The Ohio State University
Course Catalog

1966-1967
courses of instruction

This section provides descriptions of courses of instruction offered by the University at the undergraduate, graduate, and professional levels. The departments and schools, which offer the courses, are arranged in alphabetical order. The courses in each are preceded by the names of faculty members with the rank of assistant professor, associate professor, and professor in that department or school. The preceding names signifies members of the graduate faculty who function in an advisory capacity.

A 631+ Structural Design V U G 5
W, Sp. 3 cr., 2 2-hr labs.
Prereq.: 673, Engr. Mech. 605 or 3rd yr. standing.

B Basic theory and design of reinforced concrete structures. Tilson.

C A brief description of the course: Basic theory and design of reinforced concrete structures. Instructor’s name: Tilson

EXPLANATION OF COURSE LISTINGS

The material in bold type includes

The course number: 631
A dagger—denoting that the course will not be offered this year: ♠
An asterisk—indicating that the course is offered every other year: *
The course title: Structural Design V
The instructional level: U G
U = Undergraduate
U G = Advanced Undergraduate and Graduate
G = Graduate
P = Professional (for professional students enrolled in that particular school only)
Credit hours: 5

The material in italics includes


Su = Summer W = Winter
A = Autumn Sp = Spring
Summer Quarter is further divided into 1st Term and 2nd Term. See the University Calendar on the inside back cover for dates.
Lack of staff or low student enrollment may preclude offering a course, particularly at the advanced level, every quarter for which it is authorized.

Classroom and laboratory hours: 3-cr., 2-hr. labs. In the illustration above, the 5 hours of credit are earned through satisfactory completion of courses which involves attending class 3 days a week and attending 2 2-hr laboratory periods.

Prerequisites: 673, Engr. Mech. 605 or 3rd yr. standing.
The course number(s) or other information indicate the preparation or classification prerequisite to enrollment in the course. If no department name is listed, the course number refers to the course within the same department. The prerequisite may be satisfied by the course or courses indicated or equivalent background. If a class standing such as “3rd year standing” is listed, only students with that or higher class level are eligible for enrollment. The school or department office should be consulted in cases of question as to eligibility for taking the course.

Additional information affecting a student’s enrollment in a course: Not for credit to students majoring in Civil Engr.

A brief description of the course: Basic theory and design of reinforced concrete structures. Instructor’s name: Tilson

GENERAL PREREQUISITES

The abbreviated description of courses offered by the University follow an alphabetical order. The prerequisites of each course are a part of the descriptive material.

The system of numbering courses at The Ohio State University is limited to a 300 through 999 series in each course area, which breaks down in the following manner:

Below 500:
1. Primarily designed for freshmen and sophomores.
2. Do not carry credit for graduate students.

500 to 599:
1. Not open to freshmen.
2. Do not carry credit for graduate students.

600 through 799:
1. Designed for juniors, seniors, and graduate students.
2. Prerequisites which amount to 20 quarter hours in the same or allied subjects. A minimum of at least 10 quarter hours must be in the same subject or 30 quarter hours in not more than two allied subjects.
3. Consent of Dean of the Graduate School needed for freshmen and sophomores.

800 and above:
1. Open only for graduate students.
2. Prerequisite which amounts to 30 quarter hours in the same and allied subjects, of which 15 quarter hours must be in the same subject.

Special prerequisites as stated in the description of courses must be included with these requirements.
Accounting

Office: 452 Hagerty Hall, 1775 South College Road.

PHOENIXEUM 1MACCOLLough, (Chairman), 1PERTEG, 1ORMSTAD, 1KOLLARTSCH, 1McCoy, and 1SHEETING, ASSOCIATE PROFESSORS 1BRUSH, 1BURNHAM, 1BURNS, 1GRAY, 1LIVINGSTONE, 1Lyle and 1NorTHEuP, ASSISTANT PROFESSORS ALLEN, GORDON and VANASSE.

501 Introduction to Accounting
A, W, Sp, Su. 5 cl.
Prereq.: or concurs.: Econ. 401 or 403 or 406 or 501 or 503 or 506 or 507.
Not open to students with credit for 401-402, 411-412, 405, or 510.
The use of accounting reports in management decisions and in control of business enterprises.

502 Introduction to Accounting
A, W, Sp, Su. 5 cl.
Prereq.: 501 and Econ. 501.
Not open to students with credit for 401-402, 411-412, 405, or 510.
The accrual interpretation of transactions and fundamentals of income determination, uses of financial statements by persons outside the firm.

503 Accounting Methods
A, W, Sp, Su. 3 cl., 2 2-hr. labs.
Prereq.: 402, 412, or 502.
Not open to students with credit for 403 or 413.
The application of accounting techniques to recording and reporting financial information. Special emphasis is given to accounting systems and the use of working papers.

510 Outline of Accounting
A, W, Sp, Su. 5 cl.
Not open to students with credit for 401, 405, 411, or 501.
Survey of accounting in modern business. This course is intended for students whose major interest is in fields other than business.

603 Cost Accounting
A, W, Sp, Su. 4 cl.
Prereq.: 403, 413, or 503.
Not open to students with credit for 624. Not for graduate credit for majors in Acc.

605 Financial Accounting
A, W, Sp, Su. 4 cl.
Prereq.: 403, 413, or 503.
Not for graduate credit for majors in Acc.
Analysis and interpretation of financial statements, advanced study of concepts of asset valuation and income determination.

606 Financial Accounting
A, W, Sp, Su. 4 cl.
Prereq.: 403, 413 or 503, and 605.
A continuation of 605 with special emphasis on the accounting entity and business combinations.

623 Principles of Automatic Data Processing
A, W. 2 cl., 1 2-hr. lab.
Prereq.: 402 or 412 or 502, Econ. 542, and permission of instructor.
The principles of processing business data automatically; the uses and limitations of computers in business. Techniques used in formulating and solving business problems on computers.

624 Factory Costs
A, Sp. 5 cl.
Prereq.: 402 or 412 or 502.
Not open to majors in Acc.
Survey of industrial cost accounting for the student whose major interest is in fields other than accounting.

641 Tax Accounting I
A, W, Sp, Su. 4 cl.
Prereq.: 403 or 405 or 412 or 502 or 510.
Not for graduate credit for majors in Acc.
Fundamentals of federal, state, and local taxation, with major emphasis upon the federal income tax provisions having common application to all types of taxpayers.

642 Tax Accounting II
A, Su. 3 cl.
Prereq.: 641 and 403 or 412 or 503.
Advanced study of complex problem areas in taxation confronting the professional tax advisor, emphasizing the structure of tax provisions and opportunities for planning and control.

643 Introduction to Management Accounting
A. 3 cl. and conf.
A survey of accounting principles from the viewpoint of management, income measurement, analysis and interpretation of accounting data, internal reports.

644 Introduction to Management Accounting
W. 3 cl. and conf.
Prereq.: 643.
Continuation of 643.

713 Accounting Practice
A, W, Sp, Su. 4 cl.
Prereq.: 502 and 616 or 603 and 606.
A study of the accounting concepts and standards underlying corporate and non-corporate financial statements, including consideration of typical accounting problems.

719 Advanced Cost Accounting
A. 4 cl.
Prereq.: 601.
Advanced study of selected applications of cost accounting concepts to management problems involving performance measures with emphasis on budgetary control and standard costing.

724 Accounting Systems
A, Sp. 3 cl.
Prereq.: 603 and permission of instructor.
Not open to students with credit for 821, 822, 833, or 824.
The principles underlying the design and installation of accounting systems.
AERONAUTICAL AND ASTRONAUTICAL ENGINEERING

828† Accounting Problems of Financial Institutions and Fiduciaries G 3
A. W. Sp., Su. 5 cl.
Prereq.: 602 and 616 or 603 and 606.
Accounting principles and problems peculiar to banks, insurance companies, brokerage and investment houses, receivers, executors, and trustees.

830 Governmental Accounting G 3
A. W. Sp., Su. 3 cl.
Prereq.: 30 hrs. in Acc. or equiv.
The application of accounting principles to government. Problems relating to funds, appropriations, and allotments.

856 Accounting Policies of Regulatory Agencies G 3
Sp. 3 cl.
Prereq.: 30 hrs. in Acc. or equiv.
Not open to students with credit for 850 or 855.

950 Research in Accounting G Arr.
A. W. Sp., Su. 3 cl.
Research for thesis or dissertation purposes only.

Aeronautical and Astronautical Engineering
Office: 328 Civil and Aeronautical Engineering Bldg., 2036 Neil Avenue.
PROFESSORS 1von Eschen (Chairman), 2Edse, 1Gatewood, 1Lee, and 1LI; ASSOCIATE PROFESSORS 1Burggraf and 1Mallett; ASSISTANT PROFESSORS Bolinger, 1Fishburne, 1Niebem, and 1Petrie; and INSTRUCTORS.

681 Elements of Aeronautics and Astronautics U 4
A. W. Sp., Su. 3 cl.
Prereq.: Physics 533, Math. 544 or equiv.
An integrated study at an intermediate level of dynamics, fluid mechanics, propulsion, and light weight structures as related to Aeronautical and Astronautical Engineering.

682 Elements of Aeronautics and Astronautics U 4
W. 4 cl.
Prereq.: 681.
Continuation of 681.
683 Elements of Aeronautics and Astronautics  
Spr. 4 cl.  
Prereq.: 682.
Continuation of 682.

688 Aeromechanics  
Spr. 4 cl.  
Prereq.: 682.
Introduction to the nature and properties of aerodynamic fluids from microscopic and macroscopic points of view.

698 Special Studies in Aeronautical and Astronautical Engineering  
A, W, Sp. 3-5 cl.  
Prereq.: Permission of department.  
Repeatable to a maximum of 15 cr. hrs.
Special studies in aeronautical and astronautical engineering are undertaken to satisfy various nonrecurring needs for aeronautical and astronautical subject matter outside of the normal course structure of the department.

700 Aerokineticks  
A. 4 cl.  
Prereq.: 688.
Derivation of fundamental equations governing internal and external aerodynamic flows.

705 Aerothermochemistry I  
W. 4 cl.  
Prereq.: 700.
The aerodynamics of one-dimensional compressible flow from the molecular kinetic point of view including chemical reactions in the fluid.

707 Compressible Aerodynamics  
Spr. 4 cl.  
Prereq.: 705, 708.
The fundamentals of the aerodynamics of compressible fluids.

708 Classical Aerodynamics  
W. 4 cl.  
Prereq.: 700.
Fundamentals of steady and unsteady incompressible, nonviscous aerodynamic flows with applications to oscillating airfoils and finite wings.

713 Aeronautical Laboratory  
A. 2 cl., 2 3-hr. labs.  
Prereq.: Aero-Astr. E. 5th yr. standing.
Laboratory demonstrations and experiments in aerodynamics, aeroelasticity, propulsion, and structures of flight vehicles.

714 Advanced Aeronautical Laboratory  
W. 4-8 lab. hrs.  
Prereq.: Permission of department, 713 or equiv.
The solution of problems in aero-space engineering by experimental methods.

715 Advanced Aeronautical Laboratory  
S. 4-8 lab. hrs.  
Prereq.: Permission of department, 713 or equiv.
Continuation of 714.

724 Stability and Control of Flight Vehicles  
Sp. 4 cl.  
Prereq.: 729.

725 Stability and Control of Flight Vehicles  
W. 4 cl.  
Prereq.: 724.
Continuation of 724.

729 Motion and Deformation of Flight Vehicles  
A. 4 cl.  
Derivation of the basic equations and methods of analysis governing the motions, deformations, and resulting stresses encountered by flight vehicles.

730 Flight Vehicle Structures  
W. 4 cl.  
Prereq.: 729.
Stress and deformation analysis of light weight structures for flight vehicles under static and dynamic loadings.

731 Structural Design of Flight Vehicle Components  
Sp. 2 cl., 2 3-hr. labs.  
Prereq.: 730.

740 Preliminary Design of Flight Vehicles  
Sp. 2 cl., 2 3-hr. labs.  
Prereq.: Aero-Astr. E. 5th yr. standing.

746 Thermal Stresses in Aircraft and Missiles  
Spr. 4 cl.  
Prereq.: 730.
Theory of thermal stresses, aeroelastic heating and structural effects due to heating.

754 Aeroelasticity  
A. 4 cl.  
Prereq.: 705, 750.
Dynamic loads analysis of elastic flight vehicles subjected to unsteady airloads.

755 Aeroelasticity  
W. 4 cl.  
Prereq.: 754.
Continuation of 754.

763 Principles of Flight Vehicle Propulsion  
A. 4 cl.  
Prereq.: 707.
Functional characteristics and performance of rocket, ramjet, turboprop, turbo-propeller, pulse jet, and hybrid engines.

764 Advanced Propulsion  
W. 4 cl.  
Prereq.: 763.
Problems of chemical energy sources for space propulsion, nuclear and electric propulsion systems.

772 Advanced Compressible Flow I  
W. 4 cl.  
Prereq.: 707.
Characteristic methods, conical flow phenomena, supersonic wing theory, and slender body theory.
Advanced Compressible Flow II
Sp. 4 cl.
Prereq.: 772 and 775.
Wing-body interference, shock wave-boundary layer interaction, and control surfaces in supersonic flow.

Aerodynamics of Viscous Fluids I
A. 4 cl.
Prereq.: 707.
The elements of laminar and turbulent boundary layers in incompressible flows.

Aerodynamics of Viscous Fluids II
Sp. 4 cl.
Prereq.: 775.
Advanced problems in boundary layer flows.

Superaerodynamics
Sp. 4 cl.
Prereq.: 707.
Molecular theory of flow, rarefied gas phenomena, aerodynamic forces and heat transfer in rarefied gas flow.

Aerodynamic Heating
Sp. 4 cl.
Prereq.: 775.
The analysis of laminar and turbulent boundary layer heat transfer in high speed flow.

Hypersonic Flows
W. 4 cl.
Prereq.: 772 and 775.

Analytical Dynamics of Astronautics I
W. 4 cl.
Prereq.: 729 or equiv.
The dynamical analysis of spacecraft trajectories and orbits including atmospheric re-entry.

Analytical Dynamics of Astronautics II
Sp. 4 cl.
Prereq.: 787 or equiv.
Drag estimation, transfer orbits, perturbations, and three-body problems.

Hypersonic Flows
Sp. 4 cl.
Prereq.: 779.
Continuation of 779.

Senior Seminar
A. 1 cl.
Prereq.: Aero-Astro. E. 5th yr. standing.

Advanced Studies in Aeronautical Engineering
A. W. Sp.
Prereq.: Written permission of department.
Repeatable to a maximum of 15 cr. hrs.
Special advanced topics in aeronautical and astronautical engineering with the specific area under consideration announced.

Special Problems in Advanced Aeronautical and Astronautical Engineering
A. W. Sp. Su.
Prereq.: Written permission of department.
Repeatable to a maximum of 15 cr. hrs.
Special studies in aeronautical and astronautical engineering under one or more topics, including aircraft structures, aerodynamics, propulsion, flutter and vibration, and stability and control.

Advanced Dynamics of Flight Vehicles
A. 3 cl.
Prereq.: 725 or 755 or equiv.

Advanced Dynamics of Flight Vehicles
W. 3 cl.
Prereq.: 725 or 755 or equiv.

Advanced Dynamics of Flight Vehicles
Sp. 3 cl.
Prereq.: 725 or 755 or equiv.

Aerodynamics of Plasmas
A. 3 cl.
Prereq.: 707, 775, and Elec. E. 832 or equiv.

Aerodynamics of Plasmas
W. 3 cl.
Prereq.: 707, 775, and Elec. E. 832 or equiv.

Aerodynamics of Plasmas
Sp. 3 cl.
Prereq.: 707, 775, and Elec. E. 832 or equiv.

Advanced Structures for Flight Vehicles
A. 3 cl.
Prereq.: 730 or equiv.

Advanced Structures for Flight Vehicles
W. 3 cl.
Prereq.: 730 or equiv.

Advanced Structures for Flight Vehicles
Sp. 3 cl.
Prereq.: 730 or equiv.

Advanced Propulsion for Flight Vehicles
A. 3 cl.
Prereq.: 764 or equiv.

Advanced Propulsion for Flight Vehicles
W. 3 cl.
Prereq.: 764 or equiv.

Advanced Propulsion for Flight Vehicles
Sp. 3 cl.
Prereq.: 764 or equiv.
Agricultural Biochemistry

Office: 101 Violett Hall, 2315 Fyffe Road.

PROFESSORS: 1SMOORE, 1DREATHERAGE, 1SNELL; ASSOCIATE PROFESSORS 1BULEN, 1SERIF; ASSISTANT PROFESSORS 1AUDEREAU, 1BREHMANN, SCLEMENTS; DIAMONDSTONE, IDOUGALL, IVES, 1MENDICINO, ZUBOFF.

For related courses see Biology.

610 Introduction to Biological Chemistry UG 3
A, W, Sp, Su. 3 cl.
Prereq.: Chem. 405 or 406 or 551 and 2 qtrs. of biological science.
An introductory course in biochemistry dealing with the molecular basis of structure and metabolism of plants, animals, and microorganisms.

611 Introduction to Biological Chemistry: Laboratory UG 3
A, W, Sp, Su. 2 cl., 2 3-hr. labs.
Prereq. or concur.: 610.
Laboratory work to accompany 610. Assay techniques for chemical constituents and metabolic reactions of living cells.

613+* Chemistry of Foods and Food Processing UG 5
W. 3 cl., 2 3-hr. labs.
Prereq.: Chem. 521 and 551 or equiv.
The chemical, physical, and biological nature of foods in relation to handling, processing, packaging, quality, and consumer acceptance. Deatherage.

A-6
Agricultural Economics

Office: 103 Agricultural Administration Bldg., 2120 Puente Road.
PROFESSORS: J SMITH (Chairman), J BAILEY, J H. BAKER, J BAUMER, J CRAVEN, J CHAY, J DABACH, J DOUGAN, J HENNING (Emeritus), J MANCUS, J MC CORMICK, J MILNER, J JOYLER, J SHARP, J SHERRY, J SPITZ, J TOMPKIN, J WERTZ (Emeritus), ASSOCIATE PROFESSORS: J H. BAKER, J BERR, J BLOOM, J CLAYTON, J EIZELL, J JACOBSON, J JONES, J MCDONALD, J MITCHELL, J CHARLES, J MOORE, J PADBERG, J SHAUDY, J STEELE, J STOUT, J SWAN, J SWIFT, J WILLIAMS, ASSISTANT PROFESSORS: J BOTTUM, J HINES, J INGRAHAM, J KROTHA, J MARION, J FOLLOCK, J RASK, J REESE, J VANDERMARK.

420 Economic Development of Food and Agriculture
A, W, Sp. 5 cl.
An introduction to agricultural economics. A study of the major economic trends such as production, consumption, marketing, prices, and the economics underlying these trends. McCormick, Hines.

502 Farm Management
A, W, Sp. 4 cl; 1 2-hr. lab, 1 field trip during qtr.
Prereq.: 420 and Econ. 401, 402 or 406 or 501, 502, or 506.

510 Farm Records and Analysis
W. 1 2-hr. cl.; 1 2-hr. lab.
Prereq.: 420.
Nature and need for farm business records and analysis and interpretation of essential records from farm manager viewpoint. Their use in income tax reporting. Baker, Shadys.

602 Advanced Farm Organization
A, Su. 4 cl; 1 2-hr. lab, 1 day field trip during qtr.
Prereq.: 502.
Detailed application of production economics, management principles, and decision making techniques to the organization, operation, and administration of farms. Farm plans are developed. Shadys.

603 Cooperation in Agriculture
W. 5 cl.
Prereq.: 420 and Econ. 401, 402 or 406 or 501, 502, or 506.
Basic principles of cooperatives including types of organizations, legal aspects, membership relations, financing, organizational, and intercooperative problems, and distribution of savings. Ingraham.

605 Agricultural Policy
W, Sp, Su. 3 cl.
Prereq.: 420 and Econ. 401, 402, or 406 or 501, 502 or 506.
Characteristics and problems of agriculture. Description and analysis of programs and policies designed to assist agriculture and alternative proposals for the future. McCormick, Smith.

608 Livestock Marketing
W. 3 cl.
Prereq.: 613 or Bus. Org. 709.
Selling methods, basis of sale, agencies involved, organization of markets, transportation, financing, marketing costs, prices, when to market, grade differentials, government regulation will be studied. (Offered in cooperation with the Department of Animal Science.) Stout.

610 Agricultural Finance
A, Sp, Su. 3 cl. One Saturday and one overnight field trip.
Prereq.: 420 and Econ. 401, 402 or 406 or 501, 502 or 506.
Agricultural credit, facilities, procurement, extension, and management. Bailey, Jones.

612 Prices of Farm Products
W, Sp. 3 cl.
Prereq.: 420 and Econ. 401, 402 or 406 or 501, 502 or 506.
Characteristics of agricultural price, movement, measurement, seasonality, cycles, and forecasting, including analysis of price formation elasticity, parity, and other price statistics. Padberg.

613 Marketing Farm Products
A, W, Sp. 5 cl. Two day field trip.
Prereq.: 420 and Econ. 401, 402 or 406 or 501, 502 or 506.
Study of local, wholesale, and retail marketing agencies and principles involved in the marketing of farm products. Baumer, Sharp, Padberg, Croezen, and Stout.
COURSES OF INSTRUCTION
AGRICULTURAL ECONOMICS

614 Business Management in Agricultural Marketing
U G 3
A, Sp, Su. 2 cl., 1 lab.
Prereq.: 490 and Econ. 401, 402 or 406 or 501, 502 or 506.
A detailed study of representative agricultural marketing agencies including their problems of administration, employees, financial statements, selling, purchasing, and warehousing. Henning.

615 Land Economics
U G 3
Sp. 3 cl.
Prereq.: 420 and Econ. 401, 402 or 406, or 501, 502, or 506, or 3rd yr. standing and permission of instructor.

616 Food Economics
U G 3
Sp. 3 cl.
Prereq.: Econ. 401, 403 or 404 or 406 or 501, 502 or 504 or 506.
Economic aspects of the production, distribution, and consumption of food. Sherman.

618 Farm Appraisal
U G 3
Sp. 3 cl., 3 3-hr. field trips during qtr.
Prereq.: 502.
Farm real estate appraisal with emphasis on methods, procedure and reporting. Factors influencing land value and fluctuation in land prices. Baker.

621 Poultry Marketing
U G 5
Sp. 5 cl.
Prereq.: Poul. Sc. 401 or Zool. 401 or equiv. and Agr. Ec. 613 or Bus. Org. 700.
Factors affecting supply and demand for poultry products. Organization to achieve technical and economic efficiency within and among industry segments. (Offered in cooperation with the Department of Poultry Science.) Baker.

626 Marketing Dairy Products
U G 3
W. 3 cl.
Prereq.: 613 or permission of instructor.
A study of the principles of assembling, transporting, selling, pricing, distribution, marketing costs, and margin for dairy products. (Offered in cooperation with the Department of Dairy Science.) Baumert.

628 Marketing Fruits and Vegetables
U G 3
Sp. 3 cl. One 2-day field trip.
Prereq.: 613 or Bus. Org. 700.
Principles involved in the marketing of fruits and vegetables and the agencies concerned. Cashen.

633 Grain Marketing
U G 3
A. 3 cl.
Prereq.: 613 and Econ. 401, 402 or 406, or 501, 502 or 506.
Principles and practices involved in grain and feed marketing and the theory of grain pricing. Economics of storage, current development, and trends affecting grain marketing. Sharpe.

650 Foreign Agricultural Development
U G 3
A. 3 cl.
Prereq.: 420 and Econ. 401, 402 or 406, or 501, 502 or 506, or permission of instructor.
Analysis of agricultural organization, production and marketing in foreign countries. Foreign agricultural policies and international competition. Appraisal of foreign technical assistance programs in agriculture. Smith.

697 Natural Resources Problems, Programs, and Policies
U G 4
W. 2 2-hr. cl.
Prereq.: Consev. 401 and 514, or equiv., with permission of instructor.
An analytical study of contemporary and future problems of natural resources conservation and the programs and policies related to their solution. Dambach.

701 Special Problems
U G 2-5
A, W, Sp, Su.
Prereq.: 8 cr. hrs. of Agr. Ec. and permission of instructor.
Repeatable.
Planning, conducting, and reporting a special problem in agricultural economics fitting the needs of the student, under the guidance of an instructor.

711 Food Merchandising
U G 4
Sp. 4 cl.
Prereq.: Bus. Org. 705 or equiv. with permission of instructor.
Management problems in the food distribution channel including consideration of the wholesale and retail markets. Marion.

713 Market Organization in Agricultural Industries
U G 4
Sp. 4 cl.
Prereq.: 613 or Bus. Org. 700 or equiv. with permission of instructor.
Analysis of agricultural market structure, behavior, and performance. Interpretation of recent changes in agricultural market structure. Fadner.

811 Research Methods in Agricultural Economics
G 3
A, W. 3 cl.
Prereq.: Econ. 707, 5 hrs. of college mathematics, 4 hrs. of statistics, or equiv., with permission of instructor.
Principles of scientific methods in agricultural economic investigations. Sherman, Williams, Walker.

820 Economics of Agricultural Production
G 3
A, Sp. 3 cl.
Prereq.: 15 hrs. of Ag. Econ., 5 hrs. of mathematics, 4 hrs. of statistics, Econ. 707-708 or equiv. with permission of instructor.
A critical consideration of economic principles as they apply to production problems in agriculture. Williams, Walker.

821 Advanced Economics of Agricultural Production
G 3
Sp. 3 cl.
Prereq.: 820, Econ. 804 A-B, Math. 440 or equiv. with permission of instructor.
A further consideration of economic principles as they apply to production problems in agriculture. Williams, Walker.

830 Advanced Farm Organization and Resource Management
G 3
W. 3 cl.
Prereq.: Agr. Econ. 602.
This course is designed to integrate resource use and the human factor under dynamic conditions of risk and uncertainty with a goal of economic progress. Tomphin.
Agricultural Education

Office: 208 Agricultural Administration Bldg., 2120 Fyffe Road. PROFESSORS: ENDELL (Chairman), KIRBY, I., McCORMICK, HITCHIE, ROBINSON, TAYLOR, STEWART (Emeritus), WOLF, WOOD, and WOODIN; ASSOCIATE PROFESSORS BOLANDER (Emeritus), CHRISTENSEN, AGUILAR, HENSEL, JOHNSON, and WILSON; ASSISTANT PROFESSORS BOUCHER, CUNNINGHAM, FIDLER (Emeritus), F. McCORMICK, RUBBLE and WORALL.

456 Introduction to Agricultural Education
A, W, Sp. 3 cl.
The importance and purpose of education in agriculture with emphasis upon nature of programs, opportunities available, and qualifications of personnel. Cunningham.

501 Methods in Teaching Vocational Agriculture
A, W, Sp. 4 cl. 4 lab. hrs. Prereq.: 456.
The learning process and its application to teaching vocational agriculture. Field trips to schools with special attention to vocational departments. Wolf.

504 Student Teaching in Vocational Agriculture
A, W, Sp. Prereq.: 501 and acceptance by Guidance Committee. Teaching experience in a selected school community with full time devoted to these courses. Concur 505 and 506.
Guided participation in the professional responsibilities of a teacher of vocational agriculture, including an intensive study of the problems encountered and the competencies developed. Gulter, Wilson and F. McCormick.

505 Student Teaching in Vocational Agriculture

506 Student Teaching in Vocational Agriculture

536 Principles in Extension Program Development
Sp. 3 cl.
Objectives and procedures in developing extension programs in agriculture and home economics with emphasis on program determination, teaching methods, and relationships to other groups. Cunningham.

550 Experience in Agricultural Education
A, W, Sp. Su. (either term or quarter). Prereq.: Permission of instructor. Repeatable to a maximum of 10 cl. hrs. A period of practical experience in an area of agricultural education approved by the adviser. Written reports of the experience are required. Wilson, Cunningham.

A-9
### COURSES OF INSTRUCTION
#### AGRICULTURAL EDUCATION

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>611</td>
<td>Teaching Aids for Agricultural Education</td>
<td>U G 3</td>
<td>Theor and practice in the development and utilization of teaching materials in agricultural education. Woodin, Guiler.</td>
</tr>
<tr>
<td>624</td>
<td>Apprenticeship in Agricultural Education</td>
<td>U 5</td>
<td>Guided participation in vocational agriculture, agricultural extension, and other programs in agricultural education in order to develop further competency in teaching. Boucher, Cunningham, Guiler, Wilson.</td>
</tr>
<tr>
<td>625</td>
<td>Apprenticeship in Agricultural Education</td>
<td>U 5</td>
<td>See 624 for description and requirements.</td>
</tr>
<tr>
<td>701</td>
<td>Special Problems</td>
<td>U G 2-5</td>
<td>Planning, conducting, and reporting a special problem in agricultural education appropriate to the needs of the student.</td>
</tr>
<tr>
<td>703</td>
<td>Methods in Teaching Agriculture</td>
<td>U G 3</td>
<td>Conditions and procedures that promote effective teaching in agricultural education at the secondary and college level. Bender.</td>
</tr>
<tr>
<td>705</td>
<td>Supervised Occupational Experiences in Agriculture</td>
<td>U G 3</td>
<td>Principles and procedures used in selecting, planning, conducting, and evaluating supervised occupational experiences in agriculture as related to teaching-learning situations. Woodin, Wolf.</td>
</tr>
<tr>
<td>707</td>
<td>Curriculum in Vocational Agriculture</td>
<td>U G 3</td>
<td>Principles and practices in the development of four-year programs of instruction adapted to local interests and needs for high school classes of vocational agriculture. Guiler.</td>
</tr>
<tr>
<td>712</td>
<td>Youth Organizations in Agriculture</td>
<td>U G 3</td>
<td>An analysis of youth organizations in agriculture in relation to the education of youth, with emphasis upon planning and conducting FFA and 4-H Club programs. Bender, Taylor.</td>
</tr>
<tr>
<td>715</td>
<td>Adult Education in Agriculture</td>
<td>U G 3</td>
<td>Principles and practices appropriate to the solution of problems encountered in developing and conducting instructional programs for young and adult farmers. Bender, Wolf.</td>
</tr>
<tr>
<td>797</td>
<td>Evaluation in Agricultural Education</td>
<td>U G 3</td>
<td>Principles and procedures of evaluation used in projecting and developing programs of agricultural education. Woodin.</td>
</tr>
<tr>
<td>799</td>
<td>Workshop in Agricultural Education</td>
<td>U G 4</td>
<td>Full time of student required for three weeks; no other courses concur.</td>
</tr>
<tr>
<td>799A</td>
<td>Workshop—Program Planning in Agricultural Extension</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W.</td>
<td></td>
<td>W. Open only to persons employed or about to be employed as extension workers.</td>
</tr>
<tr>
<td>799B</td>
<td>Workshop—Program Planning in Vocational Agriculture</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Su (2nd term).</td>
<td></td>
<td>Su. Open only to persons employed or about to be employed as teachers of vocational agriculture. Repeatable to a maximum of 8 cr. hrs.</td>
</tr>
<tr>
<td>799C</td>
<td>Workshop—Communication in Agricultural Education</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Su.</td>
<td></td>
<td>Objectives and methods of local program planning with special attention devoted to the appraisal of student needs and the use of community resources. Woodin, Wolf, Taylor.</td>
</tr>
<tr>
<td>799D</td>
<td>Workshop—Student and Apprentice Teaching in Agricultural Education</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Su.</td>
<td></td>
<td>Educational objectives for student teaching, the development of programs, the provision of experiences, the guidance and evaluation of professional growth of trainees.</td>
</tr>
</tbody>
</table>
Agricultural Engineering

Office: 105 Ives Hall, 2073 Neil Avenue.

PROFESSORS: STEWART (Chairman), BAEDEN (Emeritus), HARRRE, BONDURANT, HARROLD, J. W. JOHN, KENNEDY (Emeritus), MCGUEN (Emeritus), MILLER (Emeritus), OBERHOLT (Emeritus), and SCHWAD; ASSOCIATE PROFESSORS: BILAZEE, CURR, HERUM, I. HUBER, C. E. JOHN, JOEVEE, ROLLER, and ITAGANIDES; ASSISTANT PROFESSORS: CLAIRDELL, HALL, AND HAMID; INSTRUCTORS: FOSS, HOKNRA, HENRY, RANWY, and WIL-ARDSON.

504 Farm Shop Teaching Methods U 3
A, W, Sp. 2 cl., 6 lab. hrs.
Prereq. or concord Agr. Ed. 501.
Principles and methods of teaching selection, use, and care of hand and power tools, materials for wood and metal construction based upon farm needs. C. Johnson.

508 Practical Experience in Agricultural Engineering U 5
A.
Prereq.: Permission of advisor.
Ten weeks of agricultural engineering work prior to fifth year. The occupation, work completed, and a written report shall be subject to approval by advisor.

510 Food Products Engineering U 5
A. 3 cl., 2 2-hr. labs.
Prereq.: Math. 417 or equiv., and Physics 412 or equiv.
Engineering elements of production, distribution, and control of steam and electricity for heat, power, and light applications in food products processing. Harkness.

513 Power for Agricultural Operations I U 3
W, Sp. 2 cl., 2 lab. hrs.
Prereq.: Math 416 or 439.
Not open to students with credit for 503 or 513.
A study of power in agriculture with primary emphasis upon power needs for field operations, characteristics of available power sources, selection, and use of power units. Huber.

522 Buildings and Equipment for Farmstead Operations U 3
A. 2 cl., 2 lab. hrs.
Prereq.: Math. 416 or 439.
Not open to students with credit for 502.

525 Machines for Agricultural Operations U 3
A, S. 2 cl., 2 lab. hrs.
Prereq.: 513 or permission of instructor.
Not open to students with credit for 401.
Analysis of field machine operations with emphasis on recognition and quantitative solution of problems in selection and use of machines for optimum economic performance. Harkness, Huber.

527 Agricultural Drainage and Erosion Control U 3
A, S. 2 cl., 3 lab. hrs.
Prereq.: Math. 416 or 439, Agron. 501.
Not open to students with credit for 507.
Use and application of surveying instruments, serial and topographic maps, rainfall and runoff, and engineering problems of soil and water management on farms. Schaefer.
528 Agricultural Materials Handling Systems U 3
W. 2 cl., 2 lab. hrs.
Prereq.: 513 or permission of instructor
Principles, functional analysis and design of agricultural materials
handling systems from harvest to utilization. Barre.

536 Power for Agricultural Operations II U 3
W. 2 cl., 2 lab. hrs.
Prereq.: 513
Not open to students with credit for 509.
An analysis of the functional requirements of energy needs of the
farmstead, characteristics of available power sources, and selec-
tion of economic power units. Harkness.

557 Engineering of Crop Growth U 4
Environment I
W. 4 cl.
Prereq.: Agron. 608, Bot. 605, Math. 546.
Plant ecology, especially crop response to extremes of soil mois-
ture. Precipitation, infiltration, evapotranspiration, runoff, and
probability of drought and excess moisture. Soil classification.
Schwab.

567 Engineering of Crop Growth U 4
Environment II
Sp. 3 cl., 1 3-hr. lab.
Prereq.: 557, concur. Citeil E. 611.
Soil erosion principles and control. Contouring, terracing, vegeta-
tion, tillage and hydraulic conveyance systems. Earth dams and
farm reservoirs. Headwater flood reduction and flood routing.
Schwab.

600 Farm and Home Safety U G 1
Sp.
Causes of accidents. Methods for conducting farm and home
safety programs. For students interested in vocational agriculture,
estension, and farm organization work. Stewart.

605 Advanced Farm Power and U G 3
Field Machinery
A, Su (1st term). 3 cl., 3 3-hr. labs.
Not open to students majoring in Agr. E.
An advanced study of harvesting machines and power units from
the mechanical, operational, and economic standpoint. Emphasis is
given to the development of optimum harvest systems.

635 Sources and Utilization of Energy U G 5
in Agriculture
W. 3 cl., 2 2-hr. labs.
Not open for graduate credit to Agr. E. students.
A study of sources of energy, principles of energy conversion, and
energy conversion systems of importance to agriculture. Huber.

677 Engineering of Crop Growth U G 5
Environment III
A. 3 cl., 2 3-hr. labs.
Prereq.: 567, Bot. 606.
Not open for graduate credit to Agr. E. students.
Pumps and pumping. Design of drainage channels, subsurface
drains, and irrigation systems. Methods of irrigation. Special soil
problems and plant requirements. Legal aspects. Schwab.

687 Engineering of Crop Growth U G 4
Environment IV
Sp. 3 cl., 1 2-hr. lab.
Not open for graduate credit to Agr. E. students.
Factors influencing plant growth and engineering methods of con-
trolling growth factors through mechanical means. Approach to
functional design. Huber.

701 Special Problems U G 2-5
A, W, Sp, Ss.
Prereq.: Permission of instructor.
Advanced study of problems not included in regular courses of
this department.

702 Special Problems U G 3-5
A, W, Sp, Ss.
Prereq.: 15 hrs. of 600 level Agr. E. courses and per-
mission of instructor.
Not open for graduate credit to Agr. E. students.
Work on problems that are not included in regular courses. Prac-
tie in development, organization, solution, and report on prob-
lems of student's choosing.

703 Special Problems U G 3-5
A, W, Sp, Ss.
Prereq.: 702.
Not open for graduate credit to Agr. E. students.

752 Engineering of Agricultural Processes U G 5
and Related Structures I
A. 5 cl.
Not open for graduate credit to Agr. E. students.
Functional requirements and principles involved in housing ani-
mals and biological materials. Analysis of physical-chemical fac-
tors and properties affecting energy exchanges with the environ-
ment. Barre.

762 Engineering of Agricultural Processes U G 5
and Related Structures II
W. 5 cl.
Prereq.: 752, Elec. E. 644.
Not open for graduate credit to Agr. E. students.
Analysis of processing and materials-handling subsystem functions
in agriculture designed to provide greater yield from raw products
and to reduce human labor. Harkness.

765 Functional Design of Harvesting U G 4
A. 3 cl., 1 3-hr. lab.
Not open for graduate credit to Agr. E. students.
Harvesting machine functional requirements imposed by crop
physical and biological characteristics, by desired condition of
harvested material, and by the production system. Approach to
functional design. McLeod.

772 Engineering of Agricultural Processes U G 4
and Related Structures III
Sp. 3 cl., 1 3-hr. lab.
Prereq.: 782, Mech. E. 723.
Not open for graduate credit to Agr. E. students.
Design of agricultural structures and interior environments to
meet load requirements and to optimize recovery of animal and
plant production. Barre.

775 Engineering of Agricultural U G 5
Machines
W. 3 cl., 2 3-hr. labs.
Not open for graduate credit to Agr. E. students.
Complete engineering development of machines for agricultural
operations. Introduction to experimental work, advanced work in
analysis, functional and mechanical design, economic consider-
ation. McLeod.
779 Engineering of Agricultural Systems Sp. 3 cl. 2 2-hr. labs. Prereq.: Concurs. 772. Not open for graduate credit to Agr. E. students. Integration of engineering and biological principles in agriculture to optimize complete operational production systems. Application of relevant theory to present and future systems.

791 Senior Seminar A, 1 cl. Prereq.: Engr. senior standing. Study of professional ethics, examinations, societies, and employment opportunities.

798 Advanced Studies in Agricultural Engineering A, Sp. 3 cl. Prereq.: 15 cr. hrs. of 600 level Agr. E. courses and permission of instructor. Repeatable to a maximum of 9 cr. hrs. Advanced subjects to agricultural engineering. Course content to be announced in previous quarter. A.—Farm Structures, Stewart; Sp.—Power and Machinery.


907 Interdepartmental Seminar in Natural Resources (See under Interdepartmental Seminars.)

950 Research in Agricultural Engineering Research for thesis and dissertation purposes only.

Agronomy

Office: 105 Townsend Hall, 1885 Nell Avenue.

PROFESSORS: Volck (Chairman), Anderson, Baver, Davis, Dollinger, Hoff, Kologwaychuk, Lame (Emeritus), McLean, Mederski, Musgrave, Parsons, Ray, Smith, Taylor, Van Doren, Van Kuren, Willard (Emeritus), Iyamazaki, Yoder; Associate Professors Arscott, Haighiri, Himes, Jones, Triplett, Assistant Professors Ibadeh, Bendixen, Clark, Findley, Franklin, Graffins, Hall, Heizer, Hebb, Lapeyer, Jr., H. Miller, R. W. Miller, Niehaus, Schmidt, Strobe, Struthers, Uoglini, Yimmerstedt, Wilding.

403 Field Crop Production A, W, Sp, Su. 3 cl., 1 2-hr. lab. A study of the fundamental principles essential to crop production and a survey of adaptation, utilization, and problems in production of leading agronomic crops. Miller.

501 Soils A, W, Sp, Su. 4 cl., 1 2-hr. lab. Prereq.: Bot. 401 or permission of instructor. Introduction to the genetic, physical, chemical, and biological properties influencing soil productivity. Laboratory exercises include observation and quantitative determination of certain of these soil properties. Himes. 

515 Grain Crops A, W. 3 cl., 2 2-hr. lab. Prereq.: Bot. 401 or permission of instructor. A study of the grain crops, their classification, geographic distribution, culture, varieties, improvement, seed selection, seed production, harvesting, handling, recognition, grading, and utilization. Roy.


599 Undergraduate Seminar

W. 2 cl.
Prereq.: 15 cr. hrs. in Agron. and 3rd or 4th yr.
standing in Agron.
Research publication review and interpretation; the function of
agronomic industries is studied.

600 Crop Production in Developing

Countries

W. 4 cl.
Prereq.: 403, 501, or equiv.
Fundamental studies of field and plantation crops in tropical and
subtropical countries with emphasis on means and techniques for
obtaining production increases. Allen, Arcott, Horton.

601 Crop Management Problems and

Practices

A. W. 5 cl.
Prereq.: 501, 530, or equiv.
Recognizing, correlating, and solving crop problems relating to
the efficient production and use of field crops.

603 Origin and Classification of Soils

Sp. 4 cl., 1 2-hr. lab.
Prereq.; 501 and Geol. 416 or equiv.
Factors and processes in soil formation and the classification of
soils with specific reference to Ohio conditions. Wilding.

604 Soil Erosion and Its Control

A. 4 cl., 1 3-hr. lab.
Prereq.: 501 and Geol. 416 or equiv.
A study of the mechanics of soil erosion and its control. Field
trips to observe erosion and conservation practices are included.
Hoff.

605 Soil Microbiology

Sp. 3 cl., 2 2-hr. lab.
Prereq.: 501, Microbiol. 607 or permission of instructor.
A study of the morphology and physiology of soil microorganisms
and their biochemical transformations of inorganic and organic
materials in relation to soil fertility. Miller.

608 Soil Physics

A. 3 cl., 2 2-hr. lab.
Prereq.: 501, 1 yr. college Physics and Math. 440 or
336.
A study of the physical makeup and properties of soil, including
structure, thermal relationships, consistency, plasticity, water, and
their relationships. Taylor.

611 Soil Fertility

A. 3 cl.
Prereq.: 501.
A study of the factors affecting soil productivity and the practices
needed in good soil management. Fertilizer properties and prac-
tices are included. Hoff.

613 Soil Management

A. 3 cl.
Prereq.: 501 or equiv.
An integrated study of fertility, tillage, erosion control, and water
management in maintaining soil productivity. Staff.

614 Field Crop Breeding

W. 3 cl., 1 2-hr. lab.
Prereq.: 403 and Zool. 604 or Biol. 604 or equiv.
Principles of genetics and methods of plant breeding applied to
the improvement of field crops and the ultimate development of
superior varieties. Smith.

A-14

620 Principles of Grassland Management

Sp. 4 cl., 4 day field trip.
Prereq.: 501 and 520 or permission of instructor.
An advanced course primarily dealing with establishment, man-
gagement, maintenance, and utilization of important forage species
as pasture, hay, silage, sillage and sod crops and ranges.
Anderson.

630 Principles of Turfgrass Selection

Management

Sp. 4 cl.
Prereq.: 501 and Bot. 401 or permission of instructor.
Adaptation, identification, uses, growth characteristics, growth re-
sponses, and fundamental principles essential to the production of
quality turf. Miller.

640 Field Crop Ecology

Sp. 3 cl.
Prereq.: 501, 515, 520, and permission of instructor.
A study of the relationship of crop plants to climate, soils, and
other limiting factors of distribution, production, and quality.
Sundsten.

701 Special Problems

Prereq.: Permission of instructor.
Students may select special agronomic problems, not included in
regular courses and involving library, laboratory, or field studies.

712 Chemistry of Soils and Fertilizers

W. 3 cl., 2 2-hr. labs.
Prereq.: 611, Chem. 521 or equiv. and permission of
instructor.
A study of the chemical properties of soils and fertilizers affecting
plant growth and composition including modern laboratory analy-
sis of soil, fertilizer, and plant tissue. McLean.

801 Agronomy Seminar

A, W, Sp., 1 cl.
Prereq.: Repeatable to a maximum of 6 cr. hrs.
Discussion of current problems in agronomy.

802 Advanced Studies in Agronomy

Prereq.: Permission of instructor.
A. Techniques with Field Plot Data. Ray.
c. W. Radioactive Tracers in Plant and Soil Re-
search. Franklin.
d. A. Theories and Application of Agronomic Re-
search. McLean.
g. Sp. Theory and Application of Clay Membrane

805 Physical Chemistry of Soils

W. 3 cl., 2 2-hr. lab.
Prereq.: 605, Chem. 670 or 681, 682 and permission of
instructor.
A study of the physico-chemical properties of soils including
methods of characterizing clay minerals, soil acidity, ionic ab-
sorption and release, and plant nutrient uptake. McLean.

807 Techniques of Experimental Design

W. 5 cl.
Prereq.: Zool. 630 or Biol. 630 or equiv.
A study of experimental designs and their application to agricul-
tural research. Smith.
AIR SCIENCE

502 World Military Systems U 2
W. 1 cl., 1 lab. hr.
Prereq.: 401, 402, and 403 or permission of the Professor of Aerospace Studies.
A study of the factors contributing to the military power of the free world (excluding the United States).

503 World Military Systems U 2
Sp. 1 cl., 1 lab. hr.
Prereq.: 401, 402, and 403 or permission of the Professor of Aerospace Studies.
A study of the factors contributing to the military power of the Communist World.

Professional Officer Education Program

601 Growth and Development of Aerospace Power U 3
A. 3 cl. 1 lab.
Prereq.: 501, 502, and 503; or completion of the field training course; or permission of the Professor of Aerospace Studies.
A survey course covering the nature of war and the development of Air Power in the United States.

602 Growth and Development of Aerospace Power U 3
W. 3 cl. 1 lab.
Prereq.: 501, 502, and 503; or completion of the field training course; or permission of the Professor of Aerospace Studies.
A survey course covering the mission and organization of the Defense Department; Air Force concepts; doctrine, and employment; and introduction to aeronautics and space operations.

603 Growth and Development of Aerospace Power U 3
Sp. 3 cl. 1 lab.
Prereq.: 501, 502, and 503; or completion of the field training course; or permission of the Professor of Aerospace Studies.
A survey course covering present and future aeronautics and space operations, and the future development of aerospace power.

701 Weather and Navigation U 3
A, W. 4 cl., 1 lab. hr.
Prereq.: 601-602-603 or permission of the Professor of Aerospace Studies.
Basic principles of weather and air navigation. Prepares student for entry into Air Force flight training.

705 The Professional Officer I U 3
A. 3 cl. 1 lab.
Prereq.: 601, 602, and 603 or permission of the Professor of Aerospace Studies.
A study of military professionalism, the military justice system, and leadership theory.

706 The Professional Officer II U 3
W. 3 cl. 1 lab.
Prereq.: 601, 602, and 603 or permission of the Professor of Aerospace Studies.
A study of human relations, personnel policies, and problem solving.

707 The Professional Officer III U 3
Sp. 3 cl. 1 lab.
Prereq.: 601, 602, and 603 or permission of the Professor of Aerospace Studies.
A study of the principles and functions of management and the junior officer as administrator and member of the Command-Staff Team.

Air Science

Office: 500 Military Science Bldg., 2121 Tuttle Park Place. LT. COLONEL BASHAM and STAFF.

General Military Education Program

401 Defense of the United States U 2
A. 1 cl., 1 lab. hr.
An introductory examination of the factors of aerospace power, major ideological conflicts, requirements for military forces in being, responsibilities of citizenship, development and traditions of the military profession, role and attributes of the professional officer in American democracy, organization of the armed forces in the preservation of national security, and the United States Air Force as a major factor in the security of the free world.

402 Defense of the United States U 2
W. 1 cl., 1 lab. hr.
Prereq.: 401.
Continuation of 401.

403 Defense of the United States U 2
Sp. 1 cl., 1 lab. hr.
Prereq.: 402.
Continuation of 402.

501 World Military Systems U 2
A. 1 cl., 1 lab. hr.
Prereq.: 401, 402, and 403 or permission of the Professor of Aerospace Studies.
A study of the factors contributing to United States land and sea power.

814 Advanced Field Crop Breeding G 4
W. 3 cl., 1 3-hr. lab.
Prereq.: Zool. 618 or 630 or Bion. 618 or 630 or equiv. and permission of instructor.
A detailed study of the genetic fundamentals and modern procedures used in the development of plant breeding programs for the improvement of agronomic crops. Ray.

825 Physiological and Biochemical Aspects of Herbicides G 3
W. 3 cl.
Herbicide absorption, course, fate, and mode of action in plants; persistence and fate in soils. Benzidax.

896 Interdepartmental Seminar in Polar and Alpine Studies G 1-3
Sp.
(See under Interdepartmental Seminars).

897 Interdepartmental Seminar in Natural Resources G 1
(See under Interdepartmental Seminars.)

950 Research in Agronomy G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

Office: 500 Military Science Bldg., 2121 Tuttle Park Place. LT. COLONEL BASHAM and STAFF.

General Military Education Program

401 Defense of the United States U 2
A. 1 cl., 1 lab. hr.
An introductory examination of the factors of aerospace power, major ideological conflicts, requirements for military forces in being, responsibilities of citizenship, development and traditions of the military profession, role and attributes of the professional officer in American democracy, organization of the armed forces in the preservation of national security, and the United States Air Force as a major factor in the security of the free world.

402 Defense of the United States U 2
W. 1 cl., 1 lab. hr.
Prereq.: 401.
Continuation of 401.

403 Defense of the United States U 2
Sp. 1 cl., 1 lab. hr.
Prereq.: 402.
Continuation of 402.

501 World Military Systems U 2
A. 1 cl., 1 lab. hr.
Prereq.: 401, 402, and 403 or permission of the Professor of Aerospace Studies.
A study of the factors contributing to United States land and sea power.
Anatomy

PROFESSORS IGRAVES (Chairman), LACKERMAN, II, AP- 
LINGTON, BAKER (Emeritus), EDWARDS (Emeritus), IJ, 
EGLITIS and IPALMER; ASSOCIATE PROFESSORS II, ECLI-
TIS, IGAUCHAN, GERSTEN (Emeritus), JHALL, RUSSELL 
and IWESTON; ASSISTANT PROFESSORS BOSTON, IDEL-
PHA, HUMBERTSON, JULYAN, KÄELBLING, IVERNALL, and 
WISMAR.

For related courses see Biology.

504 Introductory Anatomy U  6
A, W, Sp, Su. 3 cl., 3 2-hr. labs.
Prereq.: Biol. 402 or equiv.
Not open to pre-dental or pre-medical students.
Fundamental principles of anatomy as illustrated by the dissection of the cat, supplemented by demonstrations of human material. Aplington, Mrs. Aplington.

505 Neuro-Muscular Anatomy U  5
A. 2 cl., 2 3-hr. labs.
Prereq.: 504 or equiv. and permission of instructor.
Not open to pre-dental or pre-medical students.
Neuro-muscular anatomy of the human body. Wootten.

513 Comparative Vertebrate Anatomy U  6
A, W, Sp, Su. 3 cl., 3 2-hr. labs.
Prereq.: Biol. 402 and Zool. 404.
The basic plan of vertebrates with emphasis on the dogfish shark and on phylogeny leading to the mammals. Julyan.

604 Anatomical Methods U  G  5
A. 2 cl., 6 lab. hrs.
Prereq.: 15 cr. hrs. of Anatl and permission of instructor.
A study of the various techniques employed in anatomical research; designed for students to begin such research. Weston and Staff.

607 General Histology U  G  6
W. 3 cl., 3 2-hr. labs.
Prereq.: 504 or 513 or equiv.
Not open to pre-dental or pre-medical students.
A detailed study of the tissues, and a general survey of the microscopic structure of the various organs. Wissmar.

608 The Eye U  G  5
Sp. 2 cl., 3 3-hr. labs.
Prereq.: 607 and permission of instructor.
Human gross anatomy of the head and neck with special emphasis on the eye and orbit. Histology and embryology of the eye and associated structures.

613 Comparative Morphology of the Lower Vertebrates U  G  6
A. 3 cl., 2 3-hr. labs.
Prereq.: Biol. 402 or Zool. 404.
Not open to optometry, pre-medical, pre-dental or pre-
veterinary students.
Comparative morphology of representative lower vertebrates. Julyan.

615 Human Developmental Anatomy and Genetics P  G  4
A. 64 cl. and lab. hrs.
Prereq.: Med. 1st yr. standing.
Emphasis is on human gametogenesis, fertilization, and the formation of germ layers, fetal membranes and organs. Weston, Russell.

616 Vertebrate Embryology U  C  6
Sp., Su. 3 cl., 3 2-hr. labs.
Prereq.: 513 or equiv. or Zool. 620.
Embryology of representative amphibians, birds and lower mammals from fertilization through gastrulation.

618 Introductory Neurology U  G  6
A. 3 cl., 2 2-hr. labs.
Prereq.: 513 or equiv.
An elementary presentation of the structure and function of the human nervous system. A basic consideration of the neurological systems and servomechanisms. Humbertson.

619 Comparative Morphology of Mammals U  G  5
Mammals
W. 3 cl., 2 3-hr. labs.
Prereq.: 513 or 613 or equiv.
Morphology of mammals, including man, from the point of view of their structural evolution. Julyan.

621 Human Anatomy P  G  8
A. 149 cl. and lab. hrs.
Prereq.: Med. 1st year standing.

622 Human Anatomy P  G  4
W. 66 cl. and lab. hrs.
Prereq.: Med. 1st yr. standing.

624 Histology of the Human P  G  3
W. 56 cl. and lab. hrs.
Prereq.: Med. 1st yr. standing.
General histology, cytology, epithelial, connective, bone, muscular, and nervous tissues, blood, hemopoietic tissue and vascular system. Egglit, Ackerman, Case, Vernall, Weston, Wissmar.

625 Histology of the Human P  G  7
Sp. 120 cl. and lab. hrs.
Prereq.: Med. 1st yr. standing.
Special histology of the integumentary, digestive, respiratory, urogenital, and endocrine systems. Egglit, Ackerman, Case, Vernall, Wissmar.

626 Human Neurology P  G  2
W. 48 cl. and lab. hrs.
Prereq.: Med. 1st yr. standing.
The gross and microscopic anatomy of the human brain and spinal cord with special emphasis on the reaction systems. Hall, Humbertson, Kaelbling.

626A Human Neurology P  G  3
Sp. 72 cl. and lab. hrs.
Prereq.: Med. 1st yr. standing.
Continuation of 626.

627 Clinical Anatomy P  G  2
Sp. 2 cl.
Prereq.: Med. 2nd yr. standing.
A study of selected anatomical regions correlated with clinical diagnostic methods. Grosses and Staff.

637 Essentials of Embryonic Development P  3
A. 2 cl., 1 8-hr. lab.
Dent. 1st yr. standing.
The early embryology and organogenesis of man. The laboratory study emphasizes the pig embryo and is supplemented by human material.
638 Human Anatomy P G 5
W, Sp. 3 cl., 2 3-hr. lab.
Prereq.: Dent. 1st yr. standing.

639 Human Anatomy P G 7
W, Sp. 4 cl., 3 3-hr. lab.
Prereq.: Dent. 1st yr. standing.

640 Histology P G 6
A, 3 cl., 3 3-hr. lab.
Prereq.: Dent. 1st yr. standing.
General histology of the tissues and special histology of the organ systems. Verrill, Caso, Eglitis.

641 Applied Anatomy P G 1
A, 1 cl.
Prereq.: Dent. 3rd yr. standing.
Anatomy of the head and neck as applied to clinical dentistry. Russell.

701 Minor Problems in Anatomy U G 2-5
A, W, Sp. Su. 1 cl., 2-3 lab. and/or library hrs.
Prereq.: 15 cr. hrs. in Anat. or allied fields and permission of instructor.
Designed to enable the student to pursue a minor investigation in some anatomical field of his choice. Graduate Staff.

705 Anatomical Methods in Electron Microscopy
2 months, offered Jan.
Sp.
Prereq.: Med. 2nd, 3rd or 4th yr. standing.
The preparation of biological materials for electron microscopy and training in the operation of the instrument. A research project may be chosen. Weston.

711 Comparative Histology G 5
Sp., 2 cl., 2 2-hr. labs.
Prereq.: 607 or 824 or equiv.
A general consideration of cells, tissues and organs of animals with emphasis on the comparative and evolutionary aspects. Wiener.

727 Anatomy of the Newborn P 6
1 month, offered Apr., Nov.
Sp.
Prereq.: Med. 2nd, 3rd or 4th yr. standing.
Gross anatomy of the newborn correlated with prenatal and postnatal development; dissection and section study. Edwards, Goughran, Graves, Eglitis.

728 Topographical Anatomy P 6
1 month, offered July, Apr.
Sp.
Prereq.: Med. 2nd, 3rd, or 4th yr. standing.
A study of human body sections with emphasis on structural relations. Edwards, Goughran, Greens, and Eglitis.

793 Special Studies in Anatomy G 3 or 5
Prereq.: Permission of instructor.
Repeatable.
a. Advanced Regional Dissections. 1 month, offered any month
b. Blood and hemopoiesis
c. Blood and Connective tissues
d. Embryology
e. Advanced comparative morphology
f. Microscopic anatomy
g. Neurology
h. Normal X-ray anatomy. 1 month, offered
i. Epithelial tissue, including glands
j. Gross human anatomy
k. Electronmicroscopy
l. Tissue culture

815 Human Morphogenesis and Genetics G 4
A, 2 cl., 2 3-hr. lab.
Prereq.: Permission of instructor.
Emphasis is placed on human gametogenesis, fertilization, germ layer formation, organogenesis, fetal membranes, and principles of human genetics.

817* Comparative Neurology G 5
W, 3 cl., 3 2-hr. lab.
Prereq.: 618 or 626 or 826 and permission of instructor.
A phylogenetic approach toward an appreciation of neurology. The development and refinement of specific tracts will be considered from invertebrates to man. Hall.

818* The Autonomic Nervous System G 4
W, 2 2-hr. cl.
Prereq.: 619 or 626 or 826 and/or permission of instructor.
A detailed presentation of the Involuntary Nervous System, Hall.

821 Human Morphology G 6
A, W, Sp., 3 cl., 9 lab. hrs.
Prereq.: Permission of instructor.
Gross anatomy of the human body for advanced students in comparative morphology. Special attention is given to the phylogenetic and ontogenetic history of the organ systems. Gross Anatomy Staff.

822 Human Morphology G 6
W, Sp. 3 cl., 9 lab. hrs.
Prereq.: 821
Continuation of 821.

824 Advanced Mammalian Histology G 5
W, 3 cl., 6 lab. hrs.
Prereq.: Permission of instructor.
General histology of mammalian tissues and special histology of the vascular system. Eglitis, Ackerman, Weston.

825 Advanced Mammalian Histology G 5
Sp., 3 cl., 6 lab. hrs.
Prereq.: Permission of instructor.
Special histology of mammalian organ systems except the vascular. Ackerman, Eglitis.
A detailed consideration of the gross and histological structure of the nervous system and sensory organs of man. Staff, Humbertson, Keibling.

830 Seminar in Anatomy
Discussions of research in progress and reports from the literature of current anatomical problems.

950 Research in Anatomy
A, W, Sp, Su.
Research for thesis or dissertation purposes only. Graduate Staff.

Animal Science
Office: 110 Animal Science Bldg., 2090 Fyffe Road.


401 Introductory Animal Science
A, W, Sp. 3 cl., 2 2-hr. lab.
Introduction to selection, breeding, feeding, management, marketing, and utilization of livestock. The objectives and economics of the industry are discussed. Parker, R. F. Wilson, G. R. Wilson, Judy.

407 Meat Selection and Identification
A, W, Sp. 3 cl., 2 2-hr. lab.
The structure and composition of beef, pork, veal, and lamb are used to distinguish grades and usefulness of meat products for domestic and institutional purposes. Kunkle, Cahill, Althouse.

501 Horse Production and Management
W. 3 cl., 2 2-hr. lab.
Prereq.: 401, 402 or 530, and 10 cr. hrs. in Biol. Sc.
Information on breeding, feeding, and miscellaneous management of horses. Inspection trips to horse farms. Emphasis on light-leg horses and equitation skills. Reed.

502 Beef Cattle Production and Management
A, Sp. 3 cl., 2 2-hr. lab.
Prereq.: 401, 402 or 530, and 10 cr. hrs. in Biol. Sc.
Economic importance of beef cattle, covering the phases of selection, breeding, feeding, and management under diversified types of farming. Commercial and pure bred operations considered. G. R. Wilson.

503 Swine Production and Management
A, Sp. 3 cl., 2 2-hr. lab.
Prereq.: 401, 402 or 530, and 10 cr. hrs. in Biol. Sc.
Selection of breeding stock, reproduction, feeding, management, and sale of commercial and breeding swine. Swine herds, markets, and research stations are visited. R. F. Wilson.

505 Sheep Production and Management
W. Sp. 3 cl., 2 2-hr. lab.
Prereq.: 401, 402 or 530, and 10 cr. hrs. in Biol. Sc.
The place of sheep on the farm—selection, breeding, management, and marketing. Inspection trips: breeding flocks, feed yards, wool warehouse, and Experiment Station, Judy.

506 Livestock Selection
Sp. 5 2-hr. lab.
Prereq.: 401 and 15 cr. hrs. Biol. Sc. or permission of instructor.
Laboratory exercises employing current standards of animal excellence including carcass value for the selection and improvement of farm livestock. Reed.

509 Meat and Meat Products
A, W, Sp. 3 cl., 2 2-hr. lab.
Prereq.: 401, 402 or 530.
Selection of slaughter animals to illustrate the relationship of breeding, feeding, and management to carcass yield, cost, and cut-out value. Meat processing is emphasized. Cahill, Kunkle.

510 Meat Grading
Sp. 1 cl., 2 2-hr. lab.
Prereq.: 401, and 402 or 530; 407 for Home Ec. students.
The factors that influence the value of meat animals, carcasses, and wholesale cuts in accordance with recognized grading standards. Laboratory practice. Althouse.

515 Livestock Management
W, Sp. 3 cl., 2 2-hr. lab.
Prereq.: 401 and 402 or 530.
Feeding, breeding, and managing of beef, sheep, and swine. Laboratory exercises are concerned with major management problems. Reed.

Principles of Animal Improvement
(See Dairy Science 520)
(Offered in cooperation with the Departments of Animal Sc. and Poul. Sc.)

530 Principles of Animal Nutrition
A, W, Sp. 4 cl., 1 2-hr. lab.
Prereq.: Chemistry 408 or 412 and Math. 438 or equiv.
Not open to students with credit for Animal Sc. 402 or Poul. Sc. 559.
A study of the fundamental principles of nutrition in mammals and birds. (Offered in cooperation with the Departments of Dairy Sc. and Poul. Sc.) Osborne, Tynan.

Livestock Marketing
(See Agricultural Economics 608)
(Offered in cooperation with the Department of Animal Sc.)

6191 Advanced Meat Technology
W. 2 cl., 2 1-hr. lab.
Prereq.: 509 or 407 and 25 cr. hrs. in Biol. Sc.
Evaluation of scientific contribution to meat products and processing. Cahill, Kunkle, Ockerman.
Anthropology

Office: 112 Hagerty Hall, 1775 South College Road. PROFESSORS ISLETO (Chairman), F. WILLIAMS; ASSOCIATE PROFESSORS BOURGUIGNON and WESTER, ASSISTANT PROFESSORS DENTAN, and IFETAY.

501 Introduction to Anthropology
A, W, Sp, Su. 5 cl.
Prereq.: 2nd yr. standing.
An introductory survey of the field of Anthropology, with emphasis upon the prehistoric development of culture. Behavior of man illustrated by the simpler societies.

502 Introduction to Physical Anthropology
A, W, Sp. 5 cl.
Prereq.: 2nd yr. standing.
The organic development of man; human evolution; the modern groupings of man. Estel and Staff.

503 Introduction to Ethnology
A, W, Sp. 5 cl.
Prereq.: 2nd yr. standing.
A comparative survey of tribal peoples in basic world areas—Asia, Africa, Oceania, North and South America. Williams and Staff.

607 Culture Contact and Technological Change
Sp. 4 cl.
Prereq.: 501 and Soc. 491 or 507, or permission of instructor.

612 Social Relations in Folk Societies
A. 4 cl.
Prereq.: 5 hrs. of Anthrop., or equiv. and permission of instructor.
Forms of social organization in simpler societies. Dynamics of social relations in such societies; a comparison of simpler forms of social structure with complex forms. Bourguignon.

613 Religion in Folk Societies
W. 4 cl.
Prereq.: 5 hrs. of Anthrop., or equiv. and permission of instructor.
World views in folk societies, emphasizing religion and sacred beliefs. Integration of these beliefs with social organization and the arts. Slides, motion pictures, recordings. Bourguignon.

Culture Patterns and Personality
(See Sociology 624.)

630 Indians of the Americas
Sp. 4 cl.
Prereq.: 3 hrs. of Anthrop., or equiv. and permission of instructor.
American Indian cultures of the time of European conquest. Estel.

632 American Indian Prehistory
A. 4 cl.
Prereq.: 5 hrs. of Anthrop., or equiv. and permission of instructor.
A survey of American Indian archaeology. The origin and development of Indian culture from the first peopling of the continent to the coming of Europeans. Estel.

A-19
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>633</td>
<td>Dynamics of American Culture</td>
<td>U G 3</td>
<td>A, Su. 3 cl. Prereq.: 5 hrs. of Anthrop., or equiv. or permission of instructor. A review of American customs, institutions, social systems, and ideas, with emphasis on recent cultural anthropological studies. Pettit.</td>
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</tr>
<tr>
<td>634</td>
<td>Ethnology of Asia</td>
<td>U G 4</td>
<td>W, Su. 4 cl. Prereq.: 5 hrs. of Anthrop., or equiv. or permission of instructor. A survey of the people of Asia. High civilizations and tribal cultures, Prehistoric origins of Asian cultures; the distribution of physical types; languages; social customs. Denten.</td>
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<tr>
<td>635</td>
<td>Ethnology of Africa</td>
<td>U G 4</td>
<td>A. 4 cl. Prereq.: 5 hrs. of Anthrop., or equiv. or permission of instructor. The people of Africa south of the Sahara. Distribution of physical types; languages; cultural areas. West Coast Kingdoms as source of the American Negro.</td>
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</tr>
<tr>
<td>659</td>
<td>Peoples and Cultures of Latin America</td>
<td>U G 3</td>
<td>Sp. 3 cl. Prereq.: 5 cr. hrs. of Anthrop. or equiv. or permission of instructor. The pre-Columbian background. Contemporary races, cultures, and social organizations. The emergence of Latin America as a distinct culture area in the modern world. Breugnon.</td>
<td></td>
</tr>
<tr>
<td>660</td>
<td>Introduction to Anthropological Linguistics</td>
<td>U G 4</td>
<td>W. 4 cl. Prereq.: 10 cr. hrs. of Anthrop. or Ling. 601. Relations of language to social organization, world view, socialization, and cultural analysis. Callahan.</td>
<td></td>
</tr>
<tr>
<td>670</td>
<td>Principles of Research in Archaeology</td>
<td>U G 4</td>
<td>Sp. Prereq.: 10 cr. hrs. of Anthrop., including 501 or 10 hrs. of work closely related to archaeological field research, and permission of instructor. Instruction in basic methods of archaeological analysis, including artifact typology and cultural classification. Methods of excavation and recording. One-day or week-end field sessions. Baby.</td>
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</tr>
<tr>
<td>674</td>
<td>Archaeological Training</td>
<td>U G 8-16</td>
<td>Expedition Su. 8 cr. hrs. for either term. (Full time in expedition camps.) Prereq.: 670 or 10 cr. hrs. of work closely related to archaeological field research, and permission of instructor. Joint expedition of The Ohio State University and the Ohio State Museum, engaged in excavating prehistoric sites in Ohio. Experience in archaeological field work. Baby.</td>
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<tr>
<td>710</td>
<td>Research Methods in Physical Anthropology</td>
<td>U G 3</td>
<td>A. 3 cl. Prereq.: 15 cr. hrs. of Anthrop. or 10 cr. hrs. of Anthrop. and 10 cr. hrs. of closely related work, and permission of instructor. Methods used in the analysis and classification of man in both comparative and evolutionary approaches. Estel, Pettay.</td>
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<tr>
<td>730</td>
<td>Osteometry</td>
<td>U G 2</td>
<td>W. 1 hr. lec., 3-hr. lab. Prereq. or concurs. 638. Laboratory measurements of human skeletons. Pettay.</td>
<td></td>
</tr>
<tr>
<td>731</td>
<td>Anthropometry</td>
<td>U G 2</td>
<td>Sp. 1 hr. lec., 3-hr. lab. Prereq. or concurs. 637. Laboratory measurement of living human beings. Pettay.</td>
<td></td>
</tr>
<tr>
<td>820</td>
<td>Seminars in Anthropology</td>
<td>G 3</td>
<td>A, W, Sp, Su. Fields of specialization are listed under the description of 700, and registration in 820 should be followed by an alphabetical letter indicating the field of the seminar.</td>
<td></td>
</tr>
<tr>
<td>896</td>
<td>Interdepartmental Seminar in Polar and Alpine Studies</td>
<td>G 1-3</td>
<td>Sp. (See under Interdepartmental Seminars)</td>
<td></td>
</tr>
<tr>
<td>899</td>
<td>Interdepartmental Seminar</td>
<td>G 1-5</td>
<td>A, W, Sp, Su. (See under Interdepartmental Seminars.)</td>
<td></td>
</tr>
</tbody>
</table>
Architecture

Office: 106 Brown Hall, 190 West 17th Avenue.

PROFESSORS: WHITAKER (Director), BAUMER (Emeritus), BORCHERS, CLARK, PHILLIAN, RONAN (Emeritus), TILLEY, and WILSON; ASSOCIATE PROFESSORS BRINKERS, and CODDINGTON; Assistant Professors BOWSER, DIPNER, INSTRUCTORS and LECTURERS.

411 Introductory Architectural Design U 4
A. 12 lab. hrs.
An introduction to architectural design, through exercises in graphics, delineation, techniques, and space organization. Library research and individual criticism. Bouwer and Staff.

412 Introductory Architectural Design U 4
W. 12 lab. hrs.
Prereq.: 411.
Continuation of 411.

413 Introductory Architectural Design U 4
Sp. 12 lab. hrs.
Prereq.: 412.
Continuation of 412.

511 Elementary Architectural Design U 5
A. 15 lab. hrs.
Prereq.: 413.
Elementary problems in architectural design dealing with organization of space for human occupancy. Library research, individual criticism, and lectures. Tilley, Biddle, and Staff.

512 Elementary Architectural Design U 5
W. 15 lab. hrs.
Prereq.: 511.
Continuation of 511.

513 Elementary Architectural Design U 5
Sp. 15 lab. hrs.
Prereq.: 512.
Continuation of 512.

521 Elementary Architectural Construction U 3
A. 1 cl., 6 lab. hrs.
Composition, manufacture, physical properties, standards, and uses of basic building materials. Theory, methods, codes, and specifications of architectural construction, preparation of contract drawings. Dipner and Staff.

522 Elementary Architectural Construction U 3
W. 1 cl., 6 lab. hrs.
Prereq.: 521.
Continuation of 521.

523 Elementary Architectural Construction U 3
Sp. 1 cl., 6 lab. hrs.
Prereq.: 522.
Continuation of 522.

571 Special Studies in Architecture U 1–5
A. Prereq.: Permission of the School.
For students not majoring in Architecture who desire to pursue special studies in the field of Architecture.

572 Special Studies in Architecture U 1–5
W.
Prereq.: Permission of the School.
For students not majoring in Architecture who desire to pursue special studies in the field of Architecture.

573 Special Studies in Architecture U 1–5
Sp.
Prereq.: Permission of the School.
For students not majoring in Architecture who desire to pursue special studies in the field of Architecture.

604 History of Ancient Architecture U 3
A. 3 cl.
Analysis of primitive structures and ancient architecture before the Christian era to illustrate basic principles of shelter, natural building techniques, and organization of space. Borchers.

605 History of Medieval and Renaissance Architecture U 3
A. 3 cl.
Analysis of architecture from the early Christian era through the Baroque, related to the spirit of the age, social organization, and increasing structural knowledge. Borchers.

611 Intermediate Architectural Design U 5
A. 15 lab. hrs.
Prereq.: 513.
Intermediate problems in architectural design dealing with space analysis and site planning; presented in an integrated and related series of building types. Clark and Staff.

612 Intermediate Architectural Design U 5
W. 15 lab. hrs.
Prereq.: 611.
Continuation of 611.

613 Intermediate Architectural Design U 5
Sp. 15 lab. hrs.
Prereq.: 612.
Continuation of 612.

621 Intermediate Architectural Construction U 4
A. 1 cl., 8 lab. hrs.
Prereq.: 613, 554 and 661, 662, 663 concur.
Continuation of composition, manufacture, physical properties, standards, and uses of basic building materials. Theory, methods, codes and specifications of architectural construction, preparation of contract drawings. Clark and Staff.

622 Intermediate Architectural Construction U 4
W. 1 cl., 8 lab. hrs.
Prereq.: 621.
Continuation of 621.

623 Intermediate Architectural Construction U 4
Sp. 1 cl., 8 lab. hrs.
Prereq.: 622.
Continuation of 622.

631 Inspection Trip U 2
Sp.
Prereq.: Arch. or Land Arch., 4th or 5th yr. standing.
Taken between Winter and Spring Quarters. Trip to inspect architect's office and buildings in Ohio and neighboring states. Written report required.

A-21
661 Architectural Building Equipment  U  4
A.  3 cl., 3 lab. hrs.
Prereq.: 711, 712, 713 and 661, 662, 663, concur.
Fundamentals of building services; installation of approved equipment; application of building, fire prevention and safety codes; specifications and preparation of working drawings. F, S, Sp, Dipn.

662 Architectural Building Equipment  U  4
W.  3 cl., 3 lab. hrs.
Prereq.: 661.
Continuation of 661.

663 Architectural Building Equipment  U  4
Sp.  3 cl., 3 lab. hrs.
Prereq.: 662.
Continuation of 662.

671 Special Studies in Architecture  U  1-5
A.
Prereq.: Permission of the School for students not majoring in Architecture who desire to pursue special studies in the field of Architecture.

672 Special Studies in Architecture  U  1-5
W.
Prereq.: Permission of the School for students not majoring in Architecture who desire to pursue special studies in the field of Architecture.

673 Special Studies in Architecture  U  1-5
Sp.
Prereq.: Permission of the School for students not majoring in Architecture who desire to pursue special studies in the field of Architecture.

707 Allied Arts  U  3
A.  3 cl.
Prereq.: Arch. 5th yr. standing.
Analysis of arts related to architecture and the expression of the nature of materials in architectural ornament, furniture and furnishings, and the garden. Borchers.

708 Community Patterns  U  3
W.  2 cl.
Prereq.: Arch. and Land. Arch. 5th yr. standing.
Analysis of architecture and the urban landscape from ancient to modern times. Tobey.

709 Urbanism and City Planning  U  3
Sp.  3 cl.
Prereq.: Arch. and Land. Arch. 5th yr. standing.
Not open to graduate Planning students.
Planning for the modern city environment; the impact of urbanization; problems of urban land-use, transportation, and rebuilding worn-out cities; analysis of representative city plans. Stollman.

711 Advanced Architectural Design  U  6
A.  18 lab. hrs.
Prereq.: 613.
Advanced problems in architectural design dealing with space organization in relation to group composition and community patterns. Library research and individual criticism. Philman and Staff.

712 Advanced Architectural Design  U  6
W.  18 lab. hrs.
Prereq.: 711.
Continuation of 711.

713 Advanced Architectural Design  U  6
Sp.  18 lab. hrs.
Prereq.: 712.
Continuation of 711.

Prereq.: 713. Arch. 5th yr. standing.
The thesis problem summarizes all the student's architectural experiences as an undergraduate; and includes a complete analysis of building types, library research, design presentation, and working drawings. Coddington and Staff.

Prereq.: 714.
Continuation of 714.

Prereq.: 715.
Continuation of 715.

754 Professional Practice: Theory of Working Drawings and Specifications  A.  3 cl.
Prereq.: Arch. 5th yr. standing.

755 Professional Practice: Building Costs, Contracts, Supervision  U  3
W.  3 cl.
Prereq.: Arch. 5th yr. standing.
Building costs, bidding procedures, forms of construction contracts and bonds, and supervision of building construction, including study of current construction projects. Wilson.

771 Special Studies in Architecture  U  C  1-5
A.
Prereq.: Permission of the School.
For students majoring in Architecture desiring to pursue special studies not offered in the fixed curriculum.

772 Special Studies in Architecture  U  C  1-5
W.
Prereq.: Permission of the School.
For students majoring in Architecture desiring to pursue special studies not offered in the fixed curriculum.

773 Special Studies in Architecture  U  C  1-5
Sp.
Prereq.: Permission of the School.
For students majoring in Architecture desiring to pursue special studies not offered in the fixed curriculum.

781 Advanced Architectural Construction  U  5
A.  1 cl., 12 lab. hrs.
Prereq.: 714, 715, 716 concur. Arch., 5th yr. standing.
Theory and methods, codes and specifications pertaining to basic parts of advanced architectural construction, and preparation of working drawings. Wileson.
## Astronomy

**Office:** 106 Osborn Hall, 155 South Oval Drive. Perkins Observatory, Delaware, Ohio.

**Professors:** S. LETTEBAK (Chairman), I. BOBROVNIKOFF, J. S. KEEGAN, M. KO, and H. KNAUS; Associate Professors H. F. B. OSWALD and J. MITCHELL; Assistant Professors J. E. CAPRIOTTI and J. COLLINS.

<table>
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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
</table>
| 401         | General Astronomy I | U 5 | A 4 cr. 1 2-hr. lab.  
Prereq.: Eligibility for Math. 439.  
Not open to students with credit for 500.  
Astronomy 401 and 402 form a comprehensive introduction to modern astronomy. 401 deals with the solar system and the earth as an astronomical body. Roark. |
| 402         | General Astronomy II | U 5 | W 4 cr. 1 2-hr. lab.  
Prereq.: Astron. 401.  
Not open to students with credit for 500.  
A continuation of Astron. 401 with emphasis on the stellar universe and physical astronomy. Roark. |
| 500         | Descriptive Astronomy | U 5 | A, Sp. 5 cr.  
Not open to students with credit for 401 and 402.  
An introductory course emphasizing the place of astronomy in man's cultural and scientific development. Collins, Mitchell, Stettebak. |
| 601         | History of Astronomy | U G 3 | W 3 cr.  
Prereq.: 401-402, or 500, or permission of instructor.  
| 6051*       | Introduction to Celestial Mechanics | U G 3 | W 3 cr.  
Prereq.: Math. 544 or 611 and Physics 413 or 532 and 533 or permission of instructor.  
Application of the laws of motion to planets, satellites, and stars. The two-, three-, and N-body problems. Introduction to orbit and perturbation theory. Collins. |
| 611         | Spherical Astronomy | U G 3 | W 3 cr.  
Prereq.: 401 or 500 or equiv.; Mathematics 441 or 543 or 538, and Physics 412 or 531.  
The application of spherical trigonometry to stellar positions and motions; stellar co-ordinate systems; time; fundamental measurements of star positions. Stettebak. |
| 650         | Stellar Astronomy | U G 3 | A 3 cr.  
Prereq.: 402 or 500; Math. 441, 538, or 543; Physics 532 and 533; or permission of instructor.  
Distances, motions, luminosities, and masses of stars. The motions and distribution of stars and interstellar matter. Star clusters and galaxies. Capzik. |
| 651         | Introduction to Astrophysics | U G 3 | W 3 cr.  
Prereq.: Physics 614 or equiv. and Math. 544 or 611 or permission of instructor.  
Study of radiation from stars and nebulae to determine the composition and physical conditions of matter in and between the stars. Stellar energy sources. Capzik. |
652 Solar System U G 3
  Sp.  3 cl.
  Prereq.: 401 or 500; Math. 441, 558, or 543; Physics 558 or 538; or permission of instructor.
The physical nature of the solar surface, planets, satellites, comets, asteroids, meteors, and diffuse matter in the solar system.
Cosmogony of the solar system. Capriotti.

700 Minor Problems in Astronomy U G 1-15
  A, W, Sp, Su.
  Prereq.: 10 cr. hrs. of Astron., Math. 538 or 543 and Physics 412-413 or 532-533.
  Repeatable.
  Independent study or laboratory work on a special problem in observational or theoretical astronomy at the Perkins or McMillin Observatory. Perkins Observatory Staff.

751 Observational Techniques U G 3
  A.
  Prereq.: 651 and Physics 608 and 718.
  Astronomical spectroscopy, Astrometry, Photographic and photoelectric Photometry, Mitchell.

752 Observational Techniques U G 3
  W.
  Prereq.: 751.
  Continuation of 751.

753 Observational Techniques U G 3
  Sp.
  Prereq.: 752.
  Continuation of 752.

Radio Astronomy Instrumentation
See Electrical Engineering 784.

801 Seminar in Astronomy G 1
  A.  1 cl.
  Prereq.: 10 cr. hours each in 600 courses or higher in Astron., Physics, and Math., or permission of instructor.
  Repeatable.
  Seminars conducted on astronomical topics of current interest. Students will participate actively in the presentation and discussion of materials. Perkins Observatory Staff.

802 Seminar in Astronomy G 1
  W.  1 cl.
  Prereq.: 801.
  Continuation of 801.

803 Seminar in Astronomy G 1
  Sp.  1 cl.
  Prereq.: 802.
  Continuation of 803.

821 * Stellar Atmospheres and Diffuse Matter G 3
  A.  3 cl.
  Prereq.: 651, Physics 702, 718, Math. 601, 611.
  Stellar classification and spectra of peculiar stars Interpretation of continuous and line spectra of stars Diffuse matter in space.

822 * Stellar Atmospheres and Diffuse Matter G 3
  W.  3 cl.
  Prereq.: 821.
  Continuation of 821.

823 * Stellar Atmospheres and Diffuse Matter G 3
  in Space
  Sp.  3 cl.
  Prereq.: 822.
  Continuation of 823.

841 * Dynamical Astronomy G 3
  A.  3 cl.
  Prereq.: 651, Math. 601, 611.

842 * Dynamical Astronomy G 3
  W.  3 cl.
  Prereq.: 841.
  Continuation of 841.

843 * Dynamical Astronomy G 3
  Sp.  3 cl.
  Prereq.: 842.
  Continuation of 842.

850 Current Topics in Astronomy G 3
  A, W, Su.
  Prereq.: 651.
  Repeatable with permission of staff.
  Staff members and visiting lecturers will present material on their current research problems. Perkins Observatory Staff.

851 * Stellar Interiors and Stellar Evolution G 3
  A.  3 cl.
  Prereq.: 651, Physics 614, 792, Math. 601, 611.

852 * Stellar Interiors and Stellar Evolution G 3
  W.  3 cl.
  Prereq.: 851.
  Continuation of 851.

853 * Stellar Interiors and Stellar Evolution G 3
  Sp.  3 cl.
  Prereq.: 852.
  Continuation of 852.

885 Interdepartmental Seminar in G 1-5
  Radio-Astronomy
  (See under Interdepartmental Seminars.)

806 Radio Astronomy Theory I G 3
  W.  3 cl.
  Prereq.: 651 and Physics 713 or Elec. E. 823 or permission of instructor.
  Fundamental theory of radio astronomy and interpretation of basic radio observations. Given in collaboration with the Department of Electrical Engineering. Krans, Ko.

807 Radio Astronomy Theory II G 3
  Sp.  3 cl.

950 Research in Astronomy and G Arr.
  Astrophysics
  A, W, Sp, Su.
  Research for thesis or dissertation purposes only.
Aviation

Office: Ohio State University Airport, 3160 Case Road.
ASSOCIATE PROFESSOR EGGSPUEHLER (Chairman); ASSISTANT PROFESSORS BILLINGS and CHAMPION; INSTRUCTORS and LECTURERS.

505 Elements of Aviation U 4
A. W, Sp, Su. 3 cl., 2 lab.
Prereq.: Math. 416 or 439, Physics 411.
Problems in fundamentals of flight and aircraft operation. Objective study of aviation laws and regulations.

506 Primary Flight U 1
A. W, Sp, Su. 5 lab.
Prereq.: 505 or concurs. and secure permission slip at University Airport prior to scheduling.
A laboratory course provided for students to achieve greater understanding of 505.

507 Introduction to Aviation U 3
W. 3 cl., 1 field trip.
A comprehensive study of our air transportation system.

600 Advanced Flight U 1-4
A. W, Sp, Su. 3 lab.
Prereq.: 506 and secure permission slip at University Airport prior to scheduling.
The student must register for specific studies in areas indicated below, and may register for more than one at a time.
Repeatable to a maximum of 4 cr. hrs.
a. Precision Flight Maneuvers
b. Flight Navigational Procedures
c. Performance Evaluation
d. Flight Safety

601 Aircraft Performance U 3
A. 3 cl.
Prereq.: 505.
Studies of airframe components, performance and design characteristics, power plants, and federal certification of aircraft equipment.

603 Air Traffic Control and Flight Meteorology U 3
A. 3 cl.
Prereq.: 505, Physics 420.
Precision navigational techniques for position control, flight planning and cruise control, aids to navigation, fundamentals of meteorological analysis, and effects of weather on flight.

605 Analysis of Problems in Aviation Safety U 3
Sp. 3 cl.
Prereq.: 601,603, Psych. 627.
Detailed analysis of standard and proposed procedures relating to safety, studies in pilot behavior, accident investigation and safety programs.

Biology

Office: 101 Botany and Zoology Building, 1775 Neil Avenue.
PROFESSORS MEYER, MOORE, WHARTON (Biological Committee, College of Agriculture), HARVEY, ROY, STIDD; ASSOCIATE PROFESSORS GILBERT, GOOD, HOUSE, PADDOCK, PLATTS, ASSISTANT PROFESSORS A. BROCKWAY, BURLEY, BYERS, COLINVAUX, GIERS, KLIEFF, KOEB, LIN, PARRISH, SKAVERS, VALIENTE; INSTRUCTORS MENEFEE and ASSISTANTS.

402 Principles of Biology U 5
A. W, Sp. 3 cl., 3 1-hr. labs.
Not open to students with credit for Zool. 400.
A study of biological principles common to all living things: prokaryotes, cells, development, organization, coordination, genetics, homeostasis, ecology, evolution and systematics. Brookway, Koeb, Menefee, and Staff.

403 Principles of Heredity U 5
A. W. 3 cl.
Prereq.: Biol. 402.
Open only to students in Animal Sc., Dairy Sc., and Poultry Sc.

505 Introduction to Ecology U 5
W. 3 cl., two Saturdays in field trips.
Not open to students with credit for Bot. 505.
An introduction to biotic communities, inter-relations of a community with its physical environment, and the application of ecological principles to human affairs. Colman, Kikoff.

509 Evolution U 5
A. Sp. 3 cl.
Prereq.: Zool. 404 or Bot. 401, 402, or equiv.
Not open to students with credit for Zool. 509.
The principles of organic evolution. Demonstrations and discussions of the facts and theories underlying the evolution of man and other living things. Tidd.

604 Genetics U 5
A, W, Sp. 3 cl.
Not open to students with credit for Zool. 604.
A consideration of the principles, concepts, and applications of classical and modern genetics. House.

617 General Cytology U 5
W. 3 cl., 1-3 hrs. lab.
Prereq.: 3 hrs. Chem. and 20 cr. hrs. of Biol. Sci.
Not open to students with credit for Zool. 617.
A study of the nature of protoplasm, the inner organization of living cells and the fundamental phenomena of life. Byers, Green, Parrish.

618 The Cytological Basis of Genetics U 5
W. 2 cl., 3 2-hr. labs.
Prereq.: 503 or 604 or equiv.
Not open to students with credit for Zool. 618.
Documentation of the correlation between genetic principles and chromosome behavior by studying the mitotic and meiotic cells of several organisms with oil immersion microscopy. Paddock.

A-25
630 The Interpretation of Biological Data
A, Su. 4 cl., 1 2-hour lab.
Prereq.: Math. 418 or 440 or equiv. and 15 cr. hrs. in Biol. Sci.
Not open to students with credit for Zool. 630. Application of statistical methods to biological problems. Emphasis on understanding principles and concepts, including estimation, testing, hypotheses, regression, chi-square, and analysis of variance. Szewczuk.

690 Topics in Biological Science
W. 5 cl.
Prereq.: Math. 418, Chem. 405 or equiv.
Not open to students with credit for Bot. 690. Lectures and demonstrations intended for students of junior standing; cells, metabolism, photochemical phenomena, chemical genetics, physiology of reproduction, population genetics, speciation, and evolution. Staff.

699 Radiation Biology
Su.
Prereq.: High school teacher status and Zool. 404 or equiv., Physics 624 or concurs, and 10 cr. hrs. in gen. Chem. and Physics.

740† Cytogenetics
Sp. 3 cl., 2 2-hour lab.
Prereq.: 401-402 or 403 or 672, Biol. 604 and Biol. 618 or Bot. 737. Origin, transmissibility, and effects of chromosomal aberrations; their usefulness in practical breeding and in attacks on fundamental cytogenetic problems. Faddick.

804‡ Ecological Investigations of Biotic Areas of North America
Su. (First term).
Prereq.: Bot. 601 or Zool. 636 or 640, 20 additional grad. hours Biol. Sci. and permission of instructor. Fee of $145 for travel and subsistence.
Not open to students with credit for Zool. 604. Full time of the student will be required traveling and living away from the campus. Intensive field work in a variety of environments will involve both supervised and independent study.

816 Mathematical Genetics
Sp.
Prereq.: 604, Math. 537 or 650 or equiv. and permission of instructor.
Not open to students with credit for any two of Zool. 706, 707, or 708; or to students with credit for Zool. 816. Effects of mating system, mutation, selection, migration, and drift on gene frequencies in populations. Elements of biometrical genetics. Applications of human genetics. Harvey.

817 Principles of Systematics
A. 2 cl., 2 hr. lab.
Prereq.: 15 cr. hrs. of Zool. or Entom. at or above the 600 level. Not open to students with credit for Zool. 817. A study of the principles and techniques of Zoological identification, classification, and nomenclature. Valentine.

830 * Physiological Genetics
Sp. 5 cl.
Not open to students with credit for Zool. 830. A consideration of the theoretical and experimental aspects of Physiological genetics, pertaining to the concept of the gene, its biochemical nature, replication, and mutation. Haines.

831* The Nature of Gene Action
Sp. 5 cl.
A study of the action of genes at all levels of expression with special emphasis on the role of genes in developmental processes. House.

Biophysics
Office: 200 Lord Hall, 124 West 17th Avenue.
PROFESSORS: LEO E. LIPETZ (Acting Chairman), and I. BLACKWELL, R. HOZEIK, I. MOORE, I. TIBBES, I. NEUMANN, I. SNELL, and I. VON WINKEL; ASSOCIATE PROFESSORS: I. HOLLANDER, I. CONNELL, I. MITH, and I. STOW.

645 * Principles of Biophysics
Spr.
(See under Physiology 645.)

646 Radiation Biophysics
W
(See under Physiology 646.)

648 * Physical Instrumentation for Biologists
Sp.
(See under Physiology 648.)

700 Seminar in Biophysics
A, W, Sp, Su. 1 cl.
Prereq.: Permission of instructor. Repeatable.

701 Minor Problems in Biophysics
A, W, Sp, Su.
Prereq.: Permission of instructor. Repeatable to a maximum of 10 cr. hrs.

702 Advanced Experimental Methods in Biophysics
A, W, Sp, Su.
Prereq.: Permission of instructor. Repeatable to a maximum of 9 cr. hrs.

800 Advanced Topics in Biophysics
C 3
Prereq.: Permission of instructor. Repeatable to a maximum of 18 cr. hrs.

950 Research in Biophysics
C Arr.
A, W, Sp, Su.
Research for thesis and dissertation purposes only.
Botany and Plant Pathology


For related courses see Biology.

401 General Botany U 5
A, W, Sp, Su. 3 cl.
Not open to students with credit for 403.
An observation and discussion course in basic processes and structures of plants, their relation to the environment, and their importance to other organisms, especially man. Staff.

402 General Botany U 5
A, W, Sp, Su. 3 cl.
Prereq.: 401.
Continuation of 401. Reproduction, heredity, variation and evolution in plants; the plant groups; importance of non-green plants; plant distribution, plants in relation to conservation. Staff.

403 General Botany U 5
A, W, Sp, Su.
Prereq.: Biol. 402.
Not open to students with credit for 401.
A basic course in botany with emphasis on the structure and processes of the seed plants. Staff.

406 Local Flora U 5
Sp, Su. 4 2-hr. cl.; several Saturday field trips.
Prereq.: 401-402 or 403 or 672.
A laboratory, field, and discussion course in identifying plants common in Ohio. Use of keys and manuals and recognition of plants in the field are emphasized. W. B. STUCKEY, J. R. FISHER, J. T. TROXEL.

519 General Plant Pathology U 5
A, Sp. 3 cl., 2 2-hr. lab.
Prereq.: 401-402 or 403 or 415.
Not open to students with credit for Bot. 415.
An introduction to diseases of plants. J. ELLETT, J. TROXEL, J. SMITH.

601 Basic Principles of Plant Ecology U C 5
A, Sp. 3 cl., 1 3-hr. lab., several Saturday field trips, 1 3-day field trip.
Prereq.: 401-402 or 403 or 672, 20 additional cr. hrs. Biol. Sc.
The establishment, development, succession, and dynamics of plant communities and their interactions with historic, climatic, soil, and biotic factors. G. K. GILBERT, J. KENOFF.

602 Ecological Relations of World Vegetation U C 5
Sp. 3 cl., 1 3-hr. lab., 1 4-day field trip.
Prereq.: 401.
A consideration of present and past distribution of plants throughout the world and the pattern and structure of modern vegetation with emphasis on North America. J. KENOFF.

605 Plant Physiology U G 3 or 5
A, W, Su. 3 cl., 2 2-hr. labs.
Prereq.: 401-402 or 403 or 672, 10 cr. hrs. Chem.
A fundamental course in plant physiology, solutions, colloids, systems, diffusion, osmotic quantities, transpiration, absorption and translocation of water, enzymes, photosynthesis, hormones, Z. B. ZAKBA, J. ELLETT.

606 Plant Physiology U G 3 or 5
W, Sp. 3 cl., 2 2-hr. lab.
Prereq.: 401-402 or 403 or 672, 10 cr. hrs. Chem.
A continuation of 605; photosynthesis, respiration and metabolic synthesis, absorption and utilization of mineral salts, digestion, translocation of solutes, growth, reproduction, dormancy, Z. B. ZAKBA, J. ELLETT.

613 a Bryophytes, Pteridophytes, and Gymnosperms U G 5
Su. 4 2-hr. lab. cl.
Prereq.: 401-402 or 403 or 672, 10 additional cr. hrs. Biol. Sc.
Comparative structures and life histories of liverworts, mosses, ferns, conifers. Heritable variations within and among these groups during geologic time. World distributions, past and present. J. LAMPE.

614 Morphology of the Angiosperms U G 5
A. 4 2-hr. cl.
Prereq.: 401-402 or 403 or 672, 10 additional cr. hrs. Biol. Sc.
The basic principles involved in the reproducing mechanisms of angiosperms and their adaptation to problems in genetics, plant breeding, and crop production. J. BLAYDES.

615 Plant Microtechnic U G 5
W. 2 cl., 3 2-hr. lab.
Prereq.: 401-402 or 403 or 672, 10 additional cr. hrs. Biol. Sc.
Principles and methods of preparing permanent plant tissue microscopic preparations. Student has opportunity to prepare a personal slide collection suitable for teaching or research. J. T. TROXEL.

635 Plant Genetics U G 5
A. 3 cl., 2 2-hr. lab.
Prereq.: 401-402 or 403 or 672, Zoö. 604 or Biol. 604. Effects of lethals, linkage, heterozygosis, introgression, polyplodiy, self-incompatibility, and cytoplasm. Laboratory experience with scarlet-carmine smears, colchicine, pregnancy tests, random number tables, and herbarium specimens. J. DOCK.

640 Developmental Plant Anatomy U G 5
Sp, Su. 4 2-hr. cl.
Prereq.: 401-402 or 403 or 672, 10 additional cr. hrs. Biol. Sc.
The initiation, differentiation, and development of tissues, tissue systems, and organs of vascular plants, and a comparative study of the various structures. J. ROCHMANN.

649 Diseases of Ornaments U G 3
W. 1 1-hr. cl., 2 2-hr. lab.
Prereq.: 519 or 571.
A detailed study of important diseases of floral and woody ornamental plants; their cause, distribution, severity, importance, and specific control measures. J. ELLETT.

650+ Diseases of Fruit Crops U G 3
A. 3 2-hr. cl.
Prereq.: 519 or 571.
A detailed study of important tree and small fruit crop diseases; their cause, distribution, severity, and specific control measures. L. ALLISON.
**COURSES OF INSTRUCTION**

**BOTANY AND PLANT PATHOLOGY**

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<th>Course Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>651*</td>
<td>Diseases of Cereal and Forage Crops</td>
<td>U C 3</td>
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<td>W.  3 2-hr. cl.</td>
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<td>Prereq.: 519 or 671.</td>
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A detailed study of important cereal and forage crop diseases; their cause, distribution, severity, importance, and specific control measures. Effelt.

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<th>Course Code</th>
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<tbody>
<tr>
<td>652*</td>
<td>Diseases of Vegetable Crops</td>
<td>U C 3</td>
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<td>Sp.  3 2-hr. cl.</td>
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<td>Prereq.: 519 or 671.</td>
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A detailed study of important vegetable crop diseases; their cause, distribution, severity, importance, and specific control measures. Allison.

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<th>Course Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>653</td>
<td>Mycology</td>
<td>U C 5</td>
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<td>A.  3 cl., 2 2-hr. lab.</td>
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<td>Prereq.: 401-402 or 403 or 672, 10 additional cr. hrs. Biol. Sc.</td>
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A study of structures, life histories, and classification of the fungi. Schmitt.

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<th>Course Code</th>
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<tr>
<td>655</td>
<td>Industrial Mycology</td>
<td>U C 3</td>
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<td>Sp.  2 cl., 1 2-hr. lab.</td>
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<td>Prereq.: 605-606, or Chem. 551 and 552 or eqivo.</td>
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The relation of fungi, especially saprophytic fungi, to human affairs, with emphasis upon their actual and potential applications in industry. Schmitt.

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<th>Course Code</th>
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<tr>
<td>658</td>
<td>Medical Mycology</td>
<td>U C 5</td>
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<td>W.  3 cl., 2 2-hr. lab.</td>
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The fungi pathogenic to man, their structure and distribution, and the importance of human mycotic diseases. Schmitt.

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<tbody>
<tr>
<td>660*</td>
<td>Bacterial Plant Pathogens</td>
<td>U C 3</td>
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<td>Sp.  2 cl., 1 2-hr. lab.</td>
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<td>Prereq.: 519 or 671 and Microbiol. 607.</td>
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Representative types of bacterial plant diseases and factors affecting their control, severity, distribution, and economic importance. Methods used in studying plant pathogenic bacteria. Trauzel.

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<th>Course Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>664</td>
<td>Field Botany</td>
<td>U C 4</td>
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<td></td>
<td>Su (first term.)</td>
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<td>Prereq.: 20 cr. hrs. Biol. Sc. including 401-402 or 403 or 672.</td>
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<td>Not open to students with credit for Hydrobiol. 664.</td>
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<td></td>
<td>Collection, preservation, field and laboratory identification, and local distribution of plants of the major groups. Fisher.</td>
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<th>Course Code</th>
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<tr>
<td>665</td>
<td>Algae</td>
<td>U C 4 or 5</td>
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<td>Sp, Su (second term). 4 2-hr. cl.</td>
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<td>Prereq.: 401-402 or 403 or 672, 10 additional cr. hrs. Biol. Sc.</td>
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<td>In Summer Qtr. given only at Frans Theodore Stone Laboratory.</td>
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A general course covering identification, growth, reproduction, evolution, distribution, and economic importance of the algae. Taft.

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<tbody>
<tr>
<td>666*</td>
<td>Plant Virus Diseases</td>
<td>U C 3</td>
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<tr>
<td></td>
<td>Sp.  2 cl., 1 2-hr. lab.</td>
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<td>Prereq.: 519 or 671.</td>
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A study of representative types of plant virus diseases; factors affecting their control, severity, distribution, and economic importance. Methods used in studying plant viruses. Trauzel.

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<tbody>
<tr>
<td>667</td>
<td>Physiology of Aquatic Plants</td>
<td>U C 4</td>
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<td>Su (second term.)</td>
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<td>Prereq.: 401-402 or 403 or 672 or eqivo. and 20 cr. hrs. of Chem.</td>
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<td>Not open to students with credit for Hydrobiol. 667.</td>
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<td>Given only at Frans Theodore Stone Laboratory.</td>
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Lectures, discussions, laboratory and field work on basic topics in the physiology of aquatic plants. Burton.

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<tr>
<td>669*</td>
<td>Higher Aquatic Plants</td>
<td>U C 4</td>
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<td>Su (second term.)</td>
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<td>Prereq.: 401-402 or 403 or 672 or eqivo. and 10 additional cr. hrs. Biol. Sc.</td>
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Not open to students with credit for Hydrobiol. 669. Given only at Frans Theodore Stone Laboratory.

The aquatic plants of the Lake Erie region other than the algae. Field and laboratory work on their identification and ecological relation. Fisher.

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<tbody>
<tr>
<td>670*</td>
<td>Aquatic Mycology</td>
<td>U C 5</td>
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<td>Su (second term.)</td>
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<td>Prereq.: 401-402 or 403 or 672 or eqivo. and 10 additional cr. hrs. Biol. Sc.</td>
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A lecture, laboratory, and field course designed to acquaint the student with the fungi found in aquatic habitats including soil, water. Schmitt.

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<tbody>
<tr>
<td>671</td>
<td>Plant Pathology</td>
<td>U C 5</td>
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<td></td>
<td>W, Su. 3 cl., 2 2-hr. lab.</td>
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<td>Prereq.: 401-402 or 403 or 672, 15 additional cr. hrs. Biol. Sc.</td>
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<td>Not open to students with credit for Bot. 519 or 550.</td>
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<td>Not open to students majoring in plant pathology.</td>
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Representative plant diseases are studied with emphasis on general principles of disease development and control. Trauzel, Effelt.

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<tr>
<td>672</td>
<td>Basic Concepts in Botany</td>
<td>U C 5</td>
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<td>Prereq.: 10 hrs. Chem.</td>
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<td>Not open to students with credit for 401 or 403.</td>
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<td>Graduate credit only to participants in the Academic Year Institute.</td>
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An advanced course in the basic concepts of botany for students with a fundamental knowledge of chemistry. Taft.

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<tr>
<td>673*</td>
<td>Taxonomy of Vascular Plants</td>
<td>U C 5</td>
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<td>A. 4 3-hr. lab. several Saturday field trips.</td>
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<td>Prereq.: 406 or 664.</td>
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A laboratory, field, and discussion course in the classification and identification of vascular plants. Fisher.

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<tbody>
<tr>
<td>674</td>
<td>Field Plant Ecology</td>
<td>U C 4</td>
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<td></td>
<td>Su (second term.)</td>
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<td>Prereq.: 401-402 or 403 or 672 and 10 hrs. additional cr. Biol. Sc.</td>
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Principles of plant ecology as exemplified by the study of aquatic terrestrial habitats. Emphasis on field work with supplementary lectures and laboratory work.

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<tr>
<td>701</td>
<td>Special Problems</td>
<td>U C 1-5</td>
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<td>A, W, Sp, Su.</td>
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<td>Prereq.: 401-462 or 403 or 672 and 10 hrs. additional cr. Biol. Sc.</td>
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Problems may be selected in the fields of taxonomy, morphology, anatomy, physiology, biology, ecology, genetics, cytology, plant pathology, mycology, or ichnology.
718 Physiology of Fungi

W. 3 cl., 2 2-hr. lab.
Prereq.: 605-606, 653.
The physiology of the nutrition, growth, and reproduction of fungi.

725 Physiological Methods

A. 6 lab. hrs.
Prereq. or concur.: 605-606.
Not open to students with credit for 633.
Selected research techniques dealing primarily with respiration, photosynthesis, and associated metabolic phenomena. Burton, Platt, Swanson, Zabka.

730 Physiological Methods

W. 6 lab. hrs.
Prereq. or concur.: 605-606.
Not open to students with credit for 633.
Selected research techniques dealing primarily with solution culture, sterile tissue culture, hormone assay, ion uptake, osmotic relations, and physiological reactions. Burton, Platt, Swanson, Zabka.

734 Advanced Plant Physiology: Metabolism

A. 3 cl.
Advanced study of selected topics, mainly respiration, metabolic syntheses, absorption, and utilization of mineral salts, metabolism of growth substances, photosynthesis, and translocation. Platt.

735 Advanced Plant Physiology: Growth

W. 3 cl.
Prereq.: 605-606.
Not open to students with credit for 634.
The physiology of growth and reproduction. Special attention given to the interrelated effects of internal and external factors on these processes. Meyer, Swanson.

737* Plant Cytology

Sp. 3 2-hr. lab.
Prereq.: 605-606.
Colloidal chemistry and structure of cell organs living and fixed. Ontogeny, structure, division, and fusion of plant cells. Chromosome behavior, structure, and mutation; the gene. Lampe.

751* Nematoide Diseases of Plants

A. 2 cl., 2 2-hr. lab., several Saturday field trips.
Prereq.: 519 or 671.
Economical and control methods of representative plant diseases caused by nematodes. Methods used in studying plant parasitic nematodes. Smith.

754* Advanced Mycology

Sp. 3 2-hr. lab.
Prereq.: 653.
Advanced detailed study of specific groups of fungi, with emphasis on their morphology, cytology, and genetics. Gray.

757* Experimental Taxonomy

A. 3 cl., 2 2-hr. lab., several Saturday field trips.
Prereq.: 408 or 604 and Zool. 504 or Biol. 604.
Biotsystematic categories, population analysis of mass collections, individual variations, hybridization, and introgression are studied in relation to the methods and materials of experimental taxonomic research. Fisher.

810 Botanical Colloquium

Repeatable.

815 Seminar in Plant Pathology

Repeatable.
Allison, Ellett, Trout, Smith.

820 Seminar in Plant Physiology

Repeatable.
Meyer, Swanson, Platt, Burton, Zabka.

825 Seminar in Plant Ecology

Prereq.: 601.
Repeatable.
Gilbert, Klikoff.

830 Seminar in Lichenology

Sp. 2 cl.
Repeatable.
Current problems in lichen symbiosis, morphology, taxonomy, ecology, and physiology. Rudolph.

835 Seminar in Plant Taxonomy

Repeatable.
Fisher, Weihaupt, Stuckey.

850 Principles of Plant Pathology

W. 3 2-hr. cl.
Prereq.: 950 or 651, or 652.
The basic factors governing the development of plant diseases, including host-parasite relationships, effect of environment on disease developement, and the nature of disease resistance. Allison.

860 History of Botany

Sp. 3 cl.
Prereq.: 401-402 or 403 or 672, 10 additional cr. hrs. Biol. 3c.
A brief survey of the fundamental discoveries that have led to modern concepts in plant science. Rudolph.

896 Interdepartmental Seminar in Polar and Alpine Studies

Sp.
(See under Interdepartmental Seminars)

897 Interdepartmental Seminar in Natural Resources

(See under Interdepartmental Seminars)

898 Interdepartmental Seminar in Nutrition and Food Technology

Sp.
(See under Interdepartmental Seminars)

950 Research in Botany

A, W, Sp, Su.
Research for thesis and dissertation purposes only.
Business Organization

Office: 352, 354 Hagerty Hall, 1775 South College Road.

PROFESSORS: MINER (Chairman), Abramowitz, Bar-Tells, Dickelhaupt, Bowers, Brunner, Cullman, Davidson, Davis, Donaldson, Hicks, Kindig, F. Faulk, Powell, Johnson, and Stone; Associate Professors Allen, Black, Bonner, Doody, Engel, Foster, Goodell, Howard, Howland, Moockel, Morgenroth, Riddle, Smith, S. Tuttle, and assistant professors Breiling, Blackwell, Brown, Close, Cole, Grabner, Hardy, Kollat, Kruse, Melius, Raff, and Vitt.

401 Introduction to Business U 5
A, W, Sp, Su. 5 cl.
Preq.: 1st or 2nd yr. standing.
Introduction to principles of marketing, finance, management, and other business subjects. Designed to provide a broad background for advanced courses. Goodell and Staff.

500 Personal Adjustment to Business U 1
A, W. 1 cl.
Preq.: 4th yr. standing.
Basic principles and procedures relating to preparation of job applications and career blueprints; factors facilitating the adjustment from school to business. Francis.

504 Business Communications U 3
A, W, Sp. 3 cl.
Preq.: Econ. 402 or 405 or 408 or 502 or 504 or 506 or 507, and 3rd yr. standing.
Principles of writing in business letters and reports and internal communications. Selling, buying, collecting, adjusting, credit granting, etc., by mail. Hicks and Staff.

510 Secretarial Work U 5
A. 5 cl.
Preq.: Econ. 405 or 406 or 502 or 504 or 506 or 507, Ed. 403 and 406.
Theory and practice of secretarial fundamentals; duties, responsibilities, procedures, and techniques of secretarial work. Hicks.

551 Personal Finance U 3
A, W, Sp. 3 cl.
Preq.: Sophomore standing.
Not open to students in the College of Commerce and Administration majoring in either Accounting or Finance. Credit, borrowing money, saving money, bank relationships, buying government bonds, insurance, annuities, real estate, corporate bonds and stocks, and problems of taxation and wills. Donaldson, Fahl, Goodell, Foster.

614 Business Statistics U G 4
W. 3 cl., 1 2-hr. lab.
Preq.: Econ. 522 or 542 or Soc. Work 511.

615 Industrial Statistics U G 3
A, Sp. 3 cl.
Preq.: Econ. 522 or 542.
The application of statistical methods to the design and analysis of experiments, with a view to planning, organizing, and controlling the output of industry. Abramowitz, Black, Kindig.

618 Risk and Insurance U G 3
A, W, Sp, Su. 3 cl.
Preq.: Econ. 402 or 405 or 406 or 502 or 504 or 506 or 507.
Economic theory of risk, its significance and treatment; theory and practice of property, liability, life and health insurance. Dickelhaupt, Bowers, Close.

621 Business Law; Contractual Relationships U G 4
A, W, Sp. 3 cl.
Preq.: Econ. 402 or 405 or 406 or 502 or 504 or 506 or 507.
Not for graduate credit for majors in Bus. Org. or Acc.
Role of law in business. Analysis of legal principles and decisions relating to business agreements, their formation, performance, and enforcement. Craig, Howell, Wilkins.

622 Business Law for Engineers and Architects U G 3
W, Sp. 3 cl.
Not open to students in the College of Commerce and Administration.
Study of legal problems affecting professional engineers and architects, with special reference to the fundamental principles governing contractual agreements. Wilkins.

623 Business Law: Agency and Partnerships U G 3
W. 3 cl.
Preq.: 621.
Not for graduate credit for majors in Bus. Org. or Acc.
Legal principles and cases analyzed relating to representation of principals by agents, and to the formation, operation, and dissolution of partnerships. Craig, Wilkins.

625 Business Law: Commercial Paper and Sales U G 3
A, W, Sp, Su. 3 cl.
Preq.: 621.
Analysis of cases and provisions of the Uniform Commercial Code relating to commercial paper, including checks and notes, sales of personal property and related transactions. Howell.

627 Business Law: Corporations U G 3
A, W, Sp. 3 cl.
Preq.: 621.
Analysis of legal principles and cases governing the formation, operation, and dissolution of corporations. Craig.

633 Governmental Agencies and Business U G 3
W. 3 cl.
Preq.: Econ. 402 or 405 or 406 or 502 or 504 or 506 or 507 and 3rd yr. standing.
A study of the policies and procedures of the various agencies created by federal, state, and local governments to promote and regulate business enterprise.

642 Real Estate and Urban Land Economics U G 3
A, W, Sp. 3 cl.
Preq.: Econ. 402 or 405 or 406 or 502 or 504 or 506 or 507.
A survey of the field, including valuation, markets, public influence, city analysis, financing and administration. The decision-making process regarding land resource utilization is emphasized. Smith, Stone.
### BUSINESS ORGANIZATION

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>643 Real Estate Finance</td>
<td>U G 3</td>
<td>A. 3 cl.</td>
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<td>Prereq.: 642.</td>
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<tr>
<td>Sources and methods of obtaining funds for real estate investment;</td>
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<tr>
<td>financial institutions, legal considerations, the construction</td>
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<tr>
<td>industry cycles, and financing policies, practices, and</td>
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<tr>
<td>experiences. <em>Stone, Smith.</em></td>
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<tr>
<td>645 Trade Associations</td>
<td>U G 3</td>
<td>Sp. 3 cl.</td>
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<td></td>
<td></td>
<td>Prereq.: Econ. 402 or 404 or 406 or 502 or 504 or 506 or 507.</td>
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<tr>
<td>The nature and functions of trade associations and their relation</td>
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<td>to business and to government. <em>Smith.</em></td>
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<tr>
<td>646 Real Property Valuation</td>
<td>U G 3</td>
<td>Sp. 3 cl.</td>
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<td>Prereq.: 642.</td>
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<tr>
<td>Professional valuation as a guide to business decisions; valuation</td>
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<tr>
<td>theory and procedures; factors influencing real estate values, and</td>
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<tr>
<td>the selection and analysis of data. <em>Smith.</em></td>
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<tr>
<td>647 Real Estate Administration</td>
<td>U G 3</td>
<td>Sp. 3 cl.</td>
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<td>Prereq.: 642.</td>
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<tr>
<td>Administration of real estate businesses in the performance of</td>
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<tr>
<td>economic functions. Operations of brokerage, development,</td>
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<tr>
<td>construction, management, and financing firms are considered.</td>
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<tr>
<td><em>Smith.</em></td>
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<tr>
<td>649 Real Property Law</td>
<td>U G 3</td>
<td>W. 3 cl.</td>
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<td>Prereq.: 642.</td>
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<tr>
<td>Legal principles affecting land utilization and value, interests,</td>
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<td>instruments, transactions, participants, relationships, and</td>
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<tr>
<td>licensing regulations.</td>
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<tr>
<td>650 Corporation Finance</td>
<td>U G 4</td>
<td>A, W, Sp, Su. 5 cl.</td>
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<td>Prereq.: Econ. 402 or 404 or 406 or 502 or 504 or 506 or 507 and Acc. 402 or 405 or 412 or 502 or 510.</td>
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<tr>
<td>Not open to students with credit for 640 except by permission of instructor.</td>
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<tr>
<td>Forms of business organization; corporate securities, financing</td>
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<td>through securities; sources and management of working capital;</td>
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<tr>
<td>administration of income; expansion and combination;</td>
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<td>organization, receivership, and dissolution. <em>Donaldson, Riddle, and Staff.</em></td>
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<tr>
<td>651 Financial Management</td>
<td>U G 3</td>
<td>A, Sp, Su. 3 cl.</td>
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<td>Prereq.: 650.</td>
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<tr>
<td>Financial management of business units with emphasis on finance</td>
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<td>organization structure, collecting and using financial data, judging</td>
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<tr>
<td>profitability, liquidity, sources of capital, internal financial</td>
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<td>operations. <em>Pfahl, Stone, Foster.</em></td>
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<td>Prereq.: 650.</td>
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<tr>
<td>Specific problems which involve the financial policies and operations</td>
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<td>of industrial companies. <em>Donaldson, Pfahl.</em></td>
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<td>Prereq.: 650.</td>
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<tr>
<td>Nature and types of investments; objectives and programs; prices</td>
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<td>and yields; timing; taxes; supervision. <em>Donaldson, Riddle, Stone.</em></td>
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<tr>
<td>657 Security Analysis</td>
<td>U G 4</td>
<td>W, Sp, Su. 4 cl.</td>
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<td>Prereq.: 650.</td>
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<tr>
<td>Objectives of security analysis; analysis of financial statements;</td>
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<tr>
<td>principles and standards for selecting bonds and preferred stocks;</td>
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<td>appraisals and selection of common stocks. <em>Field, Stone.</em></td>
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<tr>
<td>659 Investment Banking and the Capital Market</td>
<td>U G 3</td>
<td>Sp. 3 cl.</td>
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<td>Prereq.: 650.</td>
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<tr>
<td>The capital market; security offerings; the investment banking</td>
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<tr>
<td>business—functions, organization, operation, regulation of security</td>
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<td>issues; institutional investment policies and practices. <em>Riddle.</em></td>
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<tr>
<td>660 The Stock Market</td>
<td>U G 3</td>
<td>A, Sp. 3 cl.</td>
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<td>Prereq.: 650 and Econ. 653.</td>
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<tr>
<td>Practices, procedures, and regulations relating to buying and selling securities in the organized security market. <em>Donaldson.</em></td>
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<td>670 Bank Organization and Management</td>
<td>U G 3</td>
<td>A. 3 cl.</td>
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<td>Prereq.: 650 and Econ. 653.</td>
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<tr>
<td>Functions of banking, loan and investment policy, bank organization,</td>
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<td>operation, regulation, and supervision. <em>Goodell.</em></td>
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<td>674 Savings and Trust Institutions</td>
<td>U G 3</td>
<td>W. 3 cl.</td>
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<td>Prereq.: 650 and Econ. 653.</td>
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<tr>
<td>Operations, regulation, and economic significance of savings and</td>
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<td>loan associations, saving banks, trust companies, and other financial</td>
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<td>institutions. <em>Goodell, Foster.</em></td>
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<td>Prereq.: Econ. 402 or 404 or 406 or 502 or 504 or 506 or 507 and Acc. 402 or 412 or 502 or 510.</td>
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<td>Not open to students with credit for 680.</td>
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<tr>
<td>An intensive examination of the basic fundamentals of organization</td>
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<td>and management underlying the solution of management problems.</td>
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<tr>
<td><em>Thicks and Staff.</em></td>
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<td>Prereq.: 676, Econ. 542.</td>
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<tr>
<td>Not open to students with credit for 680.</td>
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<tr>
<td>Plant location, product and process planning, materials handling,</td>
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<td>physical facilities, production control, quality control, inventory</td>
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<td>control, utilization of materials and personnel in industrial</td>
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<td>organization. <em>Abramowitz, Black, and Staff.</em></td>
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<tr>
<td>682 Supervisory Management</td>
<td>U G 3</td>
<td>A, W, Sp, Su. 3 cl.</td>
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<td>Prereq.: 677.</td>
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<tr>
<td>Managerial, technical, and human relations functions and responsi-</td>
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<tr>
<td>bilities of the first level of management as exemplified by the fore-</td>
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<td>man and supervisor. <em>Mills, Behling.</em></td>
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<tr>
<td>685 Purchasing, Stores, and Inventory Control</td>
<td>U G 3</td>
<td>A, W. 3 cl.</td>
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<td>Prereq.: 615, 677.</td>
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<tr>
<td>Objectives, principles, and methods of managing the function of</td>
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<td>procurement and of supply. Planning of materials requirements,</td>
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<tr>
<td>purchasing, receiving, storing, and disbursing. <em>Herby.</em></td>
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</tr>
</tbody>
</table>
686 Personnel Organization and Management U G 4
Su, A, W, Sp. 4 cl.
Prereq.: 676.
Not open to students with credit for 689.
Principles and practices of line and staff executives in managing the procurement, development, maintenance, and utilization of an effective and satisfied working force. Behling, Millus.

687 Production Organization and Management U G 4
W, Sp. 4 cl.
Prereq. or concurs.: 685.
Examines the problem of coordinating sales, finance, and various technical staff services with the line function of production and its requirements. Virt.

691 Office Organization and Management U G 3
A, W, Sp. 3 cl.
Prereq.: 676.
The planning, organizing, and controlling of office work; office standards, business forms, selection of business machines, analysis of office methods. Hicks.

692 Problems in Personnel Organization and Management U G 3
W, Sp. 3 cl.
Prereq.: 686 or 689.
Problems and case histories are utilized to develop proficiency in applying principles and developing decision-making powers in regard to personnel and human relations areas. Millus, Behling.

693 Wage and Salary Administration U G 3
W, Su. 3 cl.
Prereq.: 686.
Examination of problems of equitable compensation plans, alternative methods of compensation, wage and salary differentials, staff relationships, and administrative methods of compensation. Behling, Millus, Kindig.

695 Industrial Relations Management U G 3
W, Sp. 3 cl.
Prereq.: 686.
Examination of managerial and organizational aspects of employee relations arising out of relations with union, negotiation of contracts, living with contracts, and pertinent legislative matters. Behling, Millus.

698 Problems in Industrial Organization and Management Sp. 3 cl.
Prereq. or concurs.: 685, 687.
Case approach to problem-solving thought in the area of industrial organization and management. Block, Abrahamson.

700 Marketing U G 4
A, W, Sp., Su. 5 cl.
Prereq.: Econ. 402 or 404 or 408 or 502 or 504 or 506 or 507.
Critical survey of field of marketing. Structure, functions, policies, costs, and problems analyzed from consumer and other viewpoints. Emphasis on principles, trends, and quantitative expression. Davidson and Staff.

A-32

702 Managerial Marketing U G 3
A, Sp. 3 cl.
Prereq.: 700.
Marketing policies and strategy. Product planning, pricing, distribution, promotion, and service from the marketing manager's viewpoint. J. H. Davis, Stern.

704 Marketing Research U G 4
A, Sp. 4 cl.
Prereq.: 700 and Econ. 522 or 542.
The role of research in the solution of marketing problems. Emphasis is on available data analysis and methods of the field investigation. Miner, Morgenroth, Engel, Stern.

705 Retailing U G 4
A, W, Su. 4 cl.
Prereq.: 700 and Acc. 402 or 405 or 412 or 502 or 510.
Principles and methods of management as applied to retailing, including location, organization, personnel, buying, inventory control, selling, and advertising, services, expenses, and profits. Davidson, Doody.

706 Wholesaling U G 4
A, Sp. 4 cl.
Prereq.: 700 and Acc. 402 or 405 or 412 or 502 or 510.
Nature, history, institutional compositions, competitive factors, economic and governmental aspects; scientific management of wholesale establishments, including functions of sales, internal operations, and operating expense control. Davidson, J. H. Davis.

707 Retail Merchandising and Control U G 3
Sp. 3 cl.
Prereq.: 705, and Econ. 522 or 542.
Planning and analysis with reference to merchandise and expense budgets, pricing, purchase planning, buying techniques, stock control, and related phases of operation in retailing institutions. Davidson, Doody.

708 Problems in Marketing Research U G 3
Sp. 2 cl., 1 3-hr. lab.
Prereq.: 704.
Intensive problem-oriented study of selected areas of marketing research to meet the needs of students having a professional interest in such research. Miner, Morgenroth.

709 Credits and Collections U G 4
A, W, Sp. 4 cl.
Prereq.: 700 and Acc. 402 or 405 or 412 or 502 or 510.

712 Sales Management U G 4
A, W, Sp. 4 cl.
Prereq.: 676, 700, Acc. 402 or 405 or 412 or 502 or 510.
Management of sales function of a firm. Organization, forecasting, sales planning, setting territories and quotas, management of sales force, sales, and cost analysis. J. H. Davis, Cullman.

716 Principles of Advertising U G 4
A, W, Sp., Su. 4 cl.
Prereq.: 700.
BUSINESS ORGANIZATION

720 International Marketing U G 3
A, Sp. 3 cl.
Prereq.: 700.
World trade patterns, management and marketing principles applicable to international business. Politico-economic environment for international entrepreneurship. Bartels.

721† International Marketing U G 3
W. 3 cl.
Prereq.: 720.
Application of marketing management principles to international business problems. Comparative marketing analysis of selected countries. Bartels.

722† Advertising Management and Policies U G 3
W, Sp. 3 cl.
Prereq.: 718.
Critical analysis of perennial problems such as advertising budgets, client-agency relationships, advertising account management, administration and control, media planning. Callahan.

725 Field Work in Business Organization U 1-5
A, W, Sp, Su.
Prereq.: Permission of instructor.
Repeatable to a maximum of 8 cr. hrs.
Internships may be approved in the following fields of business enterprise:
- Finance, Donaldson and Staff.
- Real Estate, Smith and Staff.
- Insurance, Bickelhaupt.
- Marketing, Minor and Staff.
- Banking, Goodell.
- Industrial Management, Abramowits and Staff.
- Personnel Management, Staff.
- Transportation.
- Advertising, Callahan and Staff.
- Retailing, Davidson, Doody, and Staff.

729 Marketing G 3
A, W, Sp. 3 cl.
Prereq.: Permission of instructor.
Open only to students preparing for graduate work in business.
A critical study of the field of marketing institutions and functions primarily from a social point of view. J. H. Davis, Doody.

730 Corporation Finance G 3
A, W, Sp. 3 cl.
Prereq.: Permission of instructor.
Open only to students preparing for graduate work in business.
A critical study of the field of Corporation Finance from an economic point of view. Foster, Goodell.

749 Seminar in Real Estate G 3
W. 3 cl.
Prereq.: 642 plus one of the following: 643, 646, 647 or 649.
Issues and problems in the economics and administration of real estate resources critically examined through an intensive investigation of the literature. Smith, Stone.

750 Transportation Management U G 3
Sp. 3 cl.
Prereq.: Econ. 676 and 677.
The management of public and private transportation, considering problems of operations, sales, traffic, finance, human relations, and advertising in a service enterprise.

752† Industrial and Commercial Traffic U G 3
Management
W. 3 cl.
Prereq.: 677, or Econ. 618 or 645 or 672 or 676.
Organization of traffic management by shippers and carriers. Current problems of rates and services in the transportation of goods by various types of carriers.

760 Life and Health Insurance U G 3
A. 3 cl.
Prereq.: 618.
Examination of the principles of life and health insurance; its contracts, rates, legal concepts, and agency management. Bickelhaupt.

761 Multiple-line Insurance U G 3
W. 3 cl.
Prereq.: 618.
Study of property and liability insurance, including emphasis on the multiple-line concept, its development, organization, basic functions and problems. Bickelhaupt.

764 Business Risk Management U G 3
A. 3 cl.
Prereq.: 618.
The development of sound risk and insurance programs for business, including proper loss study analysis and treatment of property, liability, life and health risks. Bickelhaupt.

765 Life Underwriting, Group Insurance U G 3
and Pensions
Sp. 3 cl.
Prereq.: 760.
Critical analysis of the problems of professional life underwriting and estate planning, and employee benefit programs through group insurance and pensions. Bickelhaupt.

799 Special Problems in Business U G 1-3
Organization
A, W, Sp, Su.
Prereq.: Graduate or senior standing, or with a 2.5 point average in the field of specialization, and permission of instructor.
Repeatable.
- Finance, Donaldson and Staff.
- Real Estate, Smith and Staff.
- Insurance, Bickelhaupt.
- Marketing, Minor and Staff.
- Banking, Goodell.
- Industrial Management, Abramowits and Staff.
- Personnel Management, Staff.
- Transportation.
- Advertising, Callahan and Staff.
- Retailing, Davidson, Doody, and Staff.
- Analysis of Theories, Stogdill and Staff.
- Quantitative methods, Black and Staff.

800 Principles and Techniques of Research G 3
A, Sp, Su.
Prereq.: 650, 678, 700, Econ. 525 or 543.
Not open to students with credit for 703.
Principles of research methods in business and the use of research by management. The scientific method in business, sampling theory, variable analysis, research cases. Miner, Morgenroth, Engel.
802 Applications of Quantitative Methods in Business  
A, Sp. 3 cr.  
Prereq.: 600 and an introductory course in calculus.  
Applications of quantitative tools to the solution of recurring business management problems such as brokeneven points, forecasting, capital budgeting, inventory control, and product mix. Abrams, Black, Morgenroth.  

803 Advanced Finance  
W, Su. 
Prereq.: 650.  
A critical study of internal financial management of business enterprises, based primarily on comprehensive case analyses. Flath, Stone, Goodell, Foster.  

804 Seminar in Finance  
Sp. 
Prereq.: 650.  
Repeatable by permission of instructor.  
A critical study of current practices, trends and problems in the field of finance. Donaldson, Stone, Flath.  

812 Physical Distribution Management  
A.  
Prereq.: 677, 700, Econ. 522 or 542.  
Management of movement services, and coordination of demand and supply patterns for optimization of physical systems in terms of cost and customer service.  

813 Advanced Marketing  
W, Su.  
Prereq.: 700.  
A critical study of management of marketing activities in business enterprises, based primarily on comprehensive case analyses. Davidson, J. H. Davis, Doody.  

815 Seminar in General Marketing  
A.  
Prereq.: 700.  
A critical study of fundamental principles of marketing. Special emphasis on the historical, macro, social, and theoretical aspects of the subject. Davidson.  

816 Seminar in General Marketing  
W.  
Prereq.: 815.  
Continuation of 815.  
Davidson.  

817 Seminar in Contemporary Marketing Problems  
Sp.  
Prereq.: 700.  
Repeatable.  
Review of current periodical literature and individual investigation by each student of a selected marketing problem of contemporary significance for seminar discussion and written report. Bartels, J. H. Davis, Davidson, Miner.  

818 Seminar in Specialized Areas of Marketing  
W, Sp.  
Prereq.: 700.  
Repeatable.  
Regular class meetings and group discussions of the subject matter embodied by one of the following areas in the field of marketing:  

Include letter with numbers on schedule card.  
818A Advertising, Cullman.  
818B Credit and Collections, Bartels.  
818C Marketing Research, Miner.  
818D Retailing, Davidson.  
818E Sales Management, J. H. Davis.  
818F Wholesale,  
818G Marketing Theory, Bartels.  

819 History of Marketing Thought  
A.  
Prereq.: 700 and permission of instructor.  

825 Industrial Consolidations and Mergers  
W.  
Prereq.: 640 or 630.  
Historical and analytical study of industrial consolidation and mergers. Stone.  

827 The Security Market  
A.  
A critical study of the markets for listed and unlisted securities and of the factors influencing security prices. Stone.  

829 Seminar in Life and Health Insurance  
W.  
Critical consideration of current topics of significance in the field of life and health insurance through class discussions and individual research reports. Eickelbaur.  

830 Seminar in Property and Liability Insurance  
Sp.  
Investigation through class discussion and reports of the current literature on significant topics in property and liability insurance. Eickelbaur.  

833 General Administrative Management  
A.  
Prereq.: 676, 677.  
A seminar dealing with certain management problems of top executives in business organization, such as business objectives, ethics, policy, functions, and executive leadership. Hicks, Powell.  

834 General Administrative Management  
W.  
Prereq.: 676, 677.  
Deals with such top management problems as organization, structure, staff organization, decentralization, morale, and others. Hicks, Powell.  

835 Advanced Industrial Management  
W, Su.  
Prereq.: 677.  
A critical survey and examination of the current trends and advanced problems in the organization and management of industrial enterprises. Abrams, Black, Kindig.  

836 Advanced Office Organization and Management  
Sp.  
Prereq.: 691.  
A critical survey and examination of current trends and advanced problems in the field of office organization and management. Hicks.
CERAMIC ENGINEERING

Ceramic Engineering

Office: 177 Watts Hall, 2041 North College Road.
PROFESSORS: EVERHART (Chairman), BLAU, CARRUTHERS (Emeritus), R. KING (Emeritus), and RUSSELL; ASSISTANT PROFESSORS 1B. KING, and SHOOK; ADJUNCT ASSISTANT PROFESSOR ALEXANDER; INSTRUCTOR and LECTURER.

430 Industrial Experience
A. Ten weeks practical experience or its equiv., including written report, in approved factory manufacturing ceramic wares.

521 Fundamentals of Ceramic Engineering
A. 4 cr., 1 3-hr. lab.

630 Junior Inspection Trip
Sp. One week between W. and Sp. Qtr.
A class visit to various types of ceramic manufacturing plants in Ohio and adjacent states. A written report upon the work of the trip is required. Everhart, Russell.

640 Fundamentals of Ceramic Materials
Sp. 3 cr.
Survey of raw materials, their properties, functions, thermal behavior, and application. Introduction to the concept of glassy and crystalline states. Russell.

650 Ceramic Heat Processes
W. 5 cr.
Drying processes including vaporization, moisture transport, hygroscopy, and fluid flow. Firing, sintering, melting, cooling, tempering, and annealing processes. Harrell.

715 Ceramic Materials Science I
A. 4 cr.
Prereq.: Chem. 683, Mineral. 683.
Crystalline bonds, atomic structure, coordination, defect and silicate structures. Glass energy relations. Glass structure and composition related to photodinastic, optical, elastic, and mechanical properties. Blau.

716 Ceramic Materials Science II
W. 4 cr.
Prereq.: 715.
Combination of the glassy and crystalline states. Heterogeneous crystal systems. Interfacial conditions, internal stress states, inter-state bonds, micro and macro structure. Blau.

719 Ceramic Process and Product Control
Sp. 4 cr.
Prereq.: 650.
The application of control methods for processes and products. Everhart.

726 The Chemistry and Chemical Processes of Glass Technology
W. 3 cr.
Prereq.: 715, 731.
The practical processes and equipment for producing commercial molten glasses, including the selection and handling of materials, charging, processes in the furnace, types of furnaces, furnace design, and operation. Blau.
COURSES OF INSTRUCTION

CERAMIC ENGINEERING

727 The Physics and Physical Processes of Glass Technology
Sp. 4 cl.
Prereq.: 715, 731.
The development of machine processes for forming containers, tubes, flat glass, etc. Theory and processes of annealing, heat treatment, and decoration. Emphasis on the relation of processes to properties. Blau.

731 Ceramic Technology
Sp. 2 cl., 2 3-hr. lab.
The technology of glass. Blau.

732 Ceramic Technology
W. 2 cl., 2 3-hr. lab.
The technology of porcelain enamels and surface coatings for metals. King.

733 Ceramic Technology
A. 2 cl., 2 3-hr. lab.
The technology of refractories, structural clay products, and abrasives. Harsell.

734 Ceramic Technology
A. 2 cl., 2 3-hr. lab.
The technology of fine textured ceramics in the area of white wares, electrical, technical and nuclear materials, and glaze coatings. Russell.

740 Ceramic Plant Design
Sp. 4 cl., 1 2-hr. lab.
The basic concepts of ceramic plant layout and process equipment selection. Kiln, drier, and structure requirements. Manufacturing economics. Shock.

750 Special Problems
Prereq.: Permission of department.
Repeatable to a maximum of 15 cr. hrs.

765 Ceramic Research Methods
A. 1 cl., 2 2-hr. lab.
Prereq.: 716.
Introduction to research experience; organization and planning; initiating specific research, designed in combination with Ceram. E. 765 to give experience in individual and group research. Shock and Staff.

766 Ceramic Research Methods
W. 2 3-hr. lab.
Prereq.: 765.
Continuation of Ceram. E. 765 with accent on the conduct of specific research problems. Staff.

775 Ceramic Case Histories
Sp. 3 cl.
The study of selected case histories in ceramic technological and industrial problems. Designed to give experience in individual and group thinking in problem solution. Ecerhart, Blau.

776 Ceramic Case Histories
Sp. 3 cl.
The study of selected case histories in ceramic technological and industrial problems. Designed to give experience in individual and group thinking in problem solution. Russell and Staff.

781 Advanced Ceramic Materials
Science I
A. 4 cl.
Prereq.: 716 or permission of instructor.
Materials science in the areas of crystal chemistry, colloids, surface phenomena, and rheology of plastic and solid states. Thermal and optical properties. King.

782 Advanced Ceramic Materials
Science II
A. 4 cl.
Prereq.: 716 or permission of instructor.
Materials science in the area of electrical, magnetic, and semi-conductive ceramics. Behavior of special ceramics in nuclear environment. Solid state systems. Shock.

815 Seminar in Ceramic Engineering
Prereq.: Permission of instructor.
Conference and reports on problems in ceramic science, technology and engineering. Topics are chosen to cover the development of the ceramic industry. Staff.

821 Advanced Ceramic Physics and Chemistry
W. 4 cl.
Prereq.: Permission of instructor.
Reactions between solid phases, including sintering; the application of phase equilibria to ceramic problems. Oxide ceramics and thermodynamics. Alexander.

822 Advanced Ceramic Physics and Chemistry
Sp. 4 cl.
Prereq.: Permission of instructor.
Special properties of crystals; organic chemistry, ultrasonics, and thermodynamics applied to ceramics; non-oxide ceramics. Alexander.

831 Advanced Glass Science
W. 2 cl., 2 3-hr. lab.
Prereq.: 731, Chem. 683.
The coordination of composition and physical treatment for attaining desired properties in glass. Detailed consideration is given to special glasses. Blau.

832 Physical Vitreology
Sp. 4 cl.
Prereq.: 731, Chem. 683.
Advanced study of the concepts of the glassy state. Theories of random space networks, energy relations, thermal effects, phase equilibria, and X-ray diffraction studies. Blau.

841 Advanced Ceramic Science
W. 4 cl. or con.
Prereq.: 716 or equiv.
Modern engineering materials from viewpoint of ceramic science, and solid state physics. Consideration of electrical and mechanical phenomena related to technical ceramics behavior. Russell.

842 Advanced Ceramic Science
Sp. 4 cl. or con.
Prereq.: 716 or equiv.
Modern engineering materials from viewpoint of ceramic science. Thermal behavior, ceramic-metal systems, sandwich and fiber composites, space material problems, plasma and vapor deposition technology. King.
Research in Ceramic Engineering
C. Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

501 Chemical Engineering Practice Work U 5
A. 10 weeks approved work experience.
Prereq.: Chem. E. 3rd yr. standing.
The equivalent of ten weeks spent in a factory, or the engineering department of an industrial plant or organized industrial work between 3rd and 4th yr. in Chem. E. Koffolt.

503 Chemical Engineering and Process Calculations U 3
A, W. 2 cl., 2 comp. lab. hrs.
Prereq.: Physics 532, Math. 543, and Chem. 522 or permission of instructor.
The application of physico-chemical principles to problems of chemical industry. The emphasis is on graphical methods, stoichiometry, heat, and material balances. Koffolt, Gankoplis, Haering.

504 Chemical Engineering and Process Calculations U 3
W, Sp. 2 cl., 2 comp. lab. hrs.
Prereq.: 503.
Continuation of 503.

505 Chemical Engineering Practice Work U 5
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

693 Problems in Chemical Engineering U G 2-8
Operations
A, W, Sp, Su. 1 cl., 5-23 lab. hrs.
Prereq.: 692.
Repeatable. Not for graduate credit for students majoring in Chem. E.
Individual or group conferences, library, and laboratory work dealing with fundamental chemical engineering operations. Koffolt, Haering, Sweeney.

704 Inspection Trip U 2
Sp. One week between W. and Sp. Qtrs.
Repeatable.
These trips will give some practical knowledge of the magnitude of modern chemical engineering operations from a selected variety of industry. The total cost will average about $75. Koffolt, Haering.

719 Elements of Chemical Engineering U G 3
Transport Phenomena III
A, Sp. 2 cl., 2 comp. lab. hrs.
Prereq.: 692, or equiv. or permission of instructor.
Continuation of the study of transport theory. Emphasis is laid on mass transfer and stagewise operations with applied computational problems. Gankoplis, Brodkey, Smith, Sweeney.

720 Chemical Engineering Operations U G 4
W, Sp. 3 cl., 2 comp. lab. hrs.
Prereq. or concur.: 710, Chem. 652 or permission of instructor.
The application of the transport phenomena as fluids, heat and mass transfer to the chemical engineering operations of evaporation, distillation, drying, etc. Koffolt, Smith.

740 Chemical Process Control U G 3
Sp. 2 cl., 4 lab. hrs.
Prereq.: 720 or equiv. or permission of instructor.
Study of the principles employed in the measurement and control of the physical and chemical variables of chemical processes and applications to control of chemical processes. Gankoplis.

741 Chemical Engineering Operations U G 4-8
Laboratory
Su. 3 cont., 7-19 lab. hrs.
Prereq.: 720-740 or permission of instructor.
The fundamental laboratory course in the chemical engineering operations. Laboratory investigation of the operating characteristics and efficiency of chemical engineering equipment as distillation, drying, filtration, etc. Koffolt, Smith, Haering.

753 Chemical Engineering U G 3
Thermodynamics
A, Sp. 2 cl., 2 comp. lab. hrs.
Prereq.: Chem. 690 or permission of instructor.
Application of the fundamental concepts and laws of thermodynamics to problems of the chemical industry. Stress is laid on computational problem work. Kay, Smith.

754 Chemical Engineering U G 3
Thermodynamics
W, Su. 2 cl., 2 comp. lab. hrs.
Prereq.: 753.
Continuation of 753.

755 Chemical Engineering Kinetics U 3
Sp. 2 cl., 2 comp. lab. hrs.
Prereq.: 720, 754, and Chem. 683.
Chemical and engineering principles for the design and operation of chemical reactors. Kinetics of simple homogeneous systems and introduction to heterogeneous catalysts. Corrigan.

A-37
760 Chemical Engineering Economy U G 3
A. 2 cl., 2 comp. lab. hrs.
Prereq.: 741 or permission of instructor.
Economic consideration in research, development design, and
manufacturing in the chemical process industry, cost estimation,
and economic optimization of chemical engineering operations and
chemical processes. Corrigan.

761 Chemical Engineering Processes U G 3
A. 2 cl., 2 comp. lab. hrs.
Prereq.: 729, 754, concurs. 755 and 760 or permission of
instructor.
Integration of fundamentals of chemistry, chemical engineering
operations, thermodynamics, reaction kinetics, and economics for
optimization design and operation of chemical process plants. Dryden,
Brody, Corrigan, Sweney.

763 Applied Electrochemistry U G 3
A. 2 cl., 4 lab. hrs.
Prereq.: Chem. 683 or permission of instructor.
The relationship between electrical and chemical energy as applied
to chemical industries will be discussed and illustrated by labora-
tory work. Syverson.

765 Introduction to Nuclear Chemical U G 3
Engineering
W. 3 cl.
Prereq.: Physics 602 or 615 or permission of instructor.
Introductory survey of reactor engineering, reactor theory and its
relation to critical design of reactors and nuclear chemical process
equipment; radiation health physics and shielding. Dryden.

766 Nuclear Chemical Engineering U G 4
Sp. 3 cl., 3 hr. lab.
Prereq.: 765 or permission of instructor.
Continuation of 765 and application of chemical engineering
principles to chemical problems in the nuclear field; illustrated by
laboratory work with reactors and radioisotopes. Dryden.

770 Chemical Engineering Process U G 4
Development
W. 1 cl., 11 lab. hrs.
Prereq.: 741, 760, 761 or equiv.
Library, laboratory and pilot plant research and development on
chemical processes of industrial potential justified by preliminary
economic studies; preparation of optimum process flow sheets;
plant design studies. Dryden, Corrigan, Syverson, Sweney.

772 Chemical Engineering Process U G 3
Design
Sp. 1 cl., 4-4 hr. lab.
Prereq.: 770.
Based on processes developed in 770; equipment design, process
control, plant location studies, economic evaluation of project.
Work coordinated with Engr. Dr. 755. Syverson, Wiles.

777 The Profession of Chemical Engineering U 1
A. 1 cl.
Prereq.: Chem. E. 5th yr. standing.
The code of ethics of the chemical engineer; professional registra-
tion; responsibilities to the societies of the profession; manage-
tment, to labor, and as an administrator. Koffolt.

790 Analysis and Organization of Special U 2
Project Problem Investigations
W. 6 hrs. conf. and lab.
Prereq.: Chem. E. 5th yr. standing.
Analysis of definite problems having the theoretical and practical
application to the chemical industry; individual effort guided by a
chemical engineering staff member. Syverson, Haering.

791 Special Project Problem U G 5 or 6
Investigations
A, W, Sp, Su. 15 hrs. conf. and lab.
Prereq.: 790 or permission of instructor.
Repeatable.
Solution of study problems, either new or continued from 790.
Extensive theoretical and/or experimental work is followed by a
comprehensive report.

801 Advanced Special Problems in U Arr.
Chemical Engineering
A, W, Sp, Su. Cost, library and/or lab.
Prereq.: Satisfactory courses in the field of the problem
undertaken.
Repeatable.
A minor problems course covering the chemical engineering opera-
tion, instrumentation, thermodynamics, kinetics, the transport fields,
and chemical technology.

815 Advanced Chemical Engineering G 3
Science and Applications
A, W, Sp. 3 cl.
Prereq.: Chem. Engr. grad. standing or permission of
instructor.
Repeatable to a maximum of 31 cr. hrs.
This series of courses presents advanced concepts of science and
engineering as applied to the chemical engineering field under various topics. Koffolt, Syverson, Canakpola, Dryden, Brody, Corrigan,
Sweney.

815A Advanced mass transfer—1.
815B Advanced mass transfer—II.
815C Advanced binary and multicomponent distillation.
815D Extraction, azeotropic and extractive distillation.
815E Advanced heat transfer—1, conduction, radiation
and convection.
815F Advanced heat transfer—II, condensation, boil-
ing, design applications.
815G Drying, humidification and dehumidification.
815H Advanced momentum transfer—1, basic theory and
laminar flow.
815I Advanced momentum transfer—II, turbulence.
815J Advanced momentum transfer—III, two phase
phenomena.
815K Advanced combustion principles.
815L Advanced instrumentation and process control of
chemical plants.
815M Design of experiments, data handling and analy-
sis, quality control, linear programming.
815N Advanced process and plant design.
815O New or unusual chemical engineering operations
such as adsorption, atomysis, dialysis, ion exclu-
sion, sublimation.

820 Advanced Chemical Engineering G 3
Thermodynamics
W. 3 cl.
Prereq.: 720, 754, or permission of instructor.
Detailed discussion of the thermodynamic properties of pure com-
ounds and mixtures. Computational problem work emphasizes the
application of thermodynamics in industrial problems. Kay.

821 Advanced Chemical Engineering G 3
Thermodynamics
Sp. 3 cl.
Prereq.: 820.
Continuation of 820.
Advanced Chemical Engineering G 3
Chemical Kinetics
W. 3 cl.
Prereq.: 720, 755, or permission of instructor.
Chemical engineering kinetics from the viewpoint of industrial chemical processes. Corrigan.

Advanced Chemical Engineering G 3
Kinetics
Sp. 3 cl.
Prereq.: 830.
Continuation of 830.

Advanced Chemical Engineering G 3
Processes
A. 2 cl., 2 comp. lab. hrs.
Prereq.: 720, 755, 880; and/or 760 concurs. or equiv.
Study of selected chemical engineering processes which involve the application of chemistry, thermodynamics, reaction kinetics, and heat and mass transfer, crystallization, hydrogenation, polymerization, esterification, halogenation. Corrigan, Brodky, Dryden, Sapers, Sweeney.

Advanced Chemical Engineering G 5
Process Development
W. 1 cl., 14 lab. hrs.
Prereq.: 755, 760, 880.
Original work on development of a new process. Basic data for process design and preliminary cost estimate required. Corrigan, Dryden, Sapers, Sweeney.

Advanced Chemical Engineering G 2-6
Operations Laboratory
A, W, Sp, Su. 1 conf., 5-17 lab. hrs.
Prereq.: 720, 754, and/or concurs. 741, or permission of instructor.
Repeatable to a maximum of 15 hrs.
Chemical engineering fundamentals and operations. Koffolt.

Seminar in Chemical Engineering G 2
A, W, Sp, Su. 2 conf. hrs.
Prereq.: Graduate standing in Chem. E.
Repeatable.
Formal reports, lectures, and discussions of fundamentals and new developments in science and technology as related to chemical engineering. Koffolt, Hey, Geankoplis, Dryden, Brodky, Corrigan, Sapers, Sweeney.

Research in Chemical Engineering G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

Chemistry
Office: Evans Chemistry Laboratory, 88 West 18th Avenue.
General Chemistry Office: 115 McPherson Chemical Laboratory, 140 West 18th Avenue.

PROFESSORS: J. CALVERT (Chairman), BOWERMAN (Vice-Chairman), I. LIPINCOTT (Vice-Chairman), BROAD (Emeritus), I. BUSCH, I. CALEY, I. DORFMAN, I. GARRETT, I. HARRIS, HASKINS (Emeritus), I. HENNE, I. HINE, I. NEWMAN (Regents Professor), I. RUBIN, I. SCHECHTER, I. SHORE, I. SWEET, I. TAYLOR, I. VAN WINKLE, I. VERHOECK, I. WATTERS, I. WHITE, I. WOLFROM (Regents Professor); ASSOCIATE PROFESSORS: I. COLLAT, I. FIRESTONE, I. FRAENKEL, I. HIGTON, I. KUBATOV (Emeritus), I. LEUSSING, I. MACWOOD; ASSISTANT PROFESSORS: I. DOUGHERTY, I. GASSMAN, I. GERKEN, I. MEES, I. NOELLETTE, I. PADWA, I. PAQUETTE, I. SCHRAM, I. WOJCICKI.

General Chemistry U 4
A, W. 3 cl., 3 lab. hrs.
Prereq.: Engr. 1st yr. standing. One unit of high school Chem. and eligibility to enroll in Math 439.
Not open to students with credit for 407 or 411.
A general course in the principles of chemistry intended for students in engineering; metallic elements; applications to qualitative analysis. General Chem. Staff and Assistants.

General Chemistry U 4
W. 3 cl., 3 lab. hrs.
Prereq.: 404.
Not open to students with credit for 408 or 413.
Continuation of 404.

General Chemistry U 4
A, Sp. 2 cl., 6 lab. hrs.
Prereq.: 405.
Not open to students with credit for 408, 409, or 413.
Continuation of Chemistry 405; elementary organic chemistry; non-metallic elements.

Elementary Chemistry U 5
A, W, Sp. 4 cl., 3 lab. hrs.
Prereq.: Eligibility to enroll in Math 416.
Not open to students with credit for Chem. 404 or 411.
A course in the principles of chemistry, the chemistry of the more important elements and compounds, including the compounds of carbon (408). For students who require only two quarters of chemistry whether they have had high school chemistry or not and for students who do not present one unit of high school chemistry for entrance to the University. May be followed by 409 to satisfy all first year requirements in chemistry. General Chem. Staff and Assistants.

Elementary Chemistry U 5
A, W, Sp. 4 cl., 3 lab. hrs.
Prereq.: 407.
Not open to students with credit for 405 or 413.
Continuation of 407.

General Chemistry and Qualitative Analysis U 5
A, Sp. 3 cl., 6 lab. hrs.
Prereq.: 408.
Not open to students with credit for 406 or 413.
Designed as a transition course to follow 408 and to prepare students, from that sequence of courses, for second year chemistry.

A-39
COURSES OF INSTRUCTION

CHEMISTRY

411 General Chemistry U 5
A, W, Sp, Su. 3 cl., 4 lab. hrs.
Prereq.: One unit of high school chem., and eligibility to enroll in Math 190.
Not open to students with credit for 404.
A general course in fundamental chemical principles (411), the chemistry of the most important metals and non-metals (412), and qualitative analysis dealing with the separation and identification of the cations and anions (413). General Chem. Staff and Assistants.

412 General Chemistry U 5
A, W, Sp, Su. 3 cl., 4 lab. hrs.
Prereq.: 411.
Not open to students with credit for 405 or 408.
Continuation of 411.

413 General Chemistry U 5
A, W, Sp, Su. 3 cl., 6 lab. hrs.
Prereq.: 412.
Not open to students with credit for 406 or 409.
Continuation of 412.

511 General Chemistry U 5
A. 3 cl., 4 lab. hrs.
Prereq.: Superior performance on placement examination, 440 or equiv.
Not open to students with credit for 404, 407, or 411.
An honors course. The principles of chemical measurement (511), the properties of matter and qualitative analysis (512), systematic chemistry of the elements (513). Lippincott and Assistants.

512 General Chemistry U 5
W. 3 cl., 4 lab. hrs.
Prereq.: 511.
Continuation of 511.

513 General Chemistry U 5
Sp. 3 cl., 4 lab. hrs.
Prereq.: 512.
Continuation of 512.

521 Quantitative Analysis U 3 or 4
A, W, Sp, Su (1st term). 2 cl., 5 to 8 lab. hrs.
Prereq.: 406, 409 or 413, or equiv.
Not open to students with credit for 421.
A general course in quantitative analysis; gravimetric and volumetric analysis. College, Watters, Sweet, Collin, Leussing, and Assistants.

522 Quantitative Analysis U 3 or 4
W, Sp, Su (2nd term). 2 cl., 5 to 8 lab. hrs.
Prereq.: 521.
Not open to students with credit for 422.
Continuation of 521.

523 Quantitative Analysis U 3 or 4
Sp. 2 cl., 5 to 8 lab. hrs.
Prereq.: 522.
Not open to students with credit for 423.
Continuation of 522. Instrumental methods of analysis.

524 Problems in Quantitative Analysis U 2
Sp. 2 cl.
Prereq.: 522 or 533, or equiv.
Calculations in quantitative analysis and the interpretation of analytical data. Watters.

531 Quantitative Analysis U 5
A. 3 cl., 8 lab. hrs.
Prereq.: 406, 409, or 413 or equiv.
Not open to students with credit for 431.
The fundamental course in quantitative chemical analysis for students majoring in chemistry, Watters and Assistants.

532 Quantitative Analysis U 5
W. 3 cl., 8 lab. hrs.
Prereq.: 531.
Not open to students with credit for 432.
Continuation of 531.

533 Quantitative Analysis U 5
Sp. 3 cl., 8 lab. hrs.
Prereq.: 532.
Not open to students with credit for 433.
Continuation of 532.

551 Organic Chemistry U 5
A, Sp. 3 cl., 6 lab. hrs.
Prereq.: 406, 409, or 413, or equiv.
Not open to students with credit for 451.
A general introductory course in organic chemistry, including laboratory preparations, arranged for students preparing for dentistry, optometry, veterinary medicine, medical technology, and pharmacy. Hennie and Assistants.

552 Organic Chemistry U 5
W, Su. 3 cl., 6 lab. hrs.
Prereq.: 551.
Not open to students with credit for 452.
Continuation of 551. Hennie and Assistants.

630 Recent Advances in Chemistry U G 5
A, Su. 3 cl.
Prereq.: Academic Year Science Institute students only. 30 cr. hrs. of Chem.
Not for graduate credit to students majoring in Chemistry.
A course designed for high school science teachers. Recent developments in the theory of valence, particle nature of matter, colloids, high polymers, nuclear chemistry, fuels and photo-synthesis. Lippincott.

631 Radiochemistry U G 3
Su. Summer Institute only 4 cl. each week.
Prereq.: Academic Year Science Institute students only. 1 year college Math, 1 year college Chem., 1 year college Physics.
Not for credit to students majoring in Chem.
The properties of nucleus, selection and preparation of isotopes for tracer work, the application of radioactive isotopes to chemical problems. Sweet.

647 Organic Chemistry U G 3
A, Sp. 3 cl.
Prereq.: 413 or 499.
Not for graduate credit to students majoring in Chem.
Not open to students with credit for 451 or 551.
A fundamental course in organic chemistry designed for students preparing for medicine or high school teaching.

648 Organic Chemistry U G 3
W, Su. 3 cl.
Prereq.: 647.
Not for graduate credit to students majoring in Chem.
Not open to students with credit for 452 or 552.
Continuation of 647.
649 Organic Chemistry Laboratory U G 3
A, Sp. 9 lab. hrs.
Prereq. or concur.: 647.
Not for graduate credit to students majoring in Chem.
Not open to students with credit for Chem. 451 or 551.
A preparation of a series of typical organic compounds, such as are studied in 647-648, their purification and a study of their properties.

650 Organic Chemistry Laboratory U G 3
W, Su. 9 lab. hrs.
Prereq.: 649.
Not for graduate credit to students majoring in Chem.
Not open to students with credit for 452 or 552.
Continuation of 649.

653 Organic Chemistry U G 3
A. 3 cl.
Prereq.: 413 or 469.
Not open to students with credit for 451, 551 or 647.
Not for graduate credit to students majoring in Chem.
A fundamental course in chemistry designed for Chem. majors and chemical engineers. Henne, Reuter and Assistants.

656 Organic Chemistry Laboratory U G 3
A. 6 or 9 hrs. lab.
Prereq. or concur.: 655.
Not open to students with credit for 451-452 or 649-650. Not for graduate credit to students majoring in Chem.
The preparation, purification, characterization, and study of the properties of typical organic compounds. Henne.

657 Organic Chemistry U G 3
W. 3 cl.
Prereq.: 653.
Not open to students with credit for 453, 553, or 648.
Not for graduate credit to students majoring in Chem.
Continuation of 655.

658 Organic Chemistry Laboratory U G 3
W. 6 or 9 hrs. lab.
Prereq.: 656 or concur: 657.
Not open to students with credit for Chem. 451-452. Not for graduate credit to students majoring in Chem.
Continuation of 656.

659 Organic Chemistry U G 3
Sp. 3 cl.
Prereq.: 657.
Not for graduate credit to students majoring in Chem.
Continuation of 657.

660 Organic Chemistry Laboratory U G 3
Sp. 6 or 9 hrs. lab.
Prereq.: 655 or concur: 659.
Not open to students with credit for Chem. 451-452 or 649-650. Not for graduate credit to students majoring in Chem.
Continuation of 658.

670 Physical Chemistry U G 5
Sp. 5 cl.
Prereq.: 649-650 or 657-658, or equiv. Math. 418, and Physics 413 or equiv.
Not for graduate credit to students majoring in Chem.
A non-mathematical study of the fundamental principles of physical chemistry arranged for students in the biological sciences or in other non-mathematical fields. VanWinkle.

691 Physical Chemistry Laboratory U G 3
A. 3 cl.
Prereq.: 533 or 533 or equiv. Physics 411-412-413 or 531, 532, 533 and Math. 538 or 543. 691 concur recommended.
Not for graduate credit to students majoring in Chem.
The fundamental course in physical chem. Callcut, Harris, Van-Winkle, MacWood.

692 Physical Chemistry Laboratory U G 2
A, W, Sp. 6 lab. hrs.
Prereq. or concur.: 691.
Quantitative measurements of phenomena of chemical interest and the application of chemical principles to their interpretation.
Rubin, Harris, and Assistants.

694 Physical Chemistry Laboratory U G 2
A, W, Sp. 6 lab. hrs.
Prereq.: 691 or concur.: 692.

701 Minor Problems in Chemistry U G 1-15
Prereq.: Satisfactory courses in field of the problem and permission of instructor. Repeatable.
A qualified student may conduct a minor investigation in Chemistry.

721 Advanced Analytical Chemistry U G 3
A. 3 cl.
Prereq.: 533, 649, 683, or equiv.
The principal topics are standards, sampling, special gravimetric methods, new titration methods, and separations, with special reference to the exact analysis of complex inorganic materials. Callcut.

722 Advanced Instrumental Analysis U G 4
W. 2 cl., 6 lab. hrs.
Prereq.: 533, 683, or equiv.
Potentiometric and conductometric titration, pH determinations and the application of high frequency oscillator systems to chemical analysis. Collat, Leaming.

A-41
723 Advanced Instrumental Analysis U G 4
A. 2 cl., 6 lab. hrs.
Prereq.: 722.
A continuation of 722 including electronic analysis, conductive analysis, and polarography. Watters, Leisinger.

726† Inorganic Micro Analysis U G 4
Sp. 2 cl., 6 lab. hrs.
Prereq.: 532 or 533, 683, or equiv.
Application of micro and microscopic methods to common chemical problems. Watters, Sweet, Leisinger.

728 Spectroscopic Analysis U G 4
Sp. 2 cl., 6 lab. hrs.
Prereq.: Physics 412 or equiv.
Application of the emission spectograph to qualitative and quantitative analysis for the elements in metallurgical and biological materials. Watters.

729 Chemical Spectrophotometry U G 4
W. 2 cl., 6 lab. hrs.
Prereq.: Physics 412 or equiv.
Application of infrared, visible and ultraviolet spectrophotometers to problems involving inorganic and organic molecular structure, analysis, equilibria, and reaction rates. Watters.

742 Organic Micro Quantitative Analysis U G 4
Sp. 1 cl., 9 lab. hrs.
Prereq.: 583 or 425, 548-590, or 657-658, or equiv.
Quantitative organic analysis using micro methods. The common determination of organic quantitative analysis are studied. Sweet and Assistants.

751 Nuclear, Radio, and Radiation Chemistry U G 3
A. 3 cl.
Prereq.: 683 or equiv.
Nuclear properties, nature of radioactivity, radioactive decay and growth, interactions of radiation with matter, applications. Firestone.

752 Nuclear, Radio, and Radiation Chemistry U G 3
W. 3 cl.
Prereq.: 751.
Continuation of 751.

753 Nuclear Chemistry Laboratory U G 2 or 3
W. 6 or 9 lab. hrs.
Prereq.: 751 and/or concurr.: 752.
Techniques of handling radioactive tracers, detection and measurement of different types of radiation, neutron activations, and other related laboratory techniques. Firestone, Sweet.

754 X-rays and Crystal Structure U G 4
A. 3 cl., 3 lab. hrs.
Prereq.: Math. 538 or 542, Physics 413 or 533, or equiv.
An introduction to the methods of X-ray crystal analysis. Theory of symmetry of crystals and of diffraction will be discussed and applied. Harris and Assistants.

757 Physical Methods in Organic Chemistry U G 3
Sp. 3 cl.
Prereq.: 698 and 683 or equiv.
Selected topics in bonding, molecular orientation and reactivity of organic compounds and meta-stable intermediates with emphasis on physical methods of approach.

A-42

760 Chemistry of Organic Catalysis U G 3
Sp. 3 cl.
Prereq.: 659 and 683.
Not open to students with credit for 860.
Structure of organic catalysts and the mechanism of their reactions.

761 Advanced Inorganic Chemistry U G 3
A, Su. 3 cl.
Prereq.: 683 or permission of instructor.
An introduction to the concept and chemical systems of inorganic chemistry, including the periodic table, atomic structure, bonding, acid-base theory, co-ordination compounds, defect solid state, hydrides, organometallic compounds, etc. Shor, Busch, Wotizcki.

762 Advanced Inorganic Chemistry U G 3
W. 3 cl.
Prereq.: 761.
Continuation of 761.

763 Advanced Inorganic Chemistry U G 3
Sp. 3 cl.
Prereq.: 762.
A discussion of special topics in modern inorganic chemistry, including an introduction to the chemistry of substances in non-aqueous solvents, acid-base theory, and inorganic complex compounds. Meek.

772 Inorganic Chemistry Laboratory U G 3
Sp. 9 lab. hrs.
Prereq.: 683 or equiv.
Preparative techniques of inorganic chemistry including the use of liquidified gases, aqueous and non-aqueous solutions, anhydrous and oxygen-free systems, fusion reactions, etc. Shor.

773 Advanced Inorganic Chemistry U G 3
Laboratory
Su. 1 cl., 8 lab. hrs.
Prereq.: 691, 692, and 693 or equiv; 761, or permission of instructor.
Advanced methods for the synthesis, purification, identification and characterization of inorganic substances. Shor, Wotizcki.

777 * Photochemistry U G 3
Sp. 3 cl.
Prereq.: 683, or equiv.
An advanced course covering the experimental techniques used in photochemistry. A detailed discussion will be given to the mechanism of representative gas reactions which can be initiated by light.

782 Chemical Bibliography U G 1
A. 1 cl.
Prereq.: 533 or 538, 652, 648 or 658, or equiv.
The use of chemical library including journals, dictionaries, reference books, and other sources of chemical research. Caley.

784 History of Chemistry U G 2
W. 2 cl.
Prereq.: 523 or 533, 458, 648 or 658, or equiv.
A general course in the history of chemistry with special reference to the development of the theories of the science. Caley.

794† Chemistry of the Carbohydrates U G 3
A. 3 cl.
Prereq.: 648 or 657, or equiv.
The occurrence, structure, synthesis, and reactions of the more important mono-, di-, and polysaccharides and their derivatives. Wolfrom.
795 Colloid Chemistry  U  G  3
W.  3 cl.
Prereq.: 682.

803 Systematic Course in Experimentation  G  3
Sp.  9 lab. hrs.
Prereq.: 802.
Continuation of 802.

824 Seminar in Analytical Chemistry  G  3
A.  3 cl.
Prereq.: Permission of instructor.
Repeatable to a maximum of 9 cr. hrs.
Topic to be announced.

839 High Polymers  G  3
Sp, Su.
The chemistry and properties of high polymers including the organic chemistry of their preparation, the kinetics of polymerization and the physical chemistry of their solutions. Verhoeck, VanWinkle.

841 Advanced Organic Chemistry  G  3
A.  3 cl.
841-842-843 to be taken in sequence.
An advanced course in the fundamental principles of chemistry covering (841) the aliphatic hydrocarbons and their derivatives. Newman, Shochter, Paquette.

842 Advanced Organic Chemistry  G  3
W.  3 cl.
Prereq.: 841.
An advanced course in the fundamental principles of chemistry covering alicyclic, hydroaromatic and aromatic compounds. Newman, Shochter, Paquette.

843 Advanced Organic Chemistry  G  3
Sp.  3 cl.
Prereq.: 842.
An advanced course in the fundamental principles of chemistry covering a survey of heterocyclic compounds, carbohydrates, proteins and enzymes. Newman, Shochter, Paquette.

844 Advanced Organic Chemistry Laboratory G  3
W, Su.  9 lab. hrs.
Prereq. or concours. 841 and 842.
An advanced course in fundamental reactions and procedures with emphasis on recent advances in technique. Newman, Gasman.

845 Advanced Organic Chemistry Laboratory G  3
Sp, Su.  9 lab. hrs.
Prereq.: 844.
Continuation of 844.

847 Theoretical Organic Chemistry  G  3
A.  3 cl.
Prereq.: 2nd yr. grad. standing, 841-842.

848 Theoretical Organic Chemistry  G  3
W.  3 cl.
Prereq.: 847.
Continuation of 847.
Franekel, Ouellette, Horton.

849 Theoretical Organic Chemistry  G  3
Sp.  3 cl.
Prereq.: 848.
Continuation of 848.
Franekel, Ouellette, Horton.

850 Seminar in Organic Chemistry  G  3
A, W, Sp, Su.  3 cl.
Prereq.: Chem. 2nd yr. grad. standing and 841, 842 or equiv. and permission of instructor.
Repeatable to a maximum of 12 cr. hrs.
Topics to be announced.

861 Quantum Chemistry  G  3
A.  3 cl.
Prereq.: 857 or equiv.
Introduction to quantum theory of molecular energy states. Taylor.

862 Quantum Chemistry  G  3
W.  3 cl.
Prereq.: 861 or equiv.
Quantum theory of the chemical bond and the structure of molecules and solids.

863 Quantum Chemistry  G  3
Sp.  3 cl.
Prereq.: 862.
Continuation of 862.

864 X-ray and Electron Diffraction  G  3
W.  3 cl.
Prereq.: 754.
An advanced consideration of the theory of X-rays and electron diffractions and their applications including Fourier Methods of parameter determination in crystals, etc. Harris.

867 Seminar in Inorganic Chemistry  G  2 or 3
A.  2 cl.
Prereq.: 761 and 762 or equiv. and permission of instructor.
Repeatable to a maximum of 9 cr. hrs.
Topics to be announced. Bush.

868 Advanced Inorganic Chemistry  G  3
A.  3 cl.
Prereq.: 683, 762, or permission of instructor.
A survey of modern theories of valence and their application to the problems of structural inorganic chemistry. Short.

869 Advanced Inorganic Chemistry  G  3
W.  3 cl.
Prereq.: 688.
A detailed treatment of the chemistry of the transition elements from the standpoint of molecular and atomic structure and the mechanisms and equilibria involved in chemical reactions. Meek.

881 Chemical Kinetics  G  3
A.  3 cl.
Prereq.: 681-682-683.
A study of the velocity of chemical reactions, with emphasis on reactions taking place in solution. Verhoeck.

882 Chemical Kinetics  G  3
W.  3 cl.
Prereq.: 881 or equiv.
A study of the velocity of gas reactions in homogeneous and heterogeneous systems, chain reactions. Verhoeck.

A-43
885 * Molecular Spectra and Structure  G 3
W.  3 cl.
Prereq.: 647-648 or 655-656, 683 and Physics 726 and 737.
Molecular structure is taken up from the quantum standpoint
with particular emphasis on band spectra. MacWood.

887 Thermodynamics  G 3
W.  3 cl.
Prereq.: 881 or equiv.
Introduction to thermodynamics. The main objective is training
in the use of thermodynamics as a tool for solving chemical
problems. MacWood.

888 Thermodynamics  G 3
Sp.  3 cl.
Prereq.: 887.
Continuation of 887.

889 Advanced Thermodynamics  G 3
A.  3 cl.
Prereq.: 881 or equiv.
An introduction to Statistical Thermodynamics, including quantum
statistics, entropy and the third law, statistical-spectroscopic calcu-
lation of thermodynamic functions of gases, chemical equilibria,
and vapor pressure. D. White.

891 Seminar in Physical Chemistry  G 3
A, W, Sp.  3 cl.
Prereq.: Physical Chem. 3rd yr. grad. standing.
Repeateable to a maximum of 9 cr. hrs. with permission
of instructor.
Topics will be announced. Physical Chemistry Staff.

910 Colloquium in Chemistry  G 1
A discussion of current research in chemistry.

950 Research in Chemistry  G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

Chinese

Office: 206E University Hall, 216 North Oval Drive.
ASSOCIATE PROFESSOR CHING (Chairmen).

401 Elementary Chinese  U 5
A.  5 cl.

402 Elementary Chinese  U 5
W.  5 cl.
Prereq.: 401.

403 Intermediate Chinese  U 5
Sp.  5 cl.
Prereq.: 402.

404 Intermediate Chinese  U 5
A.  5 cl.
Prereq.: 403.

505 Chinese Conversation  U 3
W.  3 cl.
Prereq.: 404 or permission of instructor.
Practice in conversation on timely topics of the day.

506 Chinese Composition  U 3
Sp.  3 cl.
Prereq.: 404 or permission of instructor.
Practice in composing simple writings. Review of vocabulary and
grammar. Lee.

517† Study Tour of Taiwan  U 15
Su.  15 cl., two weeks at OSU; 3 weeks in Taiwan.
Prereq.: 25 cr. hrs. of Chinese or permission of
instructor.
Advanced work in conversation and reading in order to prepare
for the tour. In Taiwan only Chinese will be spoken. Some formal
instruction will be given daily by the tour leaders.

551 Chinese Literature in English  U 3
Translation
A.  3 cl.
Introduction to the great literary works of the past several hun-
dred years. These include All Men Are Brothers, The Dream of
the Red Chamber, Monkey, Romance of the Three Kingdoms.

571 Elements of Chinese Thought  U 3
W.  3 cl.
A survey of the major philosophical trends that have prevailed
in China. Discussion of Confucianism and Taoism in their
various forms. Lyell.

600 Advanced Reading: Conversation, U G 3
and Composition I
A.  3 cl.
Prereq.: 508 or permission of instructor.
Reading of contemporary prose and verse, presentation of oral
and written reports, drill in tone and intonation, practice in
translation. Lee.

610 Advanced Reading, Conversation, U G 3
and Composition II
W.  3 cl.
Prereq.: 609 or permission of instructor.
Continuation of 609. Lee.
City and Regional Planning

Office: 107 Brown Hall, 190 West 17th Avenue.
PROFESSOR: STOLLMAN; ASSOCIATE PROFESSOR GERRCKENS; ASSISTANT PROFESSOR MILLIS, and LECTURERS.

721 Recent History of City and Regional Planning
A. 3 cl.
Pre req.: Graduate standing in City and Regional Planning.
Development of City and Regional Planning since 1890; evolution of planning concepts and methods in response to urbanization and resource development; emphasis on American work. Stollman.

722 Theory of City and Regional Planning
W. 3 cl.
Pre req.: Graduate standing in City and Regional Planning.
Planning processes; the general plan; formulating goals; land development policies and decisions; alternative urban and regional forms; role and scope of planning. Stollman.

742 History of City Planning to 1900
W. 3 cl.
Pre req.: Senior standing or permission of instructor.
History of city planning from the earliest discovered settlements to the beginnings of contemporary planning. Gerrckens.

751 Introduction to Planning Design
A. 2 cl., 3 lab. hrs.
Pre req.: Graduate standing in City and Regional Planning.
Principles and practices of environmental design applied to problems of urban scale; graphic presentation of planning information. Gerrckens.

752 Elements of City Planning Practice
W. 1 cl., 6 lab. hrs.
Pre req.: 751; concur.: 762.
Physical components of urban areas: residential, commercial, industrial, pedestrian and vehicular circulations, other community facilities; analysis of design criteria and standards. Gerrckens.

753 Elements of City Planning Practice
Sp. 3 cl., 6 lab. hrs.
Pre req.: 752, 762; concur.: 763.
Continuation of 752. Gerrckens.

762 City and Regional Planning Analysis
W. 3 cl., 6 lab. hrs.
Concur.: 762.
Techniques of research and analysis in planning: land-use, employment, population, housing market, transportation studies. Mills.

763 City and Regional Planning Analysis
Sp. 2 cl., 3 lab. hrs.
Pre req.: 762. Concur.: 753.
Continuation of 762. Use of forecasts, analytic models; cost-benefit analysis and other tests of planning solutions. Mills.

791 Outlines of Urban Design
A. 9 cl., 3 lab. hrs.
Pre req.: Graduate standing in City and Regional Planning, or senior standing in Architecture, or permission of instructor.
Elements and criteria of urban design; comparative evaluation of urban design work. Gerrckens.
Civil Engineering

Office: 229 Civil and Aeronautical Engineering Building, 2036 Neil Avenue.

PROFESSORS: O'GRAY (Chairman), JGREEN, JARRER, LAKHN
(Emeritus), TALAL, DOUGLAS (Emeritus), SMITH, VANDER
GRIFT (Emeritus), and IWU; ASSOCIATE PROFESSORS
JISHWAR, JBLATTACKER, JCARR, JCOFFMAN, JCOSEK,
JHANNA, JMINTZER, MONTZ (Emeritus), PURTZ, and
JSCHWAR; ASSISTANT PROFESSORS: JLOTTMAN, PAGEN,
JSHUMATE, and JSTREETER; and INSTRUCTORS.

412 Elementary Surveying
Sp. 3 cl. 3 3-hr. lab.
Prereq.: Math. 459.
Use and adjustment of instruments, land surveying, leveling,
profiles, use of plane table, mapping, and computations. Partz.

502 Surveying I
A, W. 3 cl., 3 3-hr. lab.
Prereq.: Physics 531.
Theory and practice of measurements. Orientation by celestial
observations. Partz.

504 Photogrammetry
W. 3 cl., 1 3-hr. lab.
Prereq.: 502.
Fundamental geometry and photogrammetric applications to
engineering. Mott.

506 Surveying II
Sp. 3 cl., 2 3-hr. lab.
Topographic mapping, curves, and earthwork. Partz.

604 Structural Analysis I
W. 4 cl.
Stresses in statically determinate frames and trusses. Influence
lines, moving loads, space frames. Smith, Oppen, Chor.

609 Observational Analysis
W. 2 cl., 2 3-hr. lab.
Prereq.: 502, Math. 543.
Theory and applications of observational analysis. Partz.

611 Fluid Mechanics
A, Sp. 3 cl.
Fluid properties; fluid statics; viscous and turbulent fluid flow;
dimensional analysis and similarity. Shumate.

616 Principles of Hydraulics
U G 3
W. 3 cl.
Prereq.: Math. 440, Physics 411 or 531. Not open to
students majoring in Civil Engineering.
Basic fluid dynamic concepts with special application to flow
through porous media, stream flow measurements, solids trans-
port, and ocean hydrodynamics.

620 Public Health Engineering
W. 3 cl.
Prereq.: Chem. 406 or equiv., concor Microbiol. 607 or
equiv.
A study of the human environment from a health engineering
point of view, with emphasis on those facets of the health pic-
ture that are controllable by engineering developments. Coen.
Shumate.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
<th>Prereq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>022</td>
<td>Soil Mechanics I</td>
<td>U 4</td>
<td>Basic and engineering soil properties; fluid flow through soils; compaction, effective stresses and compression. Coffman, Wu.</td>
<td></td>
</tr>
<tr>
<td>624</td>
<td>Transportation I</td>
<td>U 4</td>
<td>A study of the development, location, geometric design, economics, finances, and operation of transportation systems. Yorrev, Tvreiter.</td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>City Surveying</td>
<td>U 3</td>
<td>City control surveys, coordinates of lot and block corners. Measurement of details, computation of areas. Setting out city plans.</td>
<td>650</td>
</tr>
<tr>
<td>661</td>
<td>Principles of Rock Mechanics</td>
<td>U 4</td>
<td>Fundamental rock properties and the evaluation and design of competent underground openings. Drilling and blasting theories, explosives, and their application. Venner.</td>
<td>623, Geol. 416</td>
</tr>
<tr>
<td>662</td>
<td>Mining Systems Engineering</td>
<td>U 3</td>
<td>Fundamentals of mining systems for bedded, massive, vein, and surface deposits. Venner.</td>
<td>623, Geol. 416</td>
</tr>
<tr>
<td>669</td>
<td>Inspection Trip</td>
<td>U 2</td>
<td>A trip to coal, metallic, and non-metallic mines plus mineral processing and preparation plants. A written report is required. Verner.</td>
<td>663</td>
</tr>
<tr>
<td>680</td>
<td>Mine Valuation and Mineral Economics</td>
<td>U 3</td>
<td>Theories of mineral sampling, calculation of ore reserves, present and future worth of mineral properties, and mineral property examination. Economic case studies of major minerals. Verner.</td>
<td>663, Econ. 503 or equiv.</td>
</tr>
<tr>
<td>703</td>
<td>Principles of Sanitary Engineering I</td>
<td>U G 5</td>
<td>Basic principles of water resources including hydrology; reservoirs; design of transmission, distribution, and collection systems; supply and demand rates; statistical methods; construction materials and methods. Cosenza.</td>
<td>728</td>
</tr>
<tr>
<td>705</td>
<td>Reinforced Concrete Structures</td>
<td>U G 4</td>
<td>Application of principles of structural engineering to the design of footings, retaining walls, and other reinforced concrete structures. Bishara, Chen.</td>
<td>623, 701</td>
</tr>
<tr>
<td>710</td>
<td>Transportation Planning</td>
<td>U G 5</td>
<td>An analysis of engineering factors affecting location, geometric design, operation, maintenance and management of coordinated transportation systems. Verner.</td>
<td>602</td>
</tr>
<tr>
<td>711</td>
<td>Elementary Structural Engineering</td>
<td>U G 3</td>
<td>Design of simple steel structures. Introduction to reinforced concrete. Furtza.</td>
<td>602</td>
</tr>
<tr>
<td>714</td>
<td>Structural Design I</td>
<td>U 5</td>
<td>Elastic design of simple steel structures, introduction to plastic design of continuous beams and simple beams. Smith.</td>
<td>741</td>
</tr>
<tr>
<td>715</td>
<td>Timber Design</td>
<td>U G 3</td>
<td>Basic properties and design practice for timber when used as a construction material in engineering structures. Smith.</td>
<td>714, Engr. Mech. 605</td>
</tr>
<tr>
<td>716</td>
<td>Principles of Sanitary Engineering II</td>
<td>U G 5</td>
<td>Unit operation in water supply and waste water recovery including selection, treatment methods and equipment, and water quality criteria. Cosenza.</td>
<td>703, 728</td>
</tr>
<tr>
<td>722</td>
<td>Fundamentals in Traffic Engineering</td>
<td>U G 3</td>
<td>Introduction to traffic characteristics, measurements, controls and regulation. Elements in traffic operation, design and planning. Treater, Schwaz.</td>
<td>624</td>
</tr>
<tr>
<td>723</td>
<td>Construction Methods and Equipment</td>
<td>U G 3</td>
<td>Selection and management of construction equipment in building of highways, dams, airports, bridges, and structures. Verner.</td>
<td>623, 634</td>
</tr>
<tr>
<td>725</td>
<td>Soil Mechanics II</td>
<td>U G 4</td>
<td>Design, construction and maintenance of embankments, drainage structures, and pavements for highways and airports. Verner, Tvreiter.</td>
<td>612</td>
</tr>
</tbody>
</table>

A-47
726 Principles of Foundation Analysis and Design U G 4
A. 4 cl.
Prereq.: 725.
Subsurface exploration; shallow foundations; piles and caissons, embankments and excavations, Wu.

728 Applied Hydraulics U G 3
A. 3 cl.
Prereq.: 611 or Engr. Mech. 610.
Not for graduate credit to students majoring in Civil E.
Civil engineering applications of fundamental fluid mechanics principles including pipe and open channel flow, masonry and earth dams, and pumps, with laboratory studies to support the above topics. Cowan, Hanna.

731 Soil Stabilization U G 4
W. 2 cl., 2 3-hr. lab.
Prereq.: 725.

733 Rigid Frame Structures U G 3
A. 3 cl.
Analysis and design of rigid frame concrete structures. Wind stress analysis. Chen.

734 Advanced Bridge Design U G 3
Sp. 3 cl.
Prereq.: 714, 701, 741.
Stresses in and design of arch bridges. Smith, Gjalio.

738 Highway Location and Design U G 3
W. 2 cl., 1 3-hr. lab.
Prereq.: 624.
Geometric design of roads and streets. Determination of alignment, grade, intersections, and traffic capacity of rural roads. Karren, Tretener.

739 Bituminous Materials and Mixtures U G 4
Sp. 3 cl., 1 3-hr. lab.
Prereq.: 724.
Types and chemical composition of asphaltic materials, physical and chemical properties of asphaltic materials and mixtures. Fegen.

741 Structural Analysis II U G 4
Sp. 4 cl.
Prereq.: 604 or 711, Engr. Mech. 602.
Not for graduate credit to students majoring in Civil E.
Deflection in trusses, beams and frames. Solution of indeterminate structures by methods of consistent deformations, and moment distribution. Ojeda, Chen.

742 Applied Hydrology U G 3
W. 3 cl.
Prereq.: 728 or equiv.
Basic principles of the hydrologic cycle; precipitation, hydrographs, unit graphs, drainage basin characteristics, infiltration, ground water hydraulics, runoff, flood and drought magnitude and probability, flood routing. Cowan, Hanna.

743 Advanced Civil Engineering I U 3
A. 3 2-hr. cl. and lab.
Prereq.: 701, 718, 734, 725.
An integrated study of the principles and methods used in the solution of problems associated with the design and construction of a large engineering project.

744 Advanced Civil Engineering II U 4
W. 3 cl., 3 1-hr. lab.
Prereq.: 743.
Continuation of 743.

745 Advanced Civil Engineering III U 4
Sp. 3 cl., 3 1-hr. lab.
Prereq.: 744.
Continuation of 744.

746 Civil Engineering Applications of Photo-Interpretation U G 4
A. 2 cl., 2 2-hr. lab.
Prereq.: 564, 724, 1 course in Geol.

748 Sanitary Engineering Laboratory U G 3
A. 2 3-hr. cl. and lab.
Prereq.: 716, Chem. 406 or equiv., Microbiol. 607 or equiv.
A laboratory study of the sanitary engineering indices pertinent to the control of water, sewage, streams, and industrial waste quality. Hanna, Shamate.

750 Mechanical Properties of Engineering U G 4
Materials W. 4 cl.
Prereq.: 623, Engr. Mech. 605, Met. E. 611 or permission of instructor.
Structure of liquids and solids, elasticity, plasticity and flow, viscosity, viscoelasticity and surface phenomena.

761 Mining Plant Engineering I U G 3
A. 3 cl.
Prereq.: 728, concur. 662.
Not for graduate credit to students majoring in Civil Engineering.
Principles of underground ventilation and compressed air systems and their application to mining problems. Vermeer.

762 Mining Plant Engineering II U G 3
W. 3 cl.
Not for graduate credit to students majoring in Civil Engineering.
Principles of underground haulage and energy transmission systems and their application to mining problems. Vermeer.

790 Advanced Civil Engineering U G 3-5
A, W, Sp, Su.
Prereq.: Senior or graduate standing with point average of 2.5 or better, and permission of department chairman. Requirement of a minimum of 20 cr. hrs., not more than 10 of which shall be in any one of the following subdivisions.
The advanced student is given opportunity to pursue advanced study. Work undertaken may be elected in the following fields of civil engineering:

a. Structural Engineering.
c. Sanitary Engineering.
d. Highway and Transportation Engineering.
e. Geodetic and Photogrammetric Engineering.
f. Constructions.
g. Materials.
Structural Design of Pavements

G 5

Su. 5 cl.
Prereq.: 815.

Stresses in pavements and behavior under moving loads, design of flexible and rigid pavements for highways and airports.

Geodesy

G 3-5

A, Sp.

Triangulation reconnaissance, use and computation of geodetic coordinates, study of various systems of plane coordinates, the more common map projections, geodesic astronomy and other problems involving the figure of the earth.

Seepage in Permeable Materials

G 5

A. 5 cl.
Prereq.: 632.


Advanced Soil Properties

G 5

W. 3 cl., 6 lab. hrs.
Prereq.: 725.

Detailed study and analysis of the mechanical properties of soils, with applications to foundation behavior. Gray.

Soil-Structure Interaction I

G 5

Sp. 5 cl.
Prereq.: 815.


Slope Stability Theory

G 3

W. 3 cl.
Prereq.: 725, 810.


Soil-Structure Interaction II

G 5

Sp. 5 cl.
Prereq.: 815.


Traffic Engineering II

G 5

W. 4 cl., 3 3-hr. lab.
Prereq.: 831 or equiv.


Traffic Engineering I

G 5

A. 4 cl., 3 3-hr. lab.
Prereq.: 722 or equiv.


Highway Administration

G 5

Sp. 5 cl.
Prereq.: 722.

A study of organization for planning, constructing, maintaining, and operating systems of roads and streets. Karrer.

Advanced Structural Engineering I

G 5

A. 4 cl., 1 3-hr. lab.
Prereq.: 741 or equiv.

Analysis and design of statically indeterminate beams, frames and trusses, using classical methods of analysis. Smith.

Advanced Structural Engineering II

G 5

(Reinforced Concrete)

W. 5 cl.
Prereq.: 725.

Effect of shrinkage and creep upon stress and deflection. Ultimate strength design of sections, and moment redistribution. Prestressed beam design theory and practice.

Plastic Analysis and Design

G 5

A. 5 cl.
Prereq.: 714, 741 or equiv.

Structural behavior in the inelastic range. Prediction of collapse loads. Structural steel design according to the plastic method. Osius.

Concrete Shell Structures

G 5

Sp. 5 cl.
Prereq.: 705, 741, Math. 609.

Analysis and design of folded plate, barrel, and other prismatic structures. Hyperbolic paraboloids. Osius.

Principles of Advanced Sanitary Engineering

G 5

A. 3 cl., 3 3-hr. lab.
Prereq.: 620, 716, 745.

Advanced analysis and design theory pertinent to the field of sanitary engineering, including water supply, waste water disposal, stream and environmental sanitation and atmospheric pollution. Cosens, Hanna.

Principles of Advanced Sanitary Engineering

G 5

W. 3 cl., 3 3-hr. lab.
Prereq.: 831.

Continuation of 831.

Principles of Advanced Sanitary Engineering

G 5

Sp. 3 cl., 3 3-hr. lab.
Prereq.: 832.

Continuation of 832.

Structural Analysis and Design for Dynamic Disturbances

G 5

Sp. 5 cl.
Prereq.: 705, 714 Engr. Mech. 607, or equiv. or permission of instructor.


Interdepartmental Seminar in Polar and Alpine Studies

G 1-3

Sp.
(See under Interdepartmental Seminars)

Advanced Civil Engineering

G 3-5

A, W, Sp, Su.
Prereq.: Graduate standing and permission of department chairman.

Repeatable to a maximum of 20 cr. hrs., not more than 10 of which shall be in any one of the fields listed below.

This course is intended to give the advanced students opportunity to pursue advanced study. Work undertaken may be elected in the following fields of civil engineering:

a. Structural Engineering.
c. Sanitary Engineering.
d. Highway and Transportation Engineering.
e. Geodetic and Photogrammetric Engineering.
f. Construction.
g. Materials.
COURSES OF INSTRUCTION

CIVIL ENGINEERING

949 Research Seminar
A. 1 cl.
Introduction to research activity.

950 Research in Civil Engineering
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

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Comparative Literature And Languages

Office: 112 Derby Hall, 154 North Oval Drive.
Professor Harry B. G. Hedges (Chairman).

401 Introduction to Western European Literature: The Greek Contribution
A.
1st or 2nd yr., standing only.

Development of Greek ideas and ideals from Homer to Plato. A course in great books of the western world and the part they play in the development of modern European and American culture.

402 Introduction to Western European Literature: The Latin Contribution
W.
1st or 2nd yr., standing only.

Virgil, Lucan, Titus, Dante, Cervantes. A course in great books of the western world and the part they play in the development of modern European and American culture.

403 Introduction to Western European Literature: The Modern World
Sp.
1st or 2nd yr., standing only.

Chaucer, Milton, Moliere, Shakespeare, Goethe. A course in great books of the western world and the part they play in the development of modern European and American culture.

Conservation

Office: 241 Lord Hall, 174 West 17th Avenue.
F. A. Dambach (Chairman of Committee).

401 Introduction to Conservation of Natural Resources
A, Sp., 3 cl and 1 3-day field trip.

An orientation on the nature and scope of natural resources and the technical, economic, social, and political aspects of conservation. Good, Johnson, Dambach.

514 Conservation Agencies
W, 3 cl.
Representatives of governmental agencies, private organizations, and university departments present programs and problems in their areas of conservation work. Johnson.

561 Field Experience in Conservation
Prereq.: Permission of adviser.

Having secured approval prior to this work experience, the student registers for this course the following quarters, in addition to his normal load, and submits a written report to his adviser. Staff or cooperating departments.

Natural Resources Problems, Programs, and Policies (See Agricultural Economics 607.)
Dairy Science

Office: 118 Plumb Hall, 735 Stadium Drive.

PROFESSORS: VANDERMARK (Chairman), ECONRAD, ELY Emeritus, HEGEMEYER, HIGGINS, HARRIS, HILBOS, KRAUS, LUDWIG and SUTTON; ASSOCIATE PROFESSORS: BRECKEL, PORTER, PRATT Emeritus, STAUBUS and TAYLOR; ASSISTANT PROFESSORS BARR, BRUM, COMES, HINES, and KAESSER; INSTRUCTORS NEUHARDT and RADER.

401 Fundamentals of Dairy Science U 5
A, W, Sp. 3 cr., 2 2-hr. lab.
A general survey of the production phases of the dairy industry covering the dairy breeds, breeding, selection, and management factors important in milk production. Barr, Ely, Kaesser, Rausch.

501 Dairy Cattle Production U 5
A, Sp. 3 cr., 2 2-hr. lab.
Prereq.: Animal Sci. 402.
Not open to students with credit for 501 or 512.

504 Dairy Herd Management U 5
W. 3 cr., 2 2-hr. lab.
Prereq.: Animal Sci. 402 or 530.
Problems and practices concerned with efficient production of milk and successful operation of a dairy herd. Rausch, Ely.

507 Dairy Cattle Selection and Judging U 3
Sp. 1 2-hr. lab., 1 4-hr. lab.

512 Milk Production U 5
Sp. 3 cr., 2 2-hr. lab.
Not open to students who have credit for 401 or 501.
A course designed to give a broad scope of dairy production with special emphasis on breeding, feeding, herd health, quality milk production, and general management. Barr.

520 Principles of Animal Improvement U 5
A, W, Sp. 5 cr.
Prereq.: 401 or Animal Sci. 401 or Poult. Sci. 401 or equiv. and Zool. 400 or Biol. 402.
Not open to students with credit for 520, 520.
An introduction to the methods available for bringing about genetic change in farm animals. Fechheimer, Jaap, Parker.

Principles of Animal Nutrition
(See Animal Sci. 530.)
(Prereq. in cooperation with the Departments of Animal Sci. and Poult. Sci.)

610 Physiology of Lactation U G 3
A. 2 2-hr. lab.
Prereq.: Vet. Physiol. 517 or equiv. or permission of instructor.
The physiological, endocrine, nutritional and environmental factors influencing the synthesis and ejection of milk. Barr, Porter.

612 Physiology of Reproduction and Growth U G 3

A. 3 1-hr. lab.
Prereq.: Vet. Physiol. 517 or equiv. or permission of instructor.
(Prereq. in cooperation with the Departments of Animal Sci. and Poult. Sci.)
Physiology of the reproductive system and of growth and development in farm animals; factors influencing reproductive performance. Ludewig.

614 Laboratory in Reproductive Physiology and Artificial Insemination U G 3
A. 2 2-hr. lab.
Prereq.: or concur: 612.
(Prereq. in cooperation with the Departments of Animal Sci. and Poult. Sci.)
Comparative anatomy and physiology of reproduction of farm animals; physiological bases for the use of artificial insemination in the research laboratory and in the field. Ludewig.

Marketing of Dairy Products
(See Agr. Eco. 630)
(Prereq. in cooperation with the Department of Dairy Sci.)

Nutrition and Feeding of Ruminant Animals
(See Animal Sci. 631.)
(Prereq. in cooperation with the Department of Dairy Sci.)

701 Special Problems U G 2-5
Prereq.: Permission of instructor.
Special assignments in the advanced phases of dairy husbandry problems. Students will elect work in desired subjects after conference with the instructor in charge.

714 Research Methods and Techniques U G 5
Sp. 3 cr., 1 4-hr. lab.
Prereq.: 20 cr. hrs. in Animal Sci. and Dairy Sci. and permission of instructor.
Survey and analysis of research work in Dairy Sci. and Animal Sci., literature reviews, collection of data, preparation of bibliographies, and presentation of reports. Gilmore.

720 Genetics of Animal Populations U G 5
W. 4 cr., 1 2-hr. lab.
Prereq.: 520 or Zool. 604 or Biol. 604 and 16 cr. hrs. in Math.
(Prereq. in cooperation with the Department of Animal Sci. and Poult. Sci.)
Theory and genetics of analyzing and altering the genetic composition of animal populations. Fechheimer, Jaap.

801 Seminar in Dairy Science G 1-3
Ely.

812 Advanced Reproductive Physiology U G 3 or 5
Sp. 2 2-hr. cl.
Prereq.: 612 or equiv.
(Prereq. in cooperation with the Departments of Animal Sci. and Poult. Sci.)
Recent advances in research in mammalian reproduction; optional individual research experience in reproductive problems with small and large mammals for additional credit. VanDemark, Gomes.

A-51
Dairy Technology

Office: 123 Vivian Hall, 2121 Fyffe Road.

PROFESSORS: GOLDF (Chairman), BURGWALD (Emeritus), HARPER, KRISSOFFERSON, and SLATTER; ASSISTANT PROFESSORS ARMSTRONG (Emeritus), BLAISEL, HANSEN, and IMIKOJACIK; INSTRUCTOR KENNY.

401 Survey of Industrial Dairying U 3
A, Sp. 2 cl., 1 2-hr. lab.
Survey of the dairy products industry dealing with compositions, properties, quality, production and distribution of dairy products; introduction to certain practical analytical methods. Slatter.

415 Dairy Industry Apprenticeship U 3
A, W., Sp., Su.
Graduation credit limited to students completing the Dairy Tech. curriculum. Ten weeks practical experience or equiv. in an approved dairy processing plant. Written report required.
Krisjofferson.

511 Dairy Refrigeration U 5
W. 5 cl.
Prereq.: 601, 602, Engr. Dr. 400, Agr. E. 510.
Concepts of heat transfer; elementary thermodynamics of refrigeration systems and application of refrigeration equipment to dairy processing, dairy heat exchangers. Blaisdell.

A-52
Dental Hygiene

Office: 233 Dentistry Bldg., 305 West 12th Avenue.

PROFESSORS: ALLISON, APLICHTON, BEYER, Boucher, DEW, KAISER, MCConnell, NEWTON, PEIETTI, W. D. POSTLE, SLEETTO, WHARTON, WHEELEY, WILMINS, WILSON, WISE, and WOELFER; ASSOCIATE PROFESSORS: APP, BRUCE, THEINTZ, KOLAS, LONG, PERMAR, TRIPPY, V. WALTZ; ASSISTANT PROFESSORS: CONROY, HARPER, HULL, MICHEL, PAPPAS, W. POSTLE, REYNOLDS, and B. SNYDER; INSTRUCTORS: COOK, HERR, MOTE, WALLACE, WEISENSTEIN, ALLEN, BUCKEY, CATHERMAN, GREENAWALT, HOCKMAN, KUMLER, McCOWAN, STOLTZ, WHITE.

401 Dental Anatomy
A. 1 cl., 6 lab. hrs.
Prereq.: Dent. Hyg. 1st yr. standing.
The morphology of human teeth and surrounding structures. Permar.

402 Dental Anatomy
Sp. 1 cl., 3 lab. hrs.
Prereq.: Dent. Hyg. 1st yr. standing.
A continuation of 401. The physiology of human teeth and surrounding structures. Permar.

403 Dental Prophylaxis
Sp. 2 cl., 7 lab. hrs.
Prereq.: Dent. Hyg. 1st yr. standing.
The demonstration of and the application of technical procedures for the removal of hard and soft deposits from the surfaces of the teeth. Reynolds, Wise and Staff.

404 Oral Hygiene
Sp. 1 cl.
Prereq.: Dent. Hyg. 1st yr. standing.
A study of the formation of deposits on teeth, the maintenance of good oral hygiene, and the prevention of periodontal disease. App.

405 Materia Medica
A. 1 cl.
Prereq.: Dent. Hyg. 2nd yr. standing.
A study of drugs commonly used in dental practice and correct methods for their use. Reynolds.

501 General Pathology
Sp. 2 cl.
Prereq.: Dent. Hyg. 1st yr. standing.
An introduction to general pathology including degenerative changes, inflammation, and repair. A discussion of the more common diseases affecting the human body. Bruce.

502 Dental Nursing
A. 2 cl.
Prereq.: Dent. Hyg. 2nd yr. standing.
A discussion of ways in which the dental hygienist may assist the general practitioner of Dentistry or one specializing in any field of Dentistry. Wise and Staff.

503 Dental Nursing
W. 2 cl.
Prereq.: Dent. Hyg. 2nd yr. standing.
Problems which students encounter in the dental hygiene clinic. Practical experience in dental assisting. Wise and Staff.

504 Dental Nursing
Sp. 1 cl.
Prereq.: Dent. Hyg. 2nd yr. standing.
A continuation of 503. The Dental Hygienist's responsibilities to her profession. Wise and Staff.
 COURSES OF INSTRUCTION
DENTAL HYGIENE

Dental Materials  
W.  1 cl., 6 lab. hrs. 
Prereq.: Dent. Hyg. 2nd yr. standing. 
A study of the composition, chemical and physical properties, manipulation and use of various materials employed in the practice of Dentistry. Woelfel.

Oral Histology and Embryology  
Sp.  1 cl. 
Prereq.: Dent. Hyg. 1st yr. standing. 
A study of the microscopic anatomy of the teeth and surrounding structures; the development of the teeth, oral cavity, and face. Fermar.

Oral Pathology  
A.  1 cl. 
Prereq.: Dent. Hyg. 2nd yr. standing. 
A study of the clinical manifestations of the common diseases affecting the teeth and their supporting structures. Bruce.

Clinical Dental Prophylaxis  
A.  9 clinic hrs. 
Prereq.: Dent. Hyg. 2nd yr. standing. 
Clinical application of principles taught in 403. Wise and Staff.

Clinical Dental Prophylaxis  
W.  15 clinic hrs. 
Prereq.: Dent. Hyg. 2nd yr. standing. 
A continuation of 508. Wise and Staff.

Clinical Dental Prophylaxis  
Sp.  15 clinic hrs. 
Prereq.: Dent. Hyg., 2nd yr. standing. 
A continuation of 509. Wise and Staff.

Nursing Techniques for Dental Hygienists  
A.  2 cl. 
Prereq.: Dent. Hyg. 2nd yr. standing. 
A study of the principles of nursing as they apply to the Dental Hygienist. Newton and Staff.

Oral Radiography  
A.  2 cl., or 6 lab. hrs. 
Prereq.: Dent. Hyg. 2nd yr. standing. 
The theory and technical procedures of oral radiography. Pappas.

Oral Hygiene in the Schools  
W.  2 cl. 
Prereq.: Dent. Hyg. 2nd yr standing. 
The principles involved in effective Dental Health Education of the general public, especially school children. Wise and Staff.

Oral Hygiene in the Schools  
Sp.  2 cl. 
Prereq.: Dent. Hyg. 2nd yr standing. 
A continuation of 513. An application of principles learned in 513 by actual teaching experiences and by visits to the schools; the history and organization of dental public health. Herney.

Anesthesia  
A.  1 cl. or 3 lab. hrs. 
Prereq.: Dent. Hyg. 2nd yr standing. 
The role of the Dental Hygienist as an assistant in Anesthesia. Premedication; physiological responses to and pharmacological actions of anesthetic agents; emergency treatment. Snyder.

Office Practices and Economics  
Sp.  2 cl. 
Prereq.: Dent. Hyg. 2nd yr standing. 
The role of the Dental Hygienist in dental practice and the economics involved. Weissstein.

Dentistry

Office: 120 Dentistry Bldg., 305 West 12th Avenue. 
PROFESSORS: J. R. WILSON (Dean), IALLISON, BROUGHED, DEW, HEINZT, KAAS, McCONNELL, JANETT, STEFEL, WILLIAMS, WISE, and WOELFEL; ASSOCIATE PRO- FESSORS APP, BECKWITH, BRUCE, IKOLAS, KREIDER, RUSSELL, MARSHALL, FERMAR, H. POSTLE, ROSEN, RUSSELL, SPANGENBERG, TAYLOR, TRIPPY, IWADE, WALTON, and WINTER; ASSISTANT PROFESSORS ASHLEMAN, ALD, BELL, BRUER, BUCHER, BOWERS, CARNES, CHANDLER, CHAPMAN, CLLENDELEN, CONROY, CROW, CRUMP, CUMMINS, DAXEHOERDE, DEEDS, DILLEY, GUMP, HIATT, HUFFMAN, HULL, IMHOFF, JEFFERS, JOHANNES, LARRIMORE, LUCKHART, MOY, MICHEL, O'BRIEN, PAPPAS, FARRISH, REYNOLDS, RUMBAUGE, RYAN, SKINNER, SNYDER, F. STARR, J. STARR, C. WALTON, AND ZACHERL; AND INSTRUCTORS.

Dental Anatomy  
A.  1 cl., 3 lab. hrs. 
Prereq.: Dent. 1st yr. standing. 
The morphology of human teeth and surrounding structures. Trippy and Staff.

Dental Anatomy  
W.  1 cl., 11 lab. hrs. 
Prereq.: Dent. 1st yr. standing. 
The physiology of human teeth and surrounding structures. Trippy and Staff.

Dental Materials  
W.  1 cl. 
Prereq.: Dent. 1st yr. standing. 

Dental Materials  
Sp.  1 cl. 
Prereq.: Dent. 1st yr. standing. 
Materials used in the restoration of carious teeth, including dental cements, waxes, plasters, amalgams, gold foil, and casting gold alloys. Den.

Orientation and History of Dentistry  
A.  1 cl. 
Prereq.: Dent. 1st yr. standing. 
The evaluation of dentistry from the ancient period through the medieval, colonial, early American and modern periods. Wilson, Harper.

Complete Prosthodontics  
A.  1 cl., 6 lab. hrs. 
Prereq.: Dent. 1st yr. standing. 
The elemental principles of impressions and jaw relations and procedures used in the construction of complete dentures. Boucher and Staff.

Complete Prosthodontics  
W.  1 cl., 8 lab. hrs. 
Prereq.: Dent. 1st yr. standing. 
The principles and practices of the arrangement of artificial teeth and in processing and finishing complete dentures. Kreider and Staff.

Fixed Partial Prosthodontics  
Sp.  1 cl. 
Prereq.: Dent. 1st yr. standing. 
Aims of service. Terminology and definitions. Correlation with other curriculum areas. Indications, contraindications, and factors relating to bridge construction. Description of technic laboratory procedures. Lang.
DENTISTRY

463 Periodontics
Sp. 1 cl.
Prereq.: Dent. 2nd yr. standing.

452 Complete Prosthodontics
W. 1 cl., 6 lab. hrs.
Prereq.: Dent. 2nd yr. standing.
The principles and practices of the construction of immediate dentures, and of making esthetic denture restorations. Larrimer and Staff.

484 Fixed Partial Prosthodontics
A. 1 cl., 3 lab. hrs.
Prereq.: Dent. 2nd yr. standing.

501 Local Anesthesia and Oral Surgery
A. 1 cl.
Prereq.: Dent. 3rd yr. standing.
The chemistry and pharmacology of local anesthesia and an introduction to the basic principles of oral surgery. Hsi, Snyder.

502 Oral Surgery
W. 1 cl.
Prereq.: Dent. 3rd yr. standing.

511 Endodontics
A. 1 cl.
Prereq.: Dent. 3rd yr. standing.
Clinical applications of the principles and technical procedures in endodontics. Keiser.

439 Removable Partial Prosthodontics
Sp. 1 cl., 8 lab. hrs.
Prereq.: Dent. 1st yr. standing.
An introduction to the principles of design and construction of removable partial dentures. Heints and Staff.

403 Local Anesthesia
Sp. 1 cl.
Prereq.: Dent. 2nd yr. standing.
The theory, chemistry and technique of local anesthesia for dental procedures. Hsi.

404 Dental Materials
A. 1 cl.
Prereq.: Dent. 2nd yr. standing.

413 Endodontics
Sp. 1 cl.
Prereq.: Dent. 2nd yr. standing.
Basic techniques and procedures used in the treatment of pulpless teeth. Basler.

431 Operative Dentistry
A. 1 cl., 3 lab. hrs.
Prereq.: Dent. 2nd yr. standing.
An introduction to the principles of Operative Dentistry; the theory and technique for simple cavity preparations. H. Footle and Staff.

432 Operative Dentistry
W. 1 cl., 6 lab. hrs.
Prereq.: Dent. 2nd yr. standing.
The theory and technical procedures for the preparation of compound and complex cavities and the use of amalgams and silicate as restorative materials. H. Footle and Staff.

433 Operative Dentistry
Sp. 1 cl., 6 lab. hrs.
Prereq.: Dent. 2nd yr. standing.
The theory and technical procedures for the use of gold inlays and gold foil as restorative materials. Preparation for the clinical aspects of Operative Dentistry. H. Footle and Staff.

452 Pedodontics
W. 2 cl., 2 lab. hrs.
Prereq.: Dent. 2nd yr. standing.
Orientation in pedodontics preparatory for clinical assignments. Patient management, modified operative procedures in cavity preparation, pulp management, the manipulation of prefabricated materials, and methods of prevention and control of dental caries. Pettit and Staff.

453 Pedodontics and Interceptive Orthodontics
Sp. 1 cl., 3 lab. hrs.
Prereq.: Dent. 2nd yr. standing.
Preparation of study casts. Construction of orthodontic bands, using different materials and techniques. Designing appliances for prevention, interception, or correction of incipient malocclusion. Pettit, Williams, and Staff.
512 Clinical Endodontics P 1
W. 2 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Kaiser and Staff.

513 Clinical Endodontics P 1
Sp. 2 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Continuation of 512. Kaiser and Staff.

531 Operative Dentistry P 4
A. 1 cl., 6 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Clinical diagnosis of pulp disease; protection and conservative treatment of the vital pulp; factors influencing the success or failure of restorative materials in clinical practice. Beckwith and Staff.

532 Operative Dentistry P 4
W. 1 cl., 6 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Detailed study of restorative materials; indications and contraindications for each; their manipulation and individual requirements in cavity preparation. Beckwith and Staff.

533 Operative Dentistry P 4
Sp. 1 cl., 6 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Clinical application of the theories and techniques of restoring carious and defective teeth. Beckwith and Staff.

540 Oral Histology and Embryology P G 4
A. 2 cl., 5 lab. hrs.
Prereq.: Anat. 640. Dent. 2nd yr. standing.
Embryology and histology of teeth and surrounding structures and their correlation to the practice of dentistry. Melf and Staff.

541 Oral Pathology P G 4
A. 3 cl., 3 lab. hrs.
Prereq.: Dent. 3rd yr. standing, 540 and Path. 655.
The histopathologic and clinical study of oral disease processes that are chiefly of local origin. Kolas and Staff.

542 Oral Pathology P G 1
W. 1 cl.
Prereq.: Dent. 3rd yr. standing.
The histopathologic and clinical study of oral disease processes that are associated with systemic disease or diseases of specific organ systems. Kolas and Staff.

545 Oral Diagnosis and Treatment Planning P 1
W. 1 cl.
Prereq.: Dent. 3rd yr. standing.
The principles and methods of oral diagnosis, with emphasis on the medical and dental history of the patient. Bruce.

546 Oral Diagnosis and Treatment Planning P 1
Sp. 1 cl.
Prereq.: Dent. 3rd yr. standing.
The interpretation of signs and symptoms, medical laboratory tests, and treatment planning for the patient. Bruce and Staff.

547 Oral Radiography P 1
A. 1 cl.
Prereq.: Dent. 3rd yr. standing.

548 Oral Radiography P 1
W. 1 cl.
Prereq.: Dent. 3rd yr. standing.
Bisection of the angle and long cone techniques used in intraoral radiography. Intraradicular radiographic technique. O’Brien.

549 Oral Radiography P 1
Sp. 1 cl.
Prereq.: Dent. 3rd yr. standing.

551 Pedodontics P 1
A. 1 cl.
Prereq.: Dent. 3rd yr. standing.

552 Clinical Pedodontics P 1
W. 2 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Pettit and Staff.

553 Clinical Pedodontics P 1
Sp. 2 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Continuation of 552. Pettit and Staff.

555 Orthodontics P 1
W. 1 cl.
Prereq.: Dent. 3rd yr. standing.
The etiology and classification of malocclusion, physiology of tooth movement, character of tissues involved. Williams.

556 Orthodontics P 2
Sp. 2 cl.
Prereq.: Dent. 3rd yr. standing.
Methods and appliances for the correction of malposed teeth. Williams.

560 Periodontics P 1
A. 1 cl.
Prereq.: Dent. 3rd yr. standing.

561 Clinical Periodontics P 1
A. 3 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
App and Staff.

562 Clinical Periodontics P 1
W. 3 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Continuation of 561. App and Staff.

563 Clinical Periodontics P 1
Sp. 3 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Continuation of 561. App and Staff.

572 Pharmacology P 1
W. 1 cl.
Prereq.: Dent. 3rd yr. standing.
General pharmacology including the origin and methods of development of drugs. Basic pharmacy involving prescriptive writing, the metric and apothecary systems, drug standards and federal drug legislation and regulation. Huitt.
DENTISTRY

573 Pharmacology P 1
Sp. 1 cl.
Prereq.: Dent. 3rd yr. standing.
The pharmacology of drugs with possible applications to dentistry, including premedications, postmedications, and drugs affecting the autonomic nervous system. Hiltz.

581 Complete Prosthodontics P 2
A. 1 cl., 2 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
The principles and practices of maxillomandibular relation records, articulating instruments and occlusion. Boucher and Staff.

582 Complete Prosthodontics P 3
W. 1 cl., 4 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
The principles and clinical practice in the restoration of esthetics and facial expression by artificial dentures. Boucher and Staff.

583 Complete Prosthodontics P 3
Sp. 1 cl., 4 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
The clinical practice of the complete denture service including the care of patients after dentures have been inserted. Boucher and Staff.

584 Fixed Partial Prosthodontics P 1
A. 1 cl.
Prereq.: Dent. 3rd yr. standing.

585 Fixed Partial Prosthodontics P 2
W. 1 cl., 3 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Elastic impression materials and related techniques including use of gypsum products, waxes, tissue retraction, and sectioning methods. Clinical applications and practice. Long and Staff.

586 Fixed Partial Prosthodontics P 3
Sp. 1 cl., 6 clinic hrs.
Prereq.: Dent. 3rd yr. standing.
Selection of abutments and retainers, connectors and pontics. Additional types of bridge work procedures. Clinical applications and practice. Long and Staff.

587 Removable Partial Prosthodontics P 1
A. 1 cl.
Prereq.: Dent. 3rd yr. standing.
Complex problems of removable partial dentures and their clinical application. Steffel.

593 Individual Studies in Dentistry P 1-6
A, W, Sp, Su.
Individual studies in any of the recognized fields of Dentistry or Summer Clinic.

600 Histologic Laboratory Technique G 1-3
A, W, Sp, Su.
Prereq.: Permission of instructor.
The preparation of oral and dental tissues for microscopic study. Format.

601 Anesthesia P 2
A. 1 cl., 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
History taking; physical evaluation techniques; common laboratory analyses; nose, throat, and mouth examinations; physiology of normal and pathologic respiration, heart functions and circulation of blood. Allison, Wallace, and Staff.

602 Anesthesia P 2
W. 1 cl., 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Oxygen and carbon dioxide transport; electrolyte and fluid balance; pharmacologic action of sedatives, hypnotics, analgesics, narcotics, intravenous barbiturates, muscle relaxants, inhalation anesthetic agents. Allison, Wallace and Staff.

603 Anesthesia P 2
Sp. 1 cl., 2 clinic hrs.
Prereq.: Dent. 4 yr. standing.
Laryngoscopy, endotracheal intubation, maintenance of anesthesia and management during recovery; management of emergencies; use of fluids, drugs, open and closed cardiac massage techniques, and analgetics. Allison, Wallace and Staff.

604 Oral Surgery P 2
A. 1 cl., 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Wound healing, inflammation, infection, their mechanism, diagnosis and treatment. Surgical management of exostosis, hyperplasia, and surgical preparation of the mouth for prosthodontics. Allison, Wallace and Staff.

605 Oral Surgery P 2
W. 1 cl., 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Diagnosis and surgical treatment plan for unerupted teeth. Incisions, methods for removal of bone, protection for adjacent teeth, hemorrhagic agents, antibiotics, sutures and suturing. Allison, Wallace and Staff.

606 Oral Surgery P 2
Sp. 1 cl., 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 605.
Diagnosis, surgical treatment, and prognosis for pathologic conditions of the mouth and jaws, of the salivary glands and their ducts, and injury for lesions. Allison, Wallace and Staff.

612 Clinical Endodontics P 2
W. 4 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Kaiser and Staff.

613 Clinical Endodontics P 1
Sp. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 612. Kaiser and Staff.

621 Dental Practice Administration P 1
A. 1 cl.
Prereq.: Dent. 4th yr. standing.

622 Dental Practice Administration P 1
W. 1 cl.
Prereq.: Dent. 4th yr. standing.

623 Dental Practice Administration P 1
Sp. 1 cl.
Prereq.: Dent. 4th yr. standing.

631 Operative Dentistry P 5
A. 1 cl., 8 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Review of the basic principles of operative dentistry and their clinical application to special problems. Taylor and Staff.
632 Operative Dentistry
W. 1 cl., 8 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Introduction of special technical procedures in Operative Dentistry and their clinical applications. Taylor and Staff.

633 Operative Dentistry
Sp. 1 cl., 8 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 632. Advanced theories, technical procedures, and materials in Operative Dentistry; their value, limitations, and clinical application. Taylor and Staff.

645 Clinical Oral Diagnosis and Treatment Planning
W. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 645. Bruce and Staff.

646 Clinical Oral Diagnosis and Treatment Planning
Sp. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 645. Bruce and Staff.

647 Clinical Oral Radiography
A. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
O'Brien and Staff.

648 Clinical Oral Radiography
W. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 647. O'Brien and Staff.

649 Clinical Oral Radiography
Sp. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 648. O'Brien and Staff.

651 Pedodontics
A. 1 cl., 3 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Diagnosis of pulp conditions of primary and permanent teeth. Techniques for treatment. Growth and development pertaining to pedodontics. Care of handicapped patients. Pettit and Staff.

652 Clinical Pedodontics
W. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Pettit and Staff.

653 Clinical Pedodontics
Sp. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 652. Pettit and Staff.

661 Clinical Periodontics
A. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
App and Staff.

662 Clinical Periodontics
W. 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 661. App and Staff.

663 Clinical Periodontics
Sp. 3 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 662. App and Staff.

672 Pharmacology
W. 1 cl., 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
The chemistry, indications, actions, and effects of antibiotics and antiinfectives. O'Brien.

673 Pharmacology
Sp. 1 cl., 2 clinic hrs.
Prereq.: Dent. 4th yr. standing.
The chemistry of tranquillizers; indications for their use and their actions. A review of prescription writing. O'Brien.

681 Complete Prosthodontics
A. 1 cl., 4 clinic hrs.
Prereq.: Dent. 4th yr. standing.
The clinical practice of special occlusal problems, temporomandibular joint disturbances, cleft palate and surgical prosthesis. Boucher and Staff.

682 Clinical Removable Prosthodontics
W. 4 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Boucher, Heints and Staff.

683 Clinical Removable Prosthodontics
Sp. 4 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 682. Boucher, Heints and Staff.

684 Clinical Fixed Partial Prosthodontics
A. 4 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Long and Staff.

685 Clinical Fixed Partial Prosthodontics
W. 4 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 684. Long and Staff.

686 Clinical Fixed Partial Prosthodontics
Sp. 4 clinic hrs.
Prereq.: Dent. 4th yr. standing.
Continuation of 685. Long and Staff.

693 Individual Studies in Dentistry
A, W, Sp, Su.
Prereq.: Permission of instructor.
Special assignments in advanced phases of dentistry problems. Students will elect to work in desired subjects after a conference with the instructor in charge.

800 Special Problems in Dentistry
800A Advanced Oral Surgery and Anesthesia
A, W, Sp, Su.
Prereq.: Oral Surg. grad. standing.
Diagnosis and treatment of surgical conditions of the teeth and contiguous structures. Advanced techniques in surgery and local and general anesthesia. Allison.
ECONOMICS

800B Advanced Orthodontics  G 1-5
A, W, Sp, Su.
Prereq.: Orthodontics grad. standing.
Applied orthodontics and myology in cephalometric roentgenographic interpretations; review of caphalic growth and development factors in normal occlusion; correction of malocclusions and dentofacial malformations. Williams, Wade and Staff.

800C Advanced Periodontics  G 1-5
A, W, Sp, Su.
Prereq.: Periodontics grad. standing.
Diagnosis and treatment of periodontal disease. Correlation between the diseases of the periodontium and probable systemic maladjustments, and maladjustments of a purely dental nature. Wilson.

800D Advanced Prosthodontics  G 1-5
A, W, Sp, Su.
The diagnosis, treatment, and replacement of missing or lost teeth and parts of the mouth by prothetic appliances; complete removable partial, or fixed partial restorations. Boucher.

800E Advanced Oral Pathology and Diagnosis  G 1-6
A, W, Sp, Su.
Prereq.: Oral Pathology grad. standing.
The interrelationships of gross, microscopic, and clinical pathology. Current advances in the field of oral pathology and diagnosis. Kolas.

800F Advanced Endodontics  G 1-5
A, W, Sp, Su.
Prereq.: Endodontics grad. standing.
Clinical problems in endodontics and their correlation with the problems in related fields of dentistry and medicine. Surgical methods will receive attention. Kaiser.

800G Advanced Pedodontics  G 1-5
A, W, Sp, Su.
Prereq.: Pedodontics grad. standing.
A study and clinical application of diagnosis and treatment of problems occurring in the various areas of pedodontics. Pettit.

800H Advanced Dental Materials  G 1-5
A, W, Sp, Su.

800I Advanced Oral Histology and Embryology  G 1-5
A, W, Sp, Su.
The principles of histology and embryology applied to the structures of the oral region—their development, morphology, functions, and clinical relationships. Wilson.

800J Advanced Operative Dentistry  G 1-5
A, W, Sp, Su.
Clinical problems in operative dentistry and their correlation with the problems in the related fields of dentistry and medicine. Special attention given to preventive dentistry. Wilson.

505 Seminar in Dentistry  G 1
Prereq.: Dent. grad. standing.
Discussion of recent advances in all branches of dental science. Review of original literature. Wilson, Perman, and Saaf.

950 Research in Dentistry  G Arr.
A, W, Sp, Su.
Research for thesis purposes only.

Economics

Office: 239 Hagerty Hall, 1775 South College Road.

PROFESSORS: CRAG (Chairman), BODENHORN, BOWERS, BRUNNER, CONDOIDE, COONS, HARISON, JAMES, LOVENSTEIN, ILYNN, MILLER, OSTER, PARNES, QUANTUS, ISHERMAN, and TIBOUT; ASSOCIATE PROFESSORS CUNNINGHAM, DEWALD, FLEISHER, KELLEY, ESHERANCE, MCGALMONT, TUTTLE, and WARNER; ASSISTANT PROFESSORS BARTH, BOTTE, BOYD, BROWN, CAMERON, GOLT, LEVINE, MICHAEL, NESTEL, ORNER, and WALTON; LECTURERS STEANS, and STICKER.

The Department of Economics offers opportunities for special study in the following subfields:

- Economic Theory
- History of Economic Thought
- Economic History, American and European
- Money and Banking
- Public Finance
- Economic Statistics, Econometrics
- International Economic Relations
- Public Control
- Labor
- Institutions and Methods of Economic Planning
- National Security Economics
- Special Fields to be arranged

501 Principles of Economics  U 5
A, W, Sp, Su. 5 cl.
Not open to freshmen, nor to students with credit for 401, 403, 409, 504, 505, 506, or 507.
A study of the organization and functioning of modern economic society, with emphasis on income determination, employment, fiscal and monetary problems and policies. Loevenstein and Staff.

502 Principles of Economics  U 5
A, W, Sp, Su. 5 cl.
Prereq.: 401 or 501. Not open to freshmen, nor to students with credit for 403, 405, 406, 504, 505, 506 or 507.
A continued study of the organization and functioning of modern economic society, with emphasis on price determination, income distribution, and special economic problems. Applebaum, Loevenstein, and Staff.

503 Principles of Economics for Engineers  U 3
A, W, Sp. 3 cl.
Not open to freshmen, nor to students with credit for 401, 403, 405, 501, 505, 506 or 507.
Macro economic principles: A study of capitalism, income determination, monetary and fiscal policies, economic problems and economic growth. Staff.

A-39
504 Principles of Economics for Engineers
A, W, Sp. 3 cl.
402 or 403. Not open to freshmen, nor to students with credit for 402, 404, 406, 503, 506 or 507.
Micro economic principles: A study of the economics of the firm, allocation of productive factors and factor income distribution, international economics. Staff.

506 Outlines of Economics
A, W, Sp, Su. 5 cl.
Not open to freshmen, nor to students with credit for 401, 402, 403, 404, 406, 503, 506, 503, 504 or 507.
Analysis of basic characteristics of American economic system; study of significant problems arising in its operation and an appraisal of proposed solutions. Harrison and Staff.

507 Fundamentals of Economics
A, W, Sp, Su. 5 cl.
Prereq.: Hist. 423.
Not open to students with credit for 401, 402, 403, 404, or 406, or 501, 502, 503, 504, 506.
Study of basic characteristics, processes, and institutions of the economic system; significant problems arising in its operation; proposed solutions. Lowenstein and Staff.

542 Elementary Economic Statistics
A, W, Sp, Su. 4 cl., 2-3 hr. lab.
Prereq.: 10 hrs. of college-level mathematics.
Not open to students with credit for 532.
Ratios, index numbers, frequency distributions, measures of central tendency, dispersion, simple probability distributions, statistical inference and testing pertaining to means and proportions, simple linear correlation, time series. L’Esperance, Nestel, Cunningham, Stearns, Brown, and Staff.

560 International Economic Relations
W, Sp. 3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 515 or 664-665-666.
Not recommended for students who plan to take 665 and 666.
Survey of international economic relations; the basis of world trade; commercial and financial policy, particularly of the United States; and recent international economic organizations. Michael, Brown and Staff.

600 Ideas of the Great Economists
Sp. 3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to graduate students in Economics.
Critical analysis of ideas of great economists, factors which influenced those ideas; their impact upon social and economic development of the modern world. Harrison and Staff.

606 Current Economic Problems
W, Sa. 3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 604-605 or to graduate students in Economics or to majors in Economics.
Examination of current problems; optimum levels of employment, conditions underlying consumer expenditures; savings, investments, inflation, deflation, agriculture, public works, housing, regional development. Bowers and Staff.

610 Economic Development
U 3
Prereq.: 623.
Empirical and theoretical consideration of long-term economic changes, including changes in industrial structure, income levels, and level of national product; emphasis on developing countries.

612 Economic and Business History of Selected American Firms
Sp. 3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 630.
Evolving corporate enterprise within the framework of American capitalist doctrine. Analysis of outstanding firms; influence of unions and government in innovation, pricing, and other practices. Harrison.

623 Money and Banking
A, W, Sp, Su. 4 cl.
Prereq.: 401 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 520 or to graduate students in Economics.
Organization, operation, and economic significance of our monetary and banking system are discussed with special reference to current conditions and problems. Craig, Quantius, Brunner, McCallum and Staff.

625 National and International Money Markets
A. 3 cl.
Prereq.: 623.
Not open to students with credit for Bus. Org. 662 or Bus. Org. 665.
Organization, functions, and control of money markets and their submarkets. Flow of funds in these markets and investment policies of market participants. Quantius, Brunner.

634 Fiscal Economics
U 3
A. 3 cl.
Prereq.: 638 or permission of instructor.
Not open to students with credit for 631 or 632 or 633.
The economics of government spending and taxation; analysis of the fiscal role and instruments of government and their effects on the economy. Cameron, Stocker, Okner, Gold.

636 Government Finance in the American Economy
A, W, Sp, Su. 4 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
For College of Commerce students and majors in economics. 623.
Not open to students with credit for 509 or 530 or 631 and 632.
Not open to graduate students in Economics.
Analysis of fiscal institutions and decision-making in the public sector of the American economy; budget planning and execution; taxation, debt, fiscal policy. Cameron, Stocker, Okner, Gold, Waldon and Staff.

644 Mathematical Economic Theory
U 3
A. 3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507, college algebra and permission of instructor.
Not open to students with credit for 675.
Application of essentials of calculus in deriving principal theorems of economic marginal analysis. Problems and examples. Cunningham.
661 Consumption Economics UG3
W. 3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 645.
Consumption from the standpoint of the individual and society; cost of living; standards and levels of living; consumer budgets; influences determining consumer choice. Warnes.

663 Population UG3
A. 3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507, or equiv. and permission of instructor.
Not open to students with credit for 660.
Impact of world population growth upon resources, productive capacities, scales of living, national defense, and international economic relations. Critical consideration of population theories and policies. Harrison.

665 Income Distribution and Public Policy UG3
Sp. 3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Trends in income distribution; analysis of measures of income distribution; policies influencing distribution; effects of income distribution on the economy. Craig, Warne, Fleisher.

666 National Income and Flow of Funds Analysis UG3
A. 3 cl.
Prereq.: 542 and Acc. 402 or 404 or 412 or 502 or 510.
Theory and practice of social accounting as applied to national income and flow of funds. Coons.

671 Government and Business UG5
A, Sp. 5 cl.
Prereq.: 403 or 404 or 406 or 502 or 504 or 506 or 507.
Economic and legal aspects of Government regulation of business in the United States; philosophies and concepts of public control; contemporary problems. Lynn, Boyd, Sherman.

672 Public Utilities and Public Works UG3
Sp. 3 cl.
Prereq.: 671 or 20 cr. hrs. of Econ.
Not open to students with credit for 648.
Study of general economic characteristics and regulation of water, gas, electric, communications, and related industries; including atomic power. Government regulation versus public ownership. Tybout, Boyd.

667 Economics of Planning UG3
A. 3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Analysis of the economics of planning and its major applications to private and public planning; procedures and techniques of economic planning. Loevenstein.

668 Labor Economics and Industrial Relations UG4
A, W, Sp, Su. 4 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 510 or 550 or 611 or 650. Not open to graduate students in Economics.
Survey of the field of labor economics; trade unionism, collective bargaining; wage determination, employment, unemployment; labor legislation. Miller, Barnes, Levine, Kelley, Barth, Fleisher.

670 Competition and Public Policy UG3
W. 3 cl.
Prereq.: 671 or 20 cr. hrs. of Econ.
Not open to students with credit for 669.
Natural, role, and regulation of competition; market structure and social performance; antitrust laws; current economic, legal, and policy problems in the antitrust area. Lynn, Rankin, Boyd.

666 International Commercial Policy UG3
W. 3 cl.
Prereq.: 423.
Specialized production, comparative cost and advantages, and the gains from trade; international payments and receipts, possible equilibrium; balance-of-payments adjustments under different monetary systems; reforms. James.

666 International Commercial Policy UG3
S. 3 cl.
Prereq.: 623.
Tariffs and other trade restrictions; economic effects of protective tariffs; regional economic integration; U. S. commercial policies; multilateral tariff reductions of America and Common Market. James.

677 Transportation Planning and Coordination UG3
W. 3 cl.
Prereq.: 676
Transportation, local development and industrial location. Criteria for public investment in highway, airport, and other transportation facilities. Tybout, Boyd.

680 Social Insurance UG3
A, Sp, Su. 3 cl.
Prereq.: 668 or permission of instructor.
Not open to students with credit for 639.
Social insurance systems to provide economic and social security against the hazards of unemployment, sickness and injury, dependent old age, premature death and liability claims. Bowers, Fenn.
COURSES OF INSTRUCTION

ECONOMICS

683 Unions and Collective Bargaining  U G 5
A.  3 cl.
Prereq: 688.
Not open to students with credit for 637 or 694-695 or 780-781.
Development of unionism in the United States; structure and
government of contemporary labor organizations; collective
bargaining; settlement of labor-management disputes. Miller, Farnes,
Levine, Barth.

684 Labor and the Government  U G 3
W.  3 cl.
Prereq: 688.
Not open to students with credit for 684.
Public policy with respect to labor problems and industrial
relations. Role of legislative, judicial, and executive branches of
state and federal governments. Miller, Farnes, Levine, Barth.

688 Economics of the Labor Market  U G 5
Sp.  3 cl.
Prereq: 688.
Not open to students with credit for 688.
Materials and methods of labor market analysis; the measure-
ment and behavior of unemployment, employers' and employees'
labor market behavior; wage determination and labor allocation.
Farnes.

690 Contemporary Economic Systems  U G 3
W.  3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Comparative study of development and operation of economic
institutions and principles in capitalistic, socialist, communist, and
fascist economic systems. Lopostenyi.

697 Economics of Socialism  U G 3
W.  3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 652 or 669 or 671.
Survey of socialist thought and movements; relations of socialist
thought to the theory and practice of socialist economics; planning,
allocation, pricing, controls. Lopostenyi.

698 Soviet Economic System  U G 5
Sp., Su.  5 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 525 or 554.
Survey of the Soviet economy with emphasis on planning; allo-
cation of resources; spending, saving, and investing; public
finance; agriculture; labor; and international economic relations.
Condolide.

699 Special Problems in Economics  U G 1-5
Advanced courses in Econ. and related fields. Juniors
registered for 699 must have an average of B or better
in all Econ. courses and a cumulative point hour of
3.0 or better. 1-5 cr. hrs. each qtr. in any one field,
repeatable to a maximum of 15 hrs. Senior Staff.
a. Economic Theory; History of Economic Thought
b. Economic History, American and European
c. Money and Banking
d. Public Finance
e. Economic Statistics; Econometrics
f. Business Fluctuations; National Income Accounting
g. International Economic Relations

h. Public Control
i. Labor
j. Institutions and Methods of Economic Planning
k. National Security Economics
l. Special Fields to be arranged

700 Honors Course  U 1-5
Open only to students enrolled in the Honors Program of
the College of Arts and Sciences or the College of
Commerce and Administration. Repeatable to a max-
imum of 15 qtr. hrs., but must be taken for at least
two quarters.
Program of readings, conferences and reports arranged for the
student who is a candidate for "Degree with Distinction" in
Economics. Flesher.

National Security Policy Studies
(See National Security Policy Studies 702-703-701.)

708 Intermediate Micro-economic Theory  U G 5
A, Sp.  4 cl.
Prereq.: 520 or 625.
Nature of economic analysis; theory of demand, costs, and
prices; factor price determination and functional income distri-
bution; competition, oligopoly, monopoly, and monopolony. Jelen,
Bodenborn and Staff.

709 Intermediate Macro-economic Theory  U G 3
W.  2 cl.
Prereq.: 623.
Theory of income and employment; Keynesian aggregate supply
and demand; consumption, saving, and the multiplier; determin-
ants of investment and the accelerator; government's role.
Janes, Craig, Desaul, Bodenborn, and Staff.

713 Economic History of the United States  U G 5
W.  3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 804-805-806 taken
prior to 1958 or with credits for 816-817-818 taken
after 1958.
General survey from discovery of America to present. European
economic background, Westward movement and its effects. Devel-
opment of economic institutions in the U. S. Harrison, Walton.

714 Economic History of Western Europe  U G 5
A.  3 cl.
Prereq.: 402 or 404 or 406 or 502 or 504 or 506 or 507.
General survey from ancient to modern times. Interrelations
economic institutions, general culture, and economic
industrial revolutions in modern times. Harrison, Walton.

740 Statistical Analysis  U G 3
A.  2 15/2-hr. cl.
Prereq.: 4 cr. hrs. of statistics.
Not open to students with credit for 703-704 or 748-744
or 710-711-712.
Elements of discrete and continuous probability theory and appli-
cations. Statistical inference and testing using binomial, Poisson,
normal and t probability distributions. L'Esperance, Cunningham,
Nestel.
741 Statistical Analysis U C 3
W. 2 1½-hr. cl.
Prereq.: 740.
Theory and application of chi-square and F distributions; analysis of variance; statistical design of experiments and surveys. L’Esperance, Cunningham, Nestel.

742 Statistical Analysis U C 3
Sp. 2 1½-hr. cl.
Prereq.: 741.
Simple, partial and multiple correlation and regression; multivariate probability distributions. L’Esperance, Cunningham.

745 Linear Programming and Economic U C 3
Analysis
A. 3 cl.
Prereq.: 403 or 404 or 406 or 502 or 504 or 506 or 507, Math. 417 or 432, or permission of instructor.
Techniques of linear programming applied to economic problems of allocation and valuation within the firm. Tybout.

770 Economics of National Security U C 3
A. 3 cl.
Prereq.: 403 or 404 or 406 or 502 or 504 or 506 or 507.
Not open to students with credit for 691.
Analysis of economic problems arising from defense and war. Emphasis on implications of defense and war economy and on economic theory and institutions. Lovenstein, Sherman.

798 Special Studies in Economics U C 1-5
Advanced courses in Econ. related fields. 1-5 cr. hrs. each qtr. in any one field. Not more than 5 cr. hrs. may be received in any one field nor a total of more than 15 hrs. in the course. Senior Staff.
a. Economic Theory; History of Economic Thought
b. Economic History, American and European
c. Money and Banking
d. Public Finance
e. Economic Statistics; Econometrics
f. Business Fluctuations; National Income Accounting
g. International Economic Relations
h. Public Control
i. Labor
j. Institutions and Methods of Economic Planning
k. National Security Economics
l. Special Fields to be arranged.

800 Research Methods In Economics G 2
A. 1 2-hour cl.
Methods of economic research, choice of research topics, and presentation and evaluation of results obtained. Required of all new graduate students in Economics. Coone, and Staff.

801 History of Economic Thought G 5
W. 3 cl.
Economic writings from the earliest times to Alfred Marshall (1890). Paton.

802 History of Economic Thought G 3
Sp. 3 cl.
Prereq.: 801.
Orthodox and critical authors from Alfred Marshall to J. M. Keynes. Lovenstein.

803 History of Economic Thought G 3
W. 3 cl.
Not open to graduate students in Economics.
Economic writings from Smith to Keynes.

804 Modern Economic Analysis G 5
2 2-1/2-hr. cl.
Not open to students with credit for 816-817-818 taken prior to 1958-1959 or with credit for 804-805-806 taken prior to 1962-1963.
To be taken in sequence.
A. Sp. Advanced micro-economic theory
B. A. Advanced macro-economic theory

807+ Theories of Welfare Economics G 3
Sp. 3 cl.
Prereq.: 708.
Study of economic standards and their application to economic welfare or well-being. Mathematical techniques are employed. Tybout.

810 Seminar in Economic Development G 3
W.
Prereq.: 810 or permission of instructor.
Repeatable to a maximum of 9 cr. hrs.
Selected topics in economic development: theories of economic growth, problems of capital formation, investment criteria, economic planning. Michael, Kelley.

811 Seminars in Economic History, American and European G 3
Sp.
Prereq.: 713 and 714, or permission of instructor.
Repeatable to a maximum of 6 cr. hrs.
Selected research topics in Economic History. Harrison.

820 Monetary Theory G 3
W. 3 cl.
Prereq.: 623, 708 and 709.
Not open to students with credit for 863.
Role of money in theoretical analysis of forces determining and influencing level of income, employment, and prices. Craig, Brunner.

821 Central Banking and Monetary Policy G 3
Sp. 3 cl.
Prereq.: 633, 708 and 709.
Not open to students with credit for 864.

830 Seminar in Fiscal Economics G 3
W. 1 cl.
Repeatable to a maximum of 6 qtr. hrs.
Analysis of theoretical and applied aspects of fiscal economics in the American and foreign economies. Selected topics of current and permanent importance. Lynam.

831+ Legal and Economic Problems in State G 3 and Local Taxation
A.
Legal, economic and administrative problems of state and local taxation with particular attention to the State of Ohio and its local governments. (Offered in cooperation with the College of Law.) Lynam, Gladder.

A-63
848 Seminar in Econometrics  G 2
Prereq.: Differential and integral calculus, and permission of instructor.
Prerequisite: maximum of six hours.
Examination of economic problems whose solutions may advantageously be sought by use of the methods of mathematics and mathematical statistics. L'Esperance, Coningham.

851 Seminar in Business Fluctuations and National Income Accounting  G 2
Sp.
Not open to students with credit for 844.
Current business cycle theory and national income accounting; evaluation of statistical measures of these phenomena; consideration and appraisal of recent literature in the field. Coons.

852 General Business Conditions Analysis  G 3
Prereq.: 20 cr. hrs. in Econ. and/or Bus. Org. and permission of instructor.
Not for graduate credit to major in Economics.
Theoretical and applied analysis of general economic conditions and their relation to decisions of the firm. Craig, Coons, and Staff.

860 Seminar in International Economic Problems  G 3
A.
Prereq.: 985-666.
Not open to students with credit for 838.
Seminar in analytical problems, theoretical and applied, of international economic adjustments; development of techniques for implementation of policies. James.

870 * Seminar in Economy and Politics  G 3
W.
Prereq.: 670 or 672 or 676 or 773.
Not open to students with credit for 834.
Economic bases for government participation in business activities: antitrust, regulation, and collective decision making. Tybout.

871 Problems in National Security Economics  G 3-5
W.
3-5 credit hrs. at option of instructor. Repeatable to a maximum of 10 credit hours.
Seminar designed to analyze in depth selected economic problems of national defense and defense-related activities. Sherman, Lovinsen.

879i Political Economy  G 3
W.
Open only to doctoral candidates in Department of Business Organization.
An evaluation of selected topics in economics.

880 Seminar in Industrial Relations  G 3
W.
637 or 653, or permission of instructor.
Not open to students with credit for 845.
Selected topics and issues in contemporary trade unionism and collective bargaining. Miller, Parnes.

881 Seminar in the Economics of the Labor Market  G 3
Sp.
Prereq.: 650 or 658 or permission of instructor.
Selected topics and issues in wage determination, employment and unemployment. Miller, Parnes, Kelley.

Education

Office: 149 Arps Hall, 1404 North High Street.

PROFESSORS: RAMSEY (Director), ALBERTY (Emeritus), ECKELBECK (Emeritus), FAWCETT (Emeritus), GOOD (Emeritus), HECK (Emeritus), HOLY (Emeritus), HARDING (Emeritus), HICKS (Emeritus), THARP (Emeritus), WOELFEL (Emeritus), and ZIMBES (Emeritus), TALLEN, SHERMAN, IBURG, IBUR, SCASSIDY, ICLAR, HOKRAD, ICOO, ICOON, IJOINS, CALBERTSON, CYPEERT, IDALE, IDNITZ, IEBERHART, IFRAZIER, IGROM, IGUST, IGARNA, IGLASS, TOLMIE, TOLAND, TLOOMIS, TILUS, IMACCA, T齑, IMACCA, G., IMICBA, IRENE, IMONEY, IMUSSG, IFITIS, IFPHILLIPS, IFRAY, IESEE, IREYARD, IREICHARDSON, LSCHLESSIÑGER, LSCHREIDER, ISTAUB, ISTEWART, ISUTON, STAYLER, STOLMISEN, STROLL, TITLER, TWAGNER, TWARNER, TWELD, and TWORKER. ASSOCIATE PROFESSORS: HELLER (Emeritus), MacLATCHY (Emeritus), T. ALBERTY, TANDREWS, BLANK, TBOZEMAN, TUCAN, EDDICH, EDDICHN, TTHROUGH, TINH, TIONG, LKAND, TLOPHENSHAW, TRR, TPLMSLEUR, TRAMMEY, TRICIO, TROADEN, TSCHENZ, TSCHENZER, TSSESSIONS, TSMIITH, STEWART, TIJSTROM, TOLBET, TWERT, UTTERBACK, TWILLIAM, WILLIE, TWOLF, and TIZODONIS. ASSISTANT PROFESSORS: MORRIS (Emeritus), SALES (Emeritus), ANDERSON, BARGAN, BUCHANAN, TIPADY, TCAVI, TCRAWFORD, TCROSSWHITE, TULLIAN, TEDELL, TELLINGER, TOGARTY, TRUFFET, TITTSHORE, TIPOMANN, TIPLOWE, TREGSEDELL, TIVERSON, TSHIRED, TIBERGIN, TIBER, TSTEVEN, TSTUFFLEBEAM, TSTOLL, TTEBURY, TTYLER, TULLIAN, TWOOD, and TWOODRUFF.
Areas

Adult Education—600B, 770, 771, 774, 800B, 835B, 898, 930.
Curriculum and Supervision—K12, 600Y, 701, 702, 704, 800Y, 863, 868, 887 950.
Dental Hygiene Education—537A.
Fine Arts—528C, 535C.
Guidance—600D, 750, 752, 754, 755A, 758B, 758, 800D, 818, 835D, 950.
Health Education—536M.
Higher Education—602E, 768, 800E, 813, 832, 835E, 843, 845, 846, 850, 851, 854, 855, 950.
Introduction to Education—408.
Music—520A, 520B, 536A, 536B.
Physical Education—520S, 520T, 536S, 536T.
School Library Science—503, 550, 551, 552, 600W, 646, 647.
Secondary Education

Teaching of Science—536Q, 600Q, 604, 605, 606, 681, 706, 713, 800Q, 835Q, 851, 950.

Vocational and Practical Arts Education

Distributive Education—526X, 600X, 717, 780, 781, 782, 800X, 835X, 950.
Workshops and field experience—505, 646, 682, 799.

401 Beginning Typewriting U 0
A 4 cl.
Reqd. in the 2nd yr. of students majoring in business education who lack proficiency required for admission to Ed. 471.
Placement tests for students having had previous training in typewriting will be given during the first class meeting of 401, 402, and 403. Students reporting for placement tests need not be registered in the course. Staff.

402 Beginning Typewriting U 0
W 4 cl.
Prereq.: 401. Staff.
Continuation of 401. Staff.

403 Beginning Typewriting Sp 4 cl.
Prereq.: 402. Staff.
Continuation of 402.

404 Beginning Shorthand U 2
A 4 cl.
Reqd. in the 2nd yr. of students majoring in business education who lack proficiency required for admission to Ed. 471.
Placement tests for students having had previous training in shorthand will be given during the first class meeting of 404, 405 and 406. Students reporting for placement tests need not be registered in the course. Wells.

405 Beginning Shorthand U 2
W 4 cl.
Prereq.: 404.
Continuation of 404. Wells.

406 Beginning Shorthand Sp 4 cl.
Prereq.: 405.
Continuation of 405. Wells.

408 Introduction to the Study of Education U 3
A, W, Sp, Su. 3 cl.
Reqd. in teacher education program in all fields (except Fine Arts and Mus.) of freshmen and students transferring into education with less than 90 cr. hrs. Reqd. enrollment in the earliest possible quarter.
An introductory study of cultural factors that affect education, with students helped to understanding through an examination of their own lives. Recie and Staff.

440 The Laboratory of Industries U 4
A, W, Sp. 5 2-hr. cl. and lab.
Orientation to technological origins of industrial arts teaching through experiences with tools, materials, processes, and products. Ray.

441 Elements of Woodworking U 4
A, Sp. 5 2-hr. cl. and lab.
Prereq.: 440 and 469 and Engr. Dr. 400.
Experience in planning and developing skills and knowledge of the construction of articles made of wood and of the industries involved. Towers.

442 Elements of Woodworking W 5 2-hr. cl. and lab.
Prereq.: 441. Staff.
Continuation of 441. Towers.

443 Elements of Metalworking U 4
A, Sp. 5 2-hr. cl. and lab.
Prereq.: 440, 469, Engr. Dr. 406.
Experience in planning and developing skills and knowledge of the construction of articles made of metal and of the industries involved. Lux.

444 Elements of Metalworking U 4
W 5 2-hr. cl. and lab.
Prereq.: 440, 469, Engr. Dr. 406.
Continuation of 443. Lux.
445  Elements of Printing  U 4
A, Sp. 5 2-hr. cl. and lab.
Prereq.: 440, 460 and Engr. Dr. 400.
Experience in letter press, platemaking, and miscellaneous processes of printing, binding, and an overview of the graphic arts industry. Haus.

446  Elements of Electricity in Industrial Arts  U 4
A, Sp. 5 2-hr. cl. and lab.
Prereq.: 440, 460 and Engr. Dr. 400, Math. 416 and Physics 413.
An introduction to the principles and practices of electricity and electronics as these apply to industrial arts programs in secondary schools, and a study of the industries involved. Staff.

450  Introduction to Power Mechanics  U 4
A, Sp. 5 2-hr. cl. and lab.
Prereq.: 440, 460, Engr. Dr. 400, Physics 411, and Math. 416.
An introduction to the field of industrial arts power and transportation. An overview of the design, function, and operation of internal combustion engines and their auxiliaries. Staff.

451  Internal Combustion Engines  U 4
W. 5 2-hr. cl. and lab.
Prereq.: 450.
A technical study of internal combustion engines and automotive, marine, and aircraft equipment. Experiences in engine analysis, malfunction diagnosis, maintenance, and repair. Staff.

456  Residential and Industrial Utilization of Electrical Power  U 4
W. 5 2-hr. cl. and lab.
Prereq.: 440.
An introduction to the principles and practices of electricity and electronics applicable to industrial arts programs in secondary schools, and a study of the industries involved. Staff.

460  Problem Planning in Industrial Arts  U 3
A, Sp. 2 2-hr. cl. and lab.
Prereq.: Engr. Dr. 400 or 401.
The planning of problems and projects suitable for the various areas and grade levels of the secondary school with references to function, style, and construction. Haus.

471  Advanced Shorthand, Typewriting, and Transcription  U 4
A. 4 2-hr. cl.
Prereq.: Educ. 3rd yr. standing or Com. and Ad. 2nd yr. standing, and 403 and 406 or permission of the instructor.
For placement in the typewriting and shorthand, see Ed. 401 and 404. Continued skill developments with emphasis upon transcription and business report and letters. Staff.

472  Advanced Shorthand, Typewriting, and Transcription  U 4
W.
Prereq.: 471.
Continuation of 471. Staff.

473  Advanced Shorthand, Typewriting, and Transcription  U 4
Sp.
Prereq.: 472.
Continuation of 472. Staff.

503† Organization and Administration of the School Library  U 3
W. 3 cl.
Practice in essential library routine. Purchase of materials, preparation for use, care and repair of books, simple loan systems will be emphasized.

Field Service Projects in Education
Professional service with children or youth in some school or community agency. Supervision by both college and agency staff, weekly seminar and evaluation paper. Andrews and Staff.

School Related Experience

505A† Interpretation of September Field U 2 experience in Schools
A.
Limited to students who have completed 10 full school days of service in schools in the immediately preceding September.

505E A, W, Sp.  U 3
For students in the Speech and Hearing Therapy Curriculum, Britt.

505K A, W, Sp.  U 3
For students in the Able Student Program, Mehl and Staff.

Experience in Community Agencies—Non School

505S Sp.  U 2-15
For students in all curricula in teacher education (elementary, secondary, and special subject areas) except those students registering for the special sections as listed below. Staff.

For students in the curriculum in Fine Arts Education, Barkham.

For students in the curriculum in Public Recreation, Murd.

For students in the curriculum in Physical Education for Men, Mand.

For students in the curriculum in Physical Education for Women, Allenbaugh.

For students in the curricula in Speech and Radio Speech, Lewis.

509 Kindergarten and Pre-School Teaching  U 3
A, W, Sp, Su. 3 cl. and observation.
Prereq.: 514 or equiv.
Recent development in the education of young children and its influence on the selection and guidance of appropriate activities. Miller and Staff.

510 Elementary Education: Arithmetic  U 3
A, W, Sp, Su. 3 cl.
Prereq. or concur.: 514 and Math. 410.
A study of the methods and materials used in arithmetic instruction. Includes development of functional relationships with other curriculums, diagnostic procedures, and remedial work. Harding and Staff.
514 Elementary Education: U 4
Conceptions of Teaching
A, W, Sp, Su. 2 hr. cl., alternate 1 hr. cl.
Prereq. or concur.: 408. For detailed statement of additional prerequisites see College of Education section. If possible, 514 and 515 should be scheduled during the same quarters on the same days of the week at consecutive hrs.
Not open in Summer Qtr. to elementary majors without teaching experience.
Students may not schedule more than 20 hrs. while taking this course.
First course in basic professional sequence. Designed to acquaint students with elementary school program in general and to deepen conceptions of teaching. Korte, Teubhmburg, and Staff.

515 Elementary Education: U 4
Child Guidance
A, W, Sp, Su. 3 hr. cl., alternate 1 hr. cl.
Prereq. or concur.: 514.
Development of teacher insight and understanding in the education of children. Class work based upon significant research. Required observation of children at University School. Strom and Staff.

516 Elementary Education: The Language Arts
A, W, Sp, Su. 2 hr. cl., alternate 1 hr. cl.
Prereq.: 514 and 3rd yr. standing in the College of Education. 516 and 517 should be scheduled during the same quarter, on the same day of the week and at consecutive hrs. prior to enrollment in student teaching.
Not open in Summer Qtr. to elementary majors without teaching experience.
Students may not schedule more than 20 hrs. while taking this course.
This course gives particular consideration to the teaching of language arts (reading, handwriting, spelling, oral and written expression) in the elementary program. School participation required. Huck, King, and Staff.

517 Elementary Education: The Social Studies
A, W, Sp, Su. 2 hr. cl., alternate 1 hr. cl.
Prereq.: Educ. 3rd yr. standing and 514. 516 and 517 should be scheduled during the same quarter, on the same day of the week and at consecutive hrs. prior to enrollment in student teaching.
Not open in Summer Qtr. to elementary majors without teaching experience.
Students may not schedule more than 20 hrs. while taking this course.
This course follows the sequential arrangements of the elementary education curriculum, placing particular emphasis upon the social studies in the elementary school program. Tomlinson, Teubhmburg, and Staff.

Teaching of Arithmetic, Language Arts, and Social Studies
Su: 12 cl.
The three courses listed above, 516, 517, and 517, will be combined in a workshop limited to graduates of Colleges of Liberal Arts.

Elementary Education: Student Teaching
Prereq.: Educ. 4th yr. standing.
For additional information see College of Education section.
Observation, participation, and responsible teaching in a public school in the greater Columbus area. Individual and group conference or seminars. (Maximum transfer credit accepted is 6 hrs.) Miller and Staff.

518A A, W, Sp. U 6-15
For students in the regular elementary education degree program.

For approved students with 3 or more yrs. of successful teaching experience.

518C Sp. U 6
For students in the program for graduates with Bachelor of Arts or comparable degrees.

518D1 Sp. U 6
Second enrollment for students in the Study-Service Program.

Elementary School Student Teaching in Special Fields
Prereq.: 3rd yr. standing. Educ Andrews and Staff.

520A Instrumental Music A, W, Sp. U 3-7
Wilson, Bennett.

520B Vocal Music A, W, Sp. U 3-7
Bonney, Sexton.

520C Fine Arts A, W, Sp. U 3-7
Mitchell.

520S Physical Education (Men) A, W, Sp. U 3-7
Coates.

520T Physical Education (Women) A, W, Sp. U 3-7
Allenbaugh, Schroeder.

521 Introduction to Children's Literature A, W, Sp, Su. 3 cl.
Prereq. or concur.: 514.
Study of literature for children with emphasis on standards for selecting materials with reference to the interest, needs, and abilities at different age levels. Korte, Huck, Ramsey.

522 Elementary Schools Industrial Arts Activities A, W, Sp, Su. 5 hr. cl., and lab.
Prereq.: 514 or equiv. Major standing in Elementary or Special Education.
Laboratory experiences involving the use of tools, materials, processes, and products through which society supplies its needs for food, clothing, shelter, tools, machines, records, utensils, and transportation. Hoare and Staff.

528 Elementary Education: Science A, W, Sp, Su. 3 cl.
Prereq.: 514 and Bot. 402; Zool. 401 or Chem. 408, Physics 492 or Geol. 418.

Prereq.: 409.
A laboratory field experience course introducing topics, problems, and skills common to prospective secondary school teachers. Hough and Staff.

A-67
Student Teaching in Secondary Schools
Prereq.: Educ. 4th yr. standing.
For additional information see College of Education section.
Observation, participation, and responsible teaching in a public school in the greater Columbus area. Individual and group conferences or seminars.
A minimum of 9 credit hours is required to meet certification standards in Ohio and in most secondary academic curricula in this College.
The individual subject area is designated by a separate section number which should be used in enrolling. Students desiring teaching in more than one area should indicate accurately both section numbers and hours in each. Andrews and Staff.

536A Instrumental Music
Continuation of 520A. Benner, Wilson.

536B Vocal Music
Continuation of 520B. Benner, Cody, Ramsey, Simmons.

536C Fine Arts
Barlow.

536D German
Allen.

536F French
Allen.

536G Industrial Arts
Haw.

536H Trade and Industrial Education
Sp.
Reese

536J Business Education
Wells, Hamme.

536L Latin
Allen.

536M Health Education
Schroeder, Costes.

536N English
Zidonia.

536O Spanish
Allen.

536P Mathematics
Crossobite.

536Q Science
Schlessinger.

536R Social Studies
Jewett.

536S Physical Education (Men)
Costes.

536T Physical Education (Women)
Schroeder.

536U Speech
Logan.

536X Distributive Education

536Z Russian
Allen.

Student Teaching in Special Fields
Prereq.: Educ. 4th yr. standing.
For additional information see College of Education section.
Andrews and Staff.

537A Dental Hygiene Education
Catherman, McGowan.

537B Radio-Speech Education

537D† School Psychological Service

537E Speech and Hearing Therapy
Brittin.

537L Special Education
Cavin, Hunt.

538† Internship in Secondary Schools
Prereq.: 536
No other course can be taken concurrently.
Provision of a professional setting in which the student may exercise and intellectualize the skills, insights, and decision making processes of the social studies teacher.

538R Social Studies
Jewett.

542 Teaching Stenographic and Clerical Subjects
A. 3 cl.
Prereq.: 4th yr. standing and 403, 409 or equiv., 553.
Objectives, methods, classroom procedures, and materials for teaching shorthand, transcription, typing, office practice, and business English. Wells.
543 Teaching Bookkeeping and Office Machines  
A, 3 cl.  
Prereq.: 4th yr. standing and 535, Acc. 403 or 413 or 503.  
The objectives, methods, classroom procedures, and materials for teaching bookkeeping and accounting, office machines and business arithmetic. Hanna.

544 Teaching the Basic Business Subjects  
W, 3 cl.  
Prereq.: 4th yr. standing and 25 cr. hrs. in Geog., Econ., and Bus. Org., and 535.  
Objectives, methods, classroom procedures, and materials for teaching general or consumer business, business law, economics, business organization, and salesmanship in the high school. Wells.

547 The Teaching of Driver Education  
A, Sp, Su. 1 2-hr. cl., 2 hr. lab.  
Prereq.: 4th yr. standing, valid driver’s license and 535.  
Graduates of the College of Education who have completed this course will be eligible for certification to teach Driver Training Courses in the secondary schools of Ohio.  
Designed to prepare teachers to organize and conduct driver training classes in the secondary schools, including methods of teaching, scheduling, and other pertinent details. Staff.

550† Library Materials for the Secondary Schools  
Sp, 3 cl.  
Prereq.: 535.  
Course is designed to develop ability in the choice of materials for library collection. Criteria, book selection aids, and evaluative study of materials are included.

551† Classifying and Cataloging in the School Library  
A.  
Prereq.: 535.  
Introduction to the principles of classifying and cataloging the simpler types of library materials.

552† Practice Library Work  
Sp, Cl. and lab. arr.  
Prereq.: 503, 550, 551.  
Designed to bring students into touch with actual library conditions through practice work in approved school libraries.

560 Letter Press and Offset Printing  
W, 5 2-hr. cl. and lab.  
Prereq.: 445. Photo, 511.  

561 The Teaching of Industrial Arts I  
A, 4 cl.  
Prereq.: 3rd yr. standing, and 535.  
A critical study of objectives, methods of presentation, evaluation class and laboratory procedures, and professional problems. Ray.

562 The Teaching of Industrial Arts II  
W, 3 cl.  
Prereq.: 3rd yr. standing, and 561.  
Examinations and evaluation textbooks, industrial publications, and audio-visual materials suitable for the various grade levels; research and development; and special consideration for exceptional pupils. Lux.

563 The Teaching of Industrial Arts III  
Sp, 3 cl.  
Prereq.: 3rd yr. standing, and 561.  

575 Trade and Industrial Education  
U 3-6  
A, W, Sp. Cl. hrs. arr.  
Prereq.: Temporary vocational teaching certificate in a trade or industrial subject, or eligibility for such certificate, and permission of instructor.  
Repeatable to a maximum of 18 cr. hrs.

581 Work Experience in Industry  
U 3-6  
A, W, Sp, Su. 5 2-hr. cl.  
Prereq.: Major standing in Indust. Arts or Trade and Indust. Ed., and permission of instructor.  
Credit in 505, 536, and 581 not to exceed 22 hrs.  
A first hand study of the working conditions, methods, and processes of industry and their implication for the teaching of industrial arts.

585 The Handicrafts  
U 4  
A, W, Sp. 5 2-hr. cl. and lab.  
Repeatable to a maximum of 12 cr. hrs.  
Designed to develop skills and knowledge in the use of the common areas of handicrafts such as leather, metals, plastics, wood, and the graphic art. Staff.

600 Individual Studies in Education  
U G 1-4  
A, W, Sp, Su.  
Prereq.: 514 and permission of instructor.

600A Business Education  
Wells, Hanna.

600B Adult Education  
Hendrickson.

600C Elementary Education  
Burr, Frasier, Harding, Huck, King, Koste, Ramsey, Story, Stahl, Towschbury, Tomlinson.

600D Guidance  
Kemp, Riccio, Peters.

600E Higher Education  
Burnett, Kircher.

600F History of Education and Comparative Education  
Sutton, Mehl, Maccio, Sanders.

600G Industrial Arts Education  

600H Trade and Industrial Education  
Reese.

600I Philosophy of Education  
Kircher, E. Maccio, G. Maccio.

600J Radio and Television Education  
Tyler.

600K Secondary Education  

600M Educational Administration  
600N Teaching of English
Eberhart, Zidonix.

600O Teaching of Foreign Language
Allen.

600P Teaching of Mathematics
Crosswhite, Lazer; Trimble.

600Q Teaching of Sciences

600R Teaching of Social Studies
Jewett, Mussenig.

600S Audio-Visual Materials of Instruction
Dale.

600T Exceptional Children
Lewis.

600U Speech Education

600V Research Techniques

600W Library Science

600X Distributive Education

600Y Curriculum and Supervision: K-12

601 Radio and Television in Education U G 3
A, Sp. 2 2-hr. cl.
Prereq.: 4th yr. standing.

The varied types of educational broadcasting in relation to objectives, planning, production, utilization, and evaluation. Tyler.

602 Audio-Visual Materials of Instruction U G 3
A, W, Sp, Su. 3 cl. hrs.
Prereq.: 4th yr. standing.

The contribution of audio-visual materials to educational objectives emphasizing the classroom use of such materials, utilization practices, basic sources of information, selection, and evaluation of field trips, films, records, etc. Miller.

603 The Teaching of Foreign Languages U G 4
in the Elementary School
W.
Prereq.: 15 hrs. of Educ. and at least one 500-level course in a foreign language.

Skill development in teaching of spoken and written foreign languages on the elementary school level; construction and use of suitable materials. Allen.

604 The Teaching of Secondary School U G 4
Science
A, W, Sp, Su. 4 cl.
Prereq.: 535 and a major or minor in physical or biological science.

Not open to students with credit for 683-684.

Objectives, problems and procedures, preparing teaching plans, use of demonstrations, experiments and projects, science curriculum and evaluation, instruments and procedures, tests and reference materials.

605 Problems in the Teaching of Biological Science
A, W, Sp, Su. 3 2-hr. cl.
Prereq.: 604, Bot. 402, Zool. 401.

Not open to students with credit for 540.

Use and design of simple apparatus, demonstrations and experiments, collection and preservation of biological materials; the role of the living organism in the classroom. House.

606 Problems in the Teaching of Earth Science
W. 3 3-hr. lab.
Prereq.: 604 and 20 qtr. hrs. in Earth Science courses.

Use of the laboratory and local field environment in teaching earth science; materials, demonstrations and experimental methods. Shrum.

607 Philosophy of Education U G 3
A, W, Sp, Su. 3 cl.
Prereq.: 4th yr. standing.


608 Principles and Methods of Teaching U G 3
Braille: Beginning
Su, A. 3 cl.

Theory and practice in learning and teaching braille reading and writing, including the alphabet, numerals, twenty-six one-cell whole-word signs and seventeen dot-five compound contractions. Hunt.

609 Principles and Methods of Teaching U G 3
Braille: Advanced
W, Su. 3 cl.

Theory and practice in learning and teaching braille reading and writing with emphasis on contractions, punctuation, and manuscript writing. Preparation for certification in braille writing. Hunt.

611 Techniques of Teaching Speech to U G 3
the Deaf
A, Su. 3 cl.

Study and practice in developing speech in the deaf. Crawford.

612 Methods in Speech and Hearing U G 3
Therapy
A, Sp. 2 2-hr. cl.
Prereq. or concurs.: 516 or 535 or aqu. Speech 683 and 697.

Organizing speech and hearing therapy programs in schools. State requirements; professional relationships; "Coordination Day" evaluation of progress; observation and child study; group vs. individual instruction. Brittin.

613 Behavioral Aspects of Language U G 3
Disabilities
W. 2 2-hr. cl.
Prereq. or concurs.: 516 or 535, Speech 684 and 698.


617 Evolution of Instruction and Guidance U G 3
of the Deaf
W, Su. 3 cl.
Prereq.: Psychol. 609.

Evolution of the oral and manual approaches of instruction of the deaf and their implication for the life adjustment problems of the deaf. Crawford.

619 Principles and Methods in the U G 3
Education of Partially Seeing Children
W, Su. 3 cl.

Identification of types and patterns of visual impairment; educational placement, facilities and programs for the partially seeing; impact of visual environment on sight; use of special equipment for partially seeing. Hunt.
624 Social Education U G 3
W, Su. 3 cl.
Prereq.: 3rd yr. standing and 514 or 535 or permission of instructor.
Analyses of social structures and processes in classroom grouping arrangements; teacher social roles, school traditions, ceremonies, clubs, and athletics. Jessee.

627 The Teaching of Speech in Secondary Schools U G 4
W, Sp, Su. 4 cl.
Prereq.: 535 and Speech 417, 470, 501, 504. Not open to students with credit for 675.
The relationship of speech to the total school program with special emphasis on fundamental processes, forensic activities, and radio speech. Lewis.

628 Teaching Dramatic Arts in Secondary Schools U G 3
A, Su. 3 cl.
Prereq.: 535, Speech 505, 511, 541, and 545.
The organization and conduct of dramatic classes and extra dramatic activities; resource planning for oral readings, choral speaking, radio-television programming and theatrical productions. Lewis.

632 The History of Western Education U G 4
A, W, Sp, Su. 4 cl.
Development of educational systems in the Western world since ancient times, education in relation to other social institutions; G. MacCle, Meld, Sutton, and Staff.

636 Historical Foundations of American Education U G 4
A, W. 4 cl.
Development of education in the United States since colonial times. Major emphasis on American education since 1830, including twentieth century developments. Meld.

641 History of Practical Arts and Vocational Education U G 3
Su. 3 cl.
Prereq.: Educ. or Agric. 3rd yr. standing.
History of those vocational and non-vocational phases of agriculture, business, industry, and homemaking which concern education. Lewis.

643 Science in Elementary Education U G 3
A, Sp, Su. 3 cl.
Prereq.: 518 or 536 or 3 yrs. of teaching experience.
The significance of research for elementary school sciences, the relation of sciences to the elementary school curriculum, and the functions of supervisory personnel. Langen, Ramsey.

644 Practicum in Educational Planning U G 3
for Partially Seeing Children
Sp, Su. 3 cl.
Prereq.: 619.
Adaptations of curriculum for the partially seeing—methods and techniques; planning educational experiences; counseling and guidance for the partially seeing. Observation and participation required. Hunt.

646 Use of Library Materials in Teaching U G 3
3 cl.
Prereq.: 521 or equiv.
Includes selection, evaluation, and study of library materials correlating with units of work in elementary grades or high school.

647 Reference Work in the School Library U G 3
3 cl.
Prereq.: 514 or 535.
Includes study of the basic reference materials such as encyclopedias, dictionaries, atlases, handbooks, gazetteers, pamphlets, and bulletins.

649 Practicum in Problems of Public Education U G 3
A, W, Sp, Su. 3 cl.
Prereq.: 514 or 535 or equiv.
Repeatability to a maximum of 9 cr. hrs.
Open to experienced teachers and administrators. Groups are organized around specific problems. Requests must be received by department chairman in time to allow for planning.

650 Techniques of Developing Language in the Deaf U G 3
A. 3 cl.
Prereq.: Psychol. 609, Speech 650.
A study of the techniques and procedures for developing elementary vocabulary and syntax for deaf children. Crawford.

651 Techniques of Developing Advanced Language in the Deaf U G 3
W. 3 cl.
Prereq.: 650.
Study of techniques and procedures for developing advanced vocabulary and syntax with deaf students. Crawford.

654 Mathematics in Elementary Schools U G 3
A, Su. 3 cl.
Prereq.: 518 or 536 or 3 yrs. teaching experience.
Not open to students in elementary education except by permission of departmental adviser.
Applications of research and theory to improvement of children's competence in computation and problem solving. Organization of instructional programs and contemporary instructional questions are considered. Harding, Stull.

655 Industrial Arts in the Elementary School U G 3
Su. 3 cl.
Prereq.: 440 or 532 or equiv.
Selection, development, and evaluation of typical experience units in both classrooms and practical arts laboratory situations at all levels of the elementary school. Hines.

656 Language Arts in the Elementary School U G 3
A. 3 cl.
Prereq.: 518 or 536 or 3 yrs. teaching experience.
Not open to students in elementary education except by permission of departmental adviser.
Problems and concerns for inservice teachers stressing current methods, issues and practices through study of significant literature and research findings. King.

657 Social Studies in the Elementary School U G 3
Sp, Su. 3 cl.
Prereq.: 518 or 536 or 3 yrs. teaching experience.
Not open to students in elementary education except by permission of departmental adviser.
The educational values of social studies, reasons for, and ways and means of integrating history, geography, and civics. Tomlinson.
659 Teaching Mathematics in Secondary Schools I
A, W, Sp., Su. 4 cl. and 20 hrs. participation during the qtr. in appropriate secondary school math classes.
Prereq.: 535 and Math. 440.
A study of the concepts and principles of mathematics appropriate for secondary school students, including a consideration of teaching procedures applicable to mathematics.

660 Teaching Mathematics in Secondary Schools II
A, W, Sp., Su. 4 cl.
Prereq.: 659.
Selected problems in the teaching of mathematics, preparation and evaluation of teaching materials including textbooks, library books, study guides, and multimedia aids. Lazar and Staff.

661 Guidance Problems in the Elementary School
W. 3 cl.
Prereq.: 514 or 535.
Selected problems which the elementary teacher faces in providing individual, small-group, and large-group guidance. Tomlinson.

663 Grammar-Usage Materials for High-School Teachers
A, W, Sp. 3 cl.
Prereq.: Eng. 418.
A study of traditional and modern linguistic systems of grammar and their bearing on the work of the English teacher. Zidonis.

666 Introduction to the Education of Mentally Retarded Children
A, W, Su. 3 cl.
Prereq.: Psychol. 600.
Study of causal factors, evaluations, learning potential, and general characteristics of the retarded child. Cain, Ames.

667 Instructional Programs for Exceptional Children
Su. 3 cl.
Prereq.: 15 cr. hrs. in Psych.
Problems, evaluation, assignments related to the participation of exceptional children in the regular classroom. grades one through twelve.

669 Literary Material for English and Social Studies
A, W, Sp., Su. 3 cl.
Prereq.: 535.

670 Teaching Literature in Secondary Schools
A, W, Sp., Su. 4 cl.
Prereq.: 535 and 20 cr. hrs. in Eng. including Eng. 418 and 564. At least one of the two courses in methods of teaching English (Ed. 670, 671) must be completed prior to student teaching and the other not later than concurrently with student teaching.
The objectives of the literature program and techniques for developing appreciation and improving skills in the reading of various types of prose and poetry. Ebershart and Staff.

671 Teaching Grammar and Composition in Secondary Schools
A, W, Sp., Su. 4 cl.
Prereq.: 515 and 564, or Eng. 594. At least one of the two courses in methods of teaching English. (Ed. 670, 671) must be completed prior to student teaching, and the other not later than concurrently with student teaching.
The role of grammar and linguistics in the English program and techniques for the teaching of oral and written expression in high school.

674 The Supervision of Journalism in Secondary Schools
Su., W. 3 cl.
Prereq.: 535 or equiv.
Not open for graduate credit to Journ. majors.
For journalism teachers in secondary schools and advisers. Covers editing, advertising, circulation, mechanical production, and publishing phases of school newspapers, magazines, and annuals. Barton.

676 The Core Program in the Junior High School
A. 3 cl.
Prereq.: 535 or equiv.
A study of the various types of core programs, their nature, development, organization, and evaluation, with special emphasis upon teaching learning procedures. Arisman.

677 The Teaching of the Social Studies I
A, W, Sp., Su. 4 cl.
Prereq.: 535 and Hist. 404 or 423.
Illustrative materials will be drawn primarily from history, with some attention to the other social studies. Muesing.

678 The Teaching of the Social Studies II
A, W, Sp. 4 cl.
Prereq.: 535 and Hist. 404 or 423.
A continuation of Ed. 677. The illustrative materials will be drawn primarily from the fields of economics, sociology, and political science, with some attention to geography and anthropology. Jowett and Staff.

681 Laboratory Practicum for Teachers of Science
A, W, Sp. 3 2-hr. cl.
Prereq.: 404 or 404-1, or major in minor standing in Physics, Chem., Physics-Chem., or Comprehensive Science.
Repeatable to a maximum of 3 cr. hrs.
The preparation, assembly and construction of demonstration and laboratory apparatus and visual aids as related to their use in science teaching. Schlesinger, Shrum.

682 Field Laboratory in Conservation Education
Su.
Prereq.: 514 or 535 or permission of instructor. Full time for first term.
Courses in conservation education. Cooperatively staffed by four state universities of Ohio. Descriptive leaflet available from Departments of Education at Kent, Miami, Ohio, and Ohio State University, Johnson and Staff.
698 Teaching of Modern Foreign Language I
A, W, Sp, 4 cl.
a. W. The Teaching of French.
b. Sp. The Teaching of Spanish.
c. A. The Teaching of German.
Prereq. or concur.: 535.
Practice in the use and preparation of teaching materials, tapes, discs, and other types of audio-visual aids. Allen and Staff.

698 Field and Laboratory Work for Teachers of Mathematics
A, Su. 2-3 hr. cl.
Prereq.: 660 or equiv. and a major or minor in Math.
The laboratory teaching of mathematics. Actual experience with a wide variety of physical devices including classroom equipment and field instruments. Crosslist.

692 The Teaching of Modern Foreign Language II
A, W. 4 cl.
a. A. The Teaching of French.
b. A. The Teaching of Spanish.
c. W. The Teaching of German
d. W. The Teaching of Russian
Prereq.: 535, and French 410 and 517, Span. 410 and 517, or Ger. 503 and 15 additional hrs. in Ger., or Russ. 403 and 503.

694 The Teaching of Latin
Sp.
Prereq. or concur.: 535, Latin 407, 408, and an additional 6 cr. hrs. in Latin.

695 Trade and Industrial Vocational Education for Out-of-School Youths and Adults
A. 3 cl.
Prereq.: 575 or equiv., and permission of instructor.
Teaching or supervising experience reqd. for grad. credit.
Philosophy, facilities, subject matter, instructional methods, teacher education, supervision, coordination; records and reports, types of programs and relationships. Reese.

699 Student Activities in the Secondary School
A. 3 cl.
Prereq.: 535 or equiv.
A study of the student activities program including home room, assemblies, clubs, publications, debating, dramatics, social activities, athletics, administration, and financial control. Laughlin.

701 Fundamentals of Curriculum
A, W, Sp, Su. 3 cl.
Prereq.: 703 or 747.
Not open to students with credit for 707, 924, or 831.
A beginning course in curriculum designed to serve as an overview of the field of curriculum and instruction: Kindergarten through 12th grade. Albert, Klohr.

702 Fundamentals of Supervision
A, W, Sp, Su. 3 cl.
Prereq.: 701.
Not open to students with credit for 826 and 829.
A beginning course in supervision of instruction emphasizing general principles and practices in elementary and secondary schools. Frazier, King, Klohr.

703 The Role of the Secondary School in the Social Order
A, W, Sp, Su. 3 cl.
Prereq.: 518 or 536 or equiv.
An orientation course for teachers and administrators which deals with the basic purposes of secondary education in relation to major issues and current trends. Arismam, Duncan, Pyneier.

704 Laboratory Study of the Ohio State University School
Sp, Su.
Prereq.: 514 or 535 or equiv.
Required minimum of 12 hrs. of observation.
The philosophy and program of the University School, as revealed through reading, directed observation, and planned conferences with the staff. Leomiz.

705 Trends in the Organization of Secondary Education
A, Sp, Su. 3 cl.
Prereq.: 518 or 536 or equiv.
Historical background and present status of American secondary education, district organization, vertical and horizontal organization, state and federal control. Hough.

706 The Supervision of School Science Programs
W, Sp. 4 cl.
Prereq.: 604 or equiv. and teaching or supervisory experience.
For those concerned with the supervision of teacher training programs in science. Objectives, curricula, recent trends, classroom management, evaluation of teaching, professional literature. Richardson, Schlessinger.

708 Evaluation in Secondary Schools
A, W, Sp. 3 cl.
Prereq.: 518 or 536 or equiv.
Study of techniques of evaluation in secondary schools. Attention is given to current evaluation practices with emphasis on procedures appropriate to Ohio schools. Artsiman, Duncan.

710 Introduction to Educational Research
A, W, Sp, Su. 3 cl.
Prereq.: 518 or 536 or equiv.
Not open to students with credit for 803.
Problems in the philosophy and logic of educational research. Application of research methods to the solution of classroom problems. Techniques of inquiry and research design. Stufflebeam and Staff.

711 History of the Universities
W, Sp. 3 cl.
The university as an institution through ten centuries; patterns of development in different countries; German, English, American contributions to the ideas of the American university. Sutton.

712 Science in the School Curriculum
A, Su. 3 cl.
Prereq.: 706 or equiv.
Foundations for science curriculum, current developments, planning and evaluation procedures, research. Richardson, Schlessinger.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Prerequisites</th>
<th>Description</th>
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</table>
| 713        | Educational Planning for Mentally Retarded Children and Youth                | U G 3  | W, Su.                     | Prereq.: 658 or equiv.  
Not open to students with credit for 773.  
A basic course for teachers and administrators which deals with curriculum goals and related educational planning for mentally retarded children and youth. Casein. |
| 714        | Industrial Arts Curriculum Planning                                         | U G 3  | W, 3 cl.                   | Prereq.: 556 or equiv.  
Review of resource reports, general and special criterion developments, formulates curriculum guidelines, and laboratory manuals of instruction. Ray. |
| 715        | Planning Industrial Arts Facilities                                         | U G 3  | A, 3 cl.                   | Prereq.: 556 or equiv.  
Open to superintendents, secondary school principals, superintendents of Indus. Arts, Vocational Ed., and teachers of Indus. Arts and Vocational Ed.  
A survey of vocational education, vocational guidance, and industrial arts. Logan and Staff of the Division of Vocational Education of the State Department of Education. |
| 717        | Survey of Vocational Education                                              | U G 3  | A, Su., 3 cl.              | Prereq.: 556 or equiv.  
Open to superintendents, secondary school principals, superintendents of Indus. Arts, Vocational Ed., guidance personnel, and teachers of Indus. Arts and Vocational Ed.  
A survey of vocational education, vocational guidance, and industrial arts. Logan and Staff of the Division of Vocational Education of the State Department of Education. |
A continuation of 718. Casein. |
| 719        | Communicative Arts; Arithmetic; Natural and Social Science                  |        | A, Su., 3 cl.              | Prereq.: 718.  
Continuation of 718. Casein. |
Continuation of 719. Casein. |
| 722        | Communicative Arts; Arithmetic; Natural and Social Science                  |        | W, Su., 3 cl.              | Prereq.: 719.  
Continuation of 719. Casein. |
The purpose, context, organization, and materials for an office practice course with practical application in an office practice laboratory. Wells. |
| 724        | Administration and Supervision of Business Education                       | U G 3  | Sp, Su., 3 cl.             | Prereq. or concurs.: 4th yr. standing and 542 or 543.  
Administrative problems involved in the evaluation of the business education program and facilities, co-operative training programs, placement and follow-up graduates, and public relations. Jennings. |
| 725        | Improvement of Instruction in Basic Business Subjects                       | G 3    | Su., 3 cl.                 | Prereq.: 543 or equiv.  
A study of objectives, methods, and materials for courses such as general business and business law. Development of units of work. |
| 726        | Teaching Bookkeeping and Related Subjects                                    | G 2    | A, Su.                     | Prereq.: 543 or equiv.  
Evaluation of the content and methods of teaching bookkeeping, accounting, and business arithmetic. Improvements in materials, tests, standards, and teaching procedures are considered. Hanna. |
| 727        | Introduction to School Administration                                       | G 3    | A, W, Sp, Su., 3 cl.       | Prereq.: 518 or 536 or equiv.  
The nature of educational administration—its purpose, the tasks, situational factors, processes; qualifications for the job-personal assessment, preparation, continued growth, professional opportunity and challenge. Clark, Larmee, Laughlin, Staub, and Staff. |
| 728        | Improvement of Instruction in Secretarial Subjects                          | G 2    | A, W, 2 cl.                | Prereq.: 542 or equiv.  
Teaching procedures basic to the development of vocational proficiency in typing, shorthand, and transcription. Available instructional materials, evaluation, standards of achievement. |
A course for school personnel, including a survey of the structure, function, and hygiene of the eyes with emphasis on educational implications of visual disabilities of blind and partially seeing children. Hunt. |
| 731        | Trends and Issues in Teaching                                               | U G 3  | W, Sp, Su., 3 cl.          | Prereq.: 656 or permission of instructor.  
An evaluation of the current trends and issues in the teaching of reading based upon the study of historical conceptions and comprehensive research in the field. Buck, King. |
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
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<tbody>
<tr>
<td>732</td>
<td>Theory and Practice in the Education of Blind Children</td>
<td>U G 3</td>
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<td>Prereq.: 730.</td>
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<td></td>
<td>Current theories and techniques in the education of blind children, adapting general curriculum, specialized content, materials and equipment for the blind child. <em>Hunt and Staff.</em></td>
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<td>734</td>
<td>Teaching Reading and Arithmetic to the Deaf</td>
<td>U G 4</td>
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<td>Prereq.: 650.</td>
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<td></td>
<td>Developing skills in reading and arithmetic in the deaf. <em>Crawford.</em></td>
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<td>735</td>
<td>Teaching Social Studies and Science to the Deaf</td>
<td>U G 3</td>
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<td>Prereq.: 734.</td>
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<td></td>
<td>Teaching skills in academic subjects to the deaf on the intermediate and high school levels. <em>Crawford.</em></td>
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<td>736</td>
<td>Education of Multihandicapped Children</td>
<td>U G 3</td>
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<td>Prereq.: Psychol. 609.</td>
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<td></td>
<td>Differential diagnosis, classification, educational placement, and adjustment of multihandicapped children.</td>
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<td>741</td>
<td>Advanced Course in Children’s Literature</td>
<td>U G 3</td>
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<td>Prereq.: 521 or 656.</td>
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<td>An evaluation of the changing role and increased importance of literature in the education of children and youth today. <em>Huck.</em></td>
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<td>747</td>
<td>Foundations of Elementary Education</td>
<td>G 3</td>
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<td>A, Su. 3 cl.</td>
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<td></td>
<td>Utilization of research in the basic sciences in developing background and understanding of present trend in elementary education. Critical examination of current theories. <em>Fraser.</em></td>
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<td>748</td>
<td>The Changing American Elementary School</td>
<td>G 3</td>
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<td>Prereq.: 518 or 536 or teaching experience.</td>
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<td>Involves investigation of objectives, issues, and curriculum organization of the modern elementary school program. <em>Fraser, Tomlinson.</em></td>
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<td>749</td>
<td>Evaluation in Elementary Schools</td>
<td>G 3</td>
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<td>Prereq.: 518 or 536 or teaching experience.</td>
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<td>Appraisal of materials and methods in terms of educational aims and research findings. Consideration of instruments and procedures for comparing achievements with established objectives. <em>Harding.</em></td>
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<td>750</td>
<td>Introduction to Guidance Services</td>
<td>U G 3</td>
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<td>A, W, Sp, Su. 3 cl.</td>
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<td>Prereq.: 535.</td>
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<td>Background and purposes of guidance service, techniques used in studying the individual; informational services; counseling service; placement and follow-up developing a guidance program. <em>Feters, Riccio.</em></td>
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<td>752</td>
<td>Group Processes</td>
<td>G 3</td>
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<td>A, W, Sp, Su. 3 cl.</td>
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<td>753</td>
<td>School Problems in Child Development</td>
<td>G 3</td>
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<td>Sp, Su. 3 cl.</td>
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<td></td>
<td>An advanced course based upon research in education and related fields which aids the teacher in guiding developmental activities of children in the elementary school. <em>Strom.</em></td>
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<td>754</td>
<td>Organization and Administration of Guidance Services</td>
<td>G 3</td>
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<td>A, W, Sp, Su. 3 cl.</td>
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<td>Prereq.: 730 or equiv.</td>
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<td>The selection, organization, and presentation of guidance material. Analysis of types of organization, methods of initiating a program, and types of in-service programs. <em>Ricci.</em></td>
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<td>755A</td>
<td>Guidance Appraisal Techniques</td>
<td>G 3</td>
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<td>A, W, Sp, Su. 3 cl.</td>
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<td>Prereq.: 750.</td>
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<td>Not open to students with credit for 755.</td>
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<td>Basic concepts and techniques in guidance work in the appraisal of the individual. <em>Kemp.</em></td>
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<td>755B</td>
<td>Guidance Appraisal Techniques</td>
<td>G 3</td>
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<td>W, Su. 3 cl.</td>
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<td>Prereq.: 750.</td>
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<td>Not open to students with credit for 755.</td>
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<td>B. Individual Appraisal—Standardized Methods.</td>
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<td></td>
<td><em>Kemp.</em></td>
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<td>756</td>
<td>Resources for Educational and Vocational Guidance</td>
<td>G 3</td>
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<td>A, W, Sp, Su. 3 cl.</td>
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<td>Prereq.: 750 or equiv.</td>
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<td>Educational and vocational resources which provide assistance in fostering the optimum physical and psychological development of students. <em>Ricci.</em></td>
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<td>757</td>
<td>Conceptions of Mind in Educational Theory</td>
<td>U G 3</td>
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<td>A, Su. 3 cl.</td>
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<td>Prereq.: 607 or equiv.</td>
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<td>A study of the doctrines of the mind that have exercised a determining influence upon educational theory and practice. <em>G. Maccia.</em></td>
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<td>758</td>
<td>The Thinking Process in Its Educational Bearings</td>
<td>U G 3</td>
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<td>Prereq.: 607 or equiv.</td>
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<td>759</td>
<td>Modern Trends in Educational Philosophy</td>
<td>U G 3</td>
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<td>A, Sp, Su. 3 cl.</td>
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<td>Prereq.: 607 or equiv.</td>
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<td>760</td>
<td>Moral and Religious Ideals in Education</td>
<td>U G 3</td>
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<td>Sp, Su. 3 cl.</td>
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<td>Prereq.: 607 or equiv.</td>
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<td>An inquiry into the role of religion in public education practices, court decision, and controversial proposals. <em>Kirscher.</em></td>
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</table>
761 The Use of Certain Concepts of Philosophy and Logic in the Teaching of Mathematics U G 3
W, Su. 3 cl.
Prereq.: or concur.: 680.
A study of the role of physical materials and certain concepts of philosophy and logic in the teaching of arithmetic, algebra, and geometry. Lazar.

762 The Teaching of Algebraic Concepts U G 4
W, Su. 4 cl.
Prereq.: 660 or equin.
The role of algebra in the secondary school, the selection of major concepts, the development of relational thinking and teaching procedures which emphasize mathematical structure. Trimble.

764 Supervised Teaching in Special U G 3-5
Classes
A, W, Sp, Su.
Prereq.: 518, or 535. Psychol. 609 or permission of instructor.
Student teaching for qualified students in any area of special education, including the special curriculum in speech and hearing therapy.

766 Education of the Emotionally and U G 3
Socially Maladjusted
Sp, Su. 3 cl.
Prereq.: Psychol. 609.

768 Directing Student Teaching G 3
A, W, Sp, Su. 3 cl.
Prereq.: Teaching certificate and teaching experience.
Principles and techniques for public school teachers and college instructors in supervising student teaching and other professional laboratory experience in teacher education. Andrews.

770 Adult Education U G 3
A, W, Su. 3 cl.
Prereq.: 4th yr. standing, for Ed. majors, 514 or 535.
The nature, extent, and significance of adult education; psychological characteristics of the adult; history and types of adult education; present trends and future developments. Hendrickson.

771 Parent Education U G 3
W, Su. 3 cl.
Prereq.: 4th yr. standing, for Ed. majors, 514 or 535.
Nature, extent, and significance of the parent education movement; home and school relationships; methods and resource; training professional and lay leaders; local and state programs. Hendrickson.

772 Preparation of Handicapped Children, U G 3
for Post-School Adjustment
Sp, Su. 3 cl.
Prereq.: Psych. 609.
Study of the roles of education, guidance, work experience, placement, and follow-up service in helping handicapped children adjust to employment, family, and community life. Cantin.

774 Discussion Methods in Adult Education G 3
W. 3 cl.
Prereq.: Permission of instructor.
The roundtable, forum, panel symposium, and other forms of discussion as applied to adult groups; laboratory practice; clinical analysis of individual difficulties. Hendrickson.

775 The History of Educational Thought: U G 3
Ancient and Medieval
A, Su. 3 cl.
Prereq.: 532 or 638.
Study and analysis of the major educational theories of the ancient and medieval periods including the educational writings of Plato, Aristotle, and St. Augustine. Mehl.

776 The History of Educational Thought: U G 3
Modern
Sp. 3 cl.
Prereq.: 632 or 636.
Study of the major educational theories since 1500 including Montaigne, Milton, Locke, and Rousseau and their influence on contemporary educational theory and practice. Mehl.

777 Comparative Education I: Europe U G 3
and the English-Speaking Countries
A, Sp, Su. 3 cl.
Prereq.: 532 or 636.
Social and cultural factors influencing the differential development of educational institutions and organization in the countries whose universal school systems are several generations old. Sanders, Sutton.

778 Comparative Education II: Asia, U G 3
Africa, Latin America
A. 3 cl.
Prereq.: 532 or 636.
Social and cultural factors affecting stability and effectiveness of educational institutions and organizations in the many countries where programs of universal education are of recent origin. Sanders, Sutton.

779 Applied Linguistics in the Teaching of G 3
Foreign Languages
Prereq.: 15 hr. in Educ., and at least one French or Spanish course on the 600-level.
Analysis of research in Applied Linguistics; construction of drills, laboratory exercises and tests; lexical items and structural inventory of French or Spanish. Allen.

780 Methods of Teaching Distributive U G 3
Education
W, Su. 3 cl.
Prereq.: 535.
The organization and preparation of teaching plans for distributive education classes; analysis of current on-the-job training methods in business establishments. Logan.

781 * Curriculum Content for Distributive U G 3
Occupational Subjects
Sp. 3 cl.
Prereq.: 780.
Securing, evaluation, and organizing instructional material and experiences for distributive cooperative education and adult extension courses. Logan.

782 Organization and Administration of U G 3
Education for the Distributive Occupations
W, Su. 3 cl.
Prereq.: 535.
A practical study of the development and operation of a distributive education program. Logan.

- Methods of Teaching Nursing U G 4
(See Nursing 798.)
On-Campus Education Workshops U G 4-8
Su. 4 cr. hrs. for 3 week workshops, 8 cr. hrs. for 6 week workshops.
Prereq.: 514 or 535 or eqv., teaching experience and permission of the workshop director.

Intensive study of a problem common to the participating leaders and/or administrators for the purpose of developing sound principles and practices relating to it.

799A Workshop on Office and Business Education. 4
Jennings. Su. (June 20-July 9)

799C† Elementary Education Workshop: Reading. 4
King. 799C Elementary Education Workshop: Science. 4
Su. (July 28-August 19)
Ramsey.

799D† Workshop on Guidance and Counseling in the Elementary School. 4
799J† Modern Media Workshop: Cross Media Approaches to Learning. 4
799K† Workshop in Junior High School Education. 4
799M On-Campus Education Workshop: Simulation of Selected Problems in School Administration. 4
(Luly 28-August 19)
Lormee, Hack, Laughlin.

799R† Workshop on the Teaching of Ohio History. 4
799T† Slow Learning Adolescents. 4
799T† Workshop on the Education of Multi-Handicapped Children. 4

799T† Workshop in Occupational Orientation and Training for Slow Learning Adolescents. 4
799X Workshop designed to revise distributive education course of study and develop instructional materials. 4
Su. (June 30-July 8) Su. (August 1-August 19)
Logan.

Seminars in Education G 2-5
A, W, Sp, Su.
Students, with permission of advisers, may register for more than one section of 800 or for the same section two or more times.
Research Problems in:

800A Business Education. 4
Banna.

800B† Adult Education. 4

800C Elementary Education 4
A, W, Sp, Su.
799C Elementary Education Workshop: Science. 4
W. Tomlinson.

800D Guidance. 4
A, W, Sp, Su.
Kemp, Peters, Riccio.

800E Higher Education. 4
A, W, Sp, Su.
Burnett, Openshaw.

800F History of Education and Comparative Education. 4
A, W.
A. Educational Planning. Sanders
History of American Education (For International Students Only) Sutton.
W. Historical Study of Foreign Educational Assistance. Sutton.

800G Industrial Arts Education. 4
A, W, Sp, Su.

800H Trade and Industrial Education. 4
W, Su.
Reese.

800I Philosophy of Education. 4
A. Philosophical Analysis and Education. E. Maccia.
W. Aesthetic Aspects of Education. Ecker.
W. To be announced. Mooney.
Sp. Theories of Knowledge and Teaching. G. Maccia.

800J Radio and Television Education. 4
Tyler.

800K Secondary Education. 4
A, W, Sp, Su.
Arison, Duncan, Frymier, Eough.

800M Educational Administration. 4
A, W, Sp, Su.
Clark, Lormee, Laughlin, Staub.

800N Teaching of English. 4
A, W, Sp, Su.
Eberhard, Ziadat.

800O Teaching of Foreign Languages. 4
Sp.
Allen.

800P Teaching of Mathematics. 4
A, W, Sp, Su.
Crosswhite, Laster, Trimble.

800Q Teaching of Sciences. 4
A, W, Sp, Su.
House, Richardson, Schlessinger, Shrum.

800R Teaching of Social Studies. 4
A, Sp, Su.
Jewett, Maccia, and Staff.
800S Audio-Visual Communication.

Staff.

800T Exceptional Children.

W, Su.

800U Speech.

A, W, Sp, Su.

Lewis.

Su. Significant Contributors to Contemporary Speech Education. Brooks.

A. Service Course Program in Speech, Brooks, Baker.

A. Creative Dramatics. Lewis.

W. Teaching Oral Interpretations at the College Level. Brooks.

W. Speech Activities in Elementary and Junior High School. Lewis.


800V Research Techniques.

A, W, Sp, Su.

800X Distributive Education.

A, W, Sp, Su.

800Y Curriculum and Supervision: K-12.

W, Su.

Klohr.

802 Research Methods

W, Su. 3 cl.

Prereq.: Master's Degree and 710 or equiv.

Problem selection, data analysis, organizational and writing problems involved in thesis preparation are considered. Clark, Ramsayer.

804 Educational Experimentation

A, Su. 1 2-hr. lab. conf. arr.

Prereq.: 710 or equiv. and 15 cr. hrs. of grad work in Ed.

Repeatability to a maximum of 5 cr. hrs.

Analysis of contribution of selected experiments to elementary, secondary, and higher education. Design of experimental method for attacking educational problems. Duncan.

808 Administration of the Secondary School

W, Su. 3 cl.

Prereq.: 727 or equiv.

Major problems and issues in the organization and administration of the secondary school. Laughlin, Staub.

809 Social Philosophies and Their Educational Bearings

Sp, Su. 3 cl.

Prereq.: 607.

A study of social philosophies in terms of their significance for educational procedures and programs. Jeueff.

810 The Educational Philosophy of John Dewey

Sp. 3 cl.

Prereq.: 758 or equiv.

A systematic study of the writings of John Dewey in their bearings upon educational theory and practice. Kircher.

812 Seminar in Methods of College Teaching in the Sciences Basic to the Health Professions

W. 2 cl.

Major problems of teaching in the health sciences in higher education. Principles, techniques, visual aids, motivation and evaluation. Individual plans in areas of specialization.

815 Organization and Administration of Industrial Education

Sp. 3 cl.

Prereq.: 856.

Not open to students with credit for 718.

International and historic background curriculum resources and development, physical organization, administrative organization, supervisory operation, and professional policies. Lux.

818 Practicum in School Guidance Work

2 2-hr. cl., 3 to 4 hr. lab. 3 cl.

Prereq.: 752, 755, 756, Psychol. 821 and permission of instructor.

Repeatable to a maximum of 9 cr. hrs.

Emphasis on practical experience in counseling and working with the supporting guidance service including:

a. Introduction to high school counseling.

b. Supervised practice in high school counseling.

c. Supervised field experience in the high school.

d. Group procedures practicum.

e. Group counseling practicum.

823 Legal Aspects of School Administration

Sp, Su. 3 cl.

Prereq.: 727 or equiv.

A study of statutory and case law, legal principles and provisions as related to educational administration, district, personnel, finance, curriculum, contracts, property, liability, and organization. Staub.

825 The Elementary School Principalship

W, Su. 3 cl.

Prereq.: 727.

Emphasis is given to the elementary-school principal's role in providing leadership in policy making, personnel matters, public relations, research, and business management. Hask, Lernme.

831 Laboratory in Curriculum Development

Sp. 3 cl.

Prereq.: 707 or equiv.

An advanced course in techniques of curriculum development and organization. Specific problems in curriculum development which are of concern to the students enrolled are studied. Pymier.

832 The Community Junior College

W, Su. 2 cl.

Origin and development of the community college, including an evaluation of general, college-parallel, terminal, and adult education programs in public and private institutions. Burnett.

835 Advanced Studies in Education

A, W, Sp, Su.

Prereq.: Graduate standing in the M. Ed. Program.

Permission of the instructor.

Designed to enable candidates pursuing the Master of Education degree to demonstrate ability to attack and deal with problems independently.

835A Business Education.

Wells, Hanna.

835B Adult Education.

Hendrickson.

835C Elementary Education.

Frazier, Harding, Huck, King, Ramsey, Tomlinson.
835D Guidance. 
Peters, Kemp, Riceo.
835E† Higher Education
835F History of Education and Comparative Education. 
G. Maccia, Mohl, Sanders, Sutton.
835G Industrial Arts Education.
835H Trade and Industrial Education. 
Reese.
835I Philosophy of Education. 
Kitcher, E. Maccia, G. Maccia.
835J Radio and Television Education. 
Tyler.
835K Secondary Education.
835M Educational Administration. 
835N Teaching of English. 
Eberhart, Zdonici.
835O Teaching of Foreign Language. 
Allen.
835P Teaching of Mathematics. 
835Q Teaching of Science. 
835R Teaching of Social Studies. 
Jewitt, Mueserig.
835S† Audio-Visual Materials of Instruction. 
Dale.
835 T† Exceptional Children.
835U Speech. 
Lewis.
835V Research Techniques. 
835X Distributive Education.

836 Practicum in Educational Administration G 4 
A. 1 cl., lab. arr. 
Prereq.: Master's degree, 727. 
Two yrs. teaching experience or equi., and permission of instructor. 
A study of the literature and methods of school surveys, as a basis for the investigation of practical problems in school administration and supervision. Clark, Laughlin.

837 Practicum in Educational Administration G 4 
W. 1 cl., lab. arr. 
Prereq.: 836. 
Continuation of 836. 
Larneem and Staub.

838 Practicum in Educational Administration G 4 
Sp. 1 cl., lab. arr. 
Prereq.: 837. 
Continuation of 837. 
Staub, Hark.

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840 The Teaching of Geometric Concepts G 4 
Sp, Su. 5 cl. 
Prereq.: 695 or 660 or equi. 
The role of demonstrative geometry, two and three-dimensional concepts, the nature of proof and teaching procedures which emphasize both deductive and algebraic methods. Crosswhite.

841 Guiding Learning Activities in the Secondary School G 3 
W, Su. 3 cl. 
Prereq.: 702, 705, and 706. 
An advanced course dealing with basic principles and generalized techniques involved in developing, organizing, and evaluating learning activities. Hough.

844 Administrative Problems of the High School Principal G 2-3 
Sp. 3 cl. 
Prereq.: 709 or equi. 
An advanced course dealing with selected problems in the administration of secondary schools. Laughlin.

845 Administration of Higher Education I G 3 
A, Sp. 2 cl. 
Prereq.: 2-3. 
Purposes and scope of higher education. Patterns of general control. Theories of administration, allocation of function, and coordination in higher education. Barnett.

848 Theories and Curricula of Higher Education G 5 
A, Su. 2-3 hr. cl., 1 hr. arr. 
A study of current theories of general education of representative and experimental college programs in the United States. Kircher.

849 Organization of Programs for Exceptional Children G 3 
Sp. 3 cl. 
Prereq.: 667 and 727, Psychol. 609. 
Planning and financing of educational programs for children who are gifted, mentally deficient, blind, partially seeing, deaf, hard of hearing, emotionally disturbed, or who have learning problems or other handicaps. Cassidy.

850 Teacher Training G 5 
W, Su. 2-3 hr. cl., 1 hr. arr. 
History, organization, administration, curriculum and method, student personnel (including measurement) peculiar to teacher training institutions.

851 Science Education in Higher Education G 4 
W. 
Prereq.: 604 or 684 or equi., and 706 or 712 or equi. 
Courses and curricula for teachers preparation programs in sciences, directing student teaching, on- and off-campus co-operative arrangements, provision for equipment and evaluation. Richardson.

853 School Community Relations G 3 
A, Su. 3 cl. 
Prereq.: 727 or equi. 
Principles and practice in developing and maintaining appropriate school community relationships; professional vs. lay roles; institutional relationships; opinion analysis, communication processes; and decision-making patterns. Staub.

854 Administration of Higher Education II G 5 
Sp. 2-3 hr. cl., 1 hr. arr. 
Prereq.: 845. 
Principles and problems of control, allocation of function, coordination, financial support, business administration, and evaluation in higher education, including graduate and professional education.
COURSES OF INSTRUCTION

EDUCATION

855 Interaction of the Student and the College Environment
G 3
A, Su. 2 cl.
A focus on the nature of the college environment, entering student, academic procedures, student performance, and student culture for those planning careers in college student personnel work. Burnett.

856 Practicum in Industrial Arts Education
G 3-5
Su. 3 cl.
Prereq.: 536.
Derivation of doctrines, formulation and evaluation of basic programs, curriculum development, organizational implementation, leadership problems, and professional progress, both here and abroad. Warner.

859 Comparative Philosophy of Education
G 3
W. 3 cl.
Prereq.: 758 or 759 or equiv.
A study of alternative philosophies of education and the speculative development of their implications for educational practice. Kitcher, B. Macoa.

863 Curriculum Theory
G 3
A. 3 cl.
Prereq.: 702 or equiv.
An advanced course in curriculum: Kindergarten through 12th grade. Kohr.

864 Problems of Elementary School Curriculum and Supervision
G 3
W, Su. 3 cl.
Prereq.: 748 and 702.
An analysis of the programs and practices involved in facing major problems in the elementary schools. Supervision and curriculum will be synthesized. Frazier, King.

865 Problems of Secondary School Supervision and Curriculum Development
G 3
Sp, Su. 3 cl.
Prereq.: 702.
Not open to students with credit for 831.
An advanced course in supervision and curriculum development emphasizing the problems involved in initiating and conducting change in the secondary school curriculum. Duncan, Frymier.

866 Research in the Laboratory of Industries
G 3
Su. 3 cl.
Prereq.: 714 or 715 or 716, teaching experience in Indus. Arts or Vocational Indus. Ed., and permission of instructor.
Individual or group studies on a conference and laboratory basis, with the publication of either a professional or technical bulletin as a goal. Warner.

868 Supervision Theory
G 3
Sp. 3 cl.
Prereq.: 702 or equiv.
An advanced course in supervision of instruction: Kindergarten through 12th grade. Frazier.

870 Administrative Problems of Beginning Superintendents
G 3
Sp. 3 cl.
Prereq.: 727 or equiv.
Emphasis on such problems as school-community relations, finance, school facilities, staff personnel, pupil personnel, instruction, and organization. Hack.

A-80

871 Administrative Problems of the City Superintendents
G 3
Sp. 3 cl.
Prereq.: 727 or equiv.
A study for practicing administrators of the problems peculiar to the educational administrator in large public school systems. Stress applications of theory to practice.

872 Administration of Pupil Personnel
G 3
W, Su. 3 cl.
Prereq.: 727 or equiv.
Organizational and administrative problems in pupil personnel area are analyzed. Legal phases of the program, policy development, and staffing relationships also are considered. Staub and Staff.

873 Staff Personnel Administration
A, Sp. Su. 3 cl.
Prereq.: 727 or equiv.
A study of problems of personnel administration in school districts—recruitment, orientation, appraisal, in-service training, promotion, certification, dismissal, personnel policies, salary provisions, and welfare. Lamee.

875 School Finance
A, Su. 3 cl.
Prereq.: 727 or equiv.
General school finance problems; finance and organization; sources of school support; variations in financial ability and effort; state-local finance plans; federal role. Hack.

876 Business Administration of Schools
G 3
W, Su. 3 cl.
Prereq.: 727 or equiv.
Function of business administration in schools; administrative relationships; personnel, budget making; procuring revenue, financial outlay and accounting; managing plant, facilities, and supplies; payroll, transportation. Hack.

880 School Plant Planning
G 3
Su. 1 2-hr. cl., 1 hr. arr.
Prereq.: 727 or equiv.
Problems and techniques in determining school building needs, evaluating school building, planning new construction or remodeling, utilizing specialized personnel; related legal and financial aspects. Conrad, Whitters.

885 Practicum in Curriculum and Supervision
G 4
A. 1 cl. plus lab to be arr.
Prereq.: Master's degree and 702.
Not open to students with credit for 831.
A study of the literature and methods of curriculum development and supervision of instruction in a field setting. Frazier.

886 Practicum in Curriculum and Supervision
G 4
W. 1 cl. plus lab. to be arr.
Prereq.: Master's degree, 702 and 885.
Not open to students with credit for 831.
Continuation of 885. Frymier.

887 Practicum in Curriculum and Supervision
G 4
Sp. 1 cl. plus lab. to be arr.
Prereq.: Master's degree, 702 and 886.
Not open to students with credit for 831.
Continuation of 886. Kohr.
538 Planning Community Adult Education Programs
A. 3 cr.
Prereq.: 770 and permission of instructor.
A study of the community agencies with adult education programs; how new programs may be developed in terms of needs which are not being met. Hendrickson.

539 Interdepartmental Seminar
A.
(See under Interdepartmental Seminars)

550 Research in Education
Research for thesis or dissertation purposes only.

Electrical Engineering

Office: 105 Caldwell Laboratory, 2024 Nell Avenue.

PROFESSORS 1THURSTON (Chairman), JAYES, 1BOONE, 2CONNIGRAPH, 1COWAN, 1W. DAVIS, DREES (Emeritus), KENNNAUGH, KEMAN (Emeritus), KEOH, KOUYOMJIAN, KRAUS, LEVINS, 1MATHIS, MIDDLETON, 1RICHMOND, SMITH, SWALTER, SWARREN, 1WEED, and 1WEIMER; ADJUNCT PROFESSORS ADAM and 1TOU; ASSOCIATE PROFESSORS 1ANDRESEN, 1BACON, ICORNET, 1D. DAVIS, 1GILFORD, 1GOTTING, 1HIGG (Emeritus), 1HRSU, 1MAD, 1PEAKE, and 1PETERS; ASSISTANT PROFESSORS 1BATTOLOTTO, 1COLLINS, 1DEBE, 1ERDMAN, 1FENTON, KOCZKAN, 1LACKEY, 1LONG, 1SCHWARTZ, and 1WILLIAMS; and INSTRUCTORS.

504 Professional Aspects of Electrical Engineering
A. 1 cr.
Employment problems of graduating seniors, professional aspects of engineering and professional societies and ethics. Discussion of employment practices. Ayres.

615 Circuit Theory IV
A. W. 4 cr.
Prereq.: 614, concur. 626, Math. 624.
Not for graduate credit to students majoring in Elec. E.

617 Field Theory I
A. W. 3 or 4 cr.
Prereq.: Physics 533, Math. 544, concur. 612.
Not for graduate credit to students majoring in Elec. E.
Vector relations, static electric fields, dielectric materials, boundary conditions, field mapping, steady electric currents and their magnetic fields, motion of charged particles.

618 Field Theory II
W, Sp. 3 or 4 cr.
Not for graduate credit to students majoring in Elec. E.
Ferromagnetic materials, time changing electric and magnetic fields, Maxwell's equations, relations between field and circuit theory, plane waves, Poynting vector, energy relations, boundary value problems.

619 Transmission and Radiation
A. S. 3 or 4 cr.
Prereq.: 618.
Not for graduate credit to students majoring in Elec. E.
General transmission theory, infinite line, terminated line, impedance transformation, rectangular waveguides, group and phase velocity, impedance of waveguides, simple transmission systems.

625 Experience in Practice
A. Ten weeks of experience in practice following the 9th qtr. or 1 yr. of acceptable industrial experience before the end of the 9th yr.
Students must register with and obtain complete information and forms from course supervisor. Ayres.

626 Electron Device Circuit Theory I
A. W. 3 or 4 cr.
Prereq.: 614 and 617 or equiv.
Not for graduate credit to students majoring in Elec. E.
Elementary theory of electron device terminal characteristics; large and small signal analysis of electron devices as circuit components; applications to rectification and to amplification.

627 Electron Device Circuit Theory II
W, Sp. 3 or 4 cr.
Prereq.: 615 and 626.
Not for graduate credit to students majoring in Elec. E.
Multistage amplifier coupling; broadening; feedback analysis and applications; power amplifiers; Class 3 and C large signal analysis; single-frequency oscillators.

628 Electron Device Circuit Theory III
A. 4 cr.
Prereq.: 627.
Not for graduate credit to students majoring in Elec. E.
Amplitude, angle, and pulse modulation, modulators; demodulators; AM and FM; switching networks utilizing thyristors, transistors, and transistors; control circuits; system applications.

A-81
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>642</td>
<td>Electrical Engineering</td>
<td>U 4</td>
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<tr>
<td>A, W, Sp.</td>
<td>3 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>Physics 533, Math. 543.</td>
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<tr>
<td>Not open to students majoring in Elec. E or Eng. Physics.</td>
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<tr>
<td>Introduction to circuit analysis; circuit analysis concepts and their extension to mechanical and thermal systems by analogy. Electrical instruments and measurements. Cowan, Weed.</td>
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<tr>
<td>643</td>
<td>Electrical Engineering</td>
<td>U 4</td>
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<tr>
<td>A, W, Sp.</td>
<td>3 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>642 or equiv.</td>
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<tr>
<td>Not open to students majoring in Elec. E or Eng. Physics.</td>
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<tr>
<td>Electromechanical devices; an introduction to the basic principles of analysis of electromechanical devices. The approach is organized to extend the circuit concepts and dynamic analysis introduced in the preceding course. Cowan.</td>
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<tr>
<td>644</td>
<td>Electron Devices and Controls</td>
<td>U 4</td>
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<tr>
<td>A, W, Sp.</td>
<td>3 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>642</td>
<td></td>
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<tr>
<td>Theory and applications of semiconductors, transistors; photoelectric, vacuum and gas filled tubes. Study of control circuits, feedback, amplifiers, oscillators, filters, magnetic amplifiers and instrumentation. Weed.</td>
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<tr>
<td>650</td>
<td>Electrical Energy Conversion I</td>
<td>UG 4</td>
</tr>
<tr>
<td>A, Sp.</td>
<td>4 cl.</td>
<td></td>
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<tr>
<td>Prereq.:</td>
<td>614 and 618</td>
<td></td>
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<tr>
<td>Not for graduate credit to students majoring in Elec. E.</td>
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<tr>
<td>Properties and theory of magnetic circuits as applied to electromechanical energy conversion. Transformers, non-linear magnetic devices. Introduction to rotating machine analysis.</td>
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<tr>
<td>651</td>
<td>Electrical Energy Conversion II</td>
<td>UG 4</td>
</tr>
<tr>
<td>A, W, Sp.</td>
<td>4 cl.</td>
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<tr>
<td>Prereq.:</td>
<td>650</td>
<td></td>
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<tr>
<td>Not for graduate credit to students majoring in Elec. E.</td>
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<tr>
<td>Field and circuit concepts of idealized rotating machines; steady and transient states; thermal transients; control machines and systems.</td>
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<tr>
<td>652</td>
<td>Electrical Energy Conversion III</td>
<td>UG 4</td>
</tr>
<tr>
<td>A, W, Sp.</td>
<td>4 cl.</td>
<td></td>
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<tr>
<td>Prereq.:</td>
<td>651</td>
<td></td>
</tr>
<tr>
<td>Not for graduate credit to students majoring in Elec. E.</td>
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<tr>
<td>Field and circuit concepts of realistic rotating machines; generalized two-phase machines as control components; magnetic amplifiers.</td>
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<tr>
<td>662</td>
<td>Electrical Laboratory I</td>
<td>U 2</td>
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<tr>
<td>A, W.</td>
<td>1 cl., 3-hr. lab.</td>
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<tr>
<td>Concur.:</td>
<td>612 or 817</td>
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<tr>
<td>Prereq.:</td>
<td>Math. 543 and Physics 533</td>
<td></td>
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<tr>
<td>Introduction to digital computer programming; characteristics and capabilities of electrical instruments; measurement of resistance, capacitance, inductance, and impedance at audio frequencies; two-dimensional field plotting. Gilfert.</td>
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<tr>
<td>663</td>
<td>Electrical Laboratory II</td>
<td>U 2</td>
</tr>
<tr>
<td>W, Sp.</td>
<td>1 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>662, concur. 613</td>
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<tr>
<td>A laboratory study of electric circuits including resonant circuits, current and voltage loci, coupled circuits, network theorems, and circuit transients. Gilfert.</td>
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<tr>
<td>664</td>
<td>Electrical Laboratory III</td>
<td>U 2</td>
</tr>
<tr>
<td>A, Sp.</td>
<td>1 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>653, concur. 614 and 619</td>
<td></td>
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<tr>
<td>Transmission line parameters; attenuation, magnitude and phase of voltage, and current on lines; reflected waves; waveguide characteristics and techniques; antenna patterns and impedances. Peters.</td>
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<tr>
<td>665</td>
<td>Electrical Laboratory IV</td>
<td>U 2</td>
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<tr>
<td>A, W.</td>
<td>1 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>653 and 626</td>
<td></td>
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<tr>
<td>Determination of terminal characteristics of vacuum, gaseous, and solid state electron devices; non-linear wave form frequency analysis; power supplies, three-phase rectifiers, single stage amplifiers. Campbell.</td>
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<tr>
<td>666‡</td>
<td>Electrical Laboratory V</td>
<td>U 2</td>
</tr>
<tr>
<td>W, Sp.</td>
<td>1 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>665 and 669</td>
<td></td>
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<tr>
<td>Tube and transistor multistage amplifiers and broadbanding; audio and radio frequency power amplifiers; characteristics and equivalent circuits of linear motion and astable core devices; general magnetic networks and transformers. Davis, Smith.</td>
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<tr>
<td>667</td>
<td>Electrical Laboratory VI</td>
<td>U 2</td>
</tr>
<tr>
<td>A, Sp.</td>
<td>1 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>666, concur. 628</td>
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<tr>
<td>Amplitude modulation; demodulation of a modulated wave; production of shaped waveforms; switching and control circuit applications; design and evaluation of a single-frequency oscillator; filters. Edelman.</td>
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<tr>
<td>668</td>
<td>Electrical Laboratory VII</td>
<td>U 2</td>
</tr>
<tr>
<td>A, W, Sp.</td>
<td>1 cl., 3-hr. lab.</td>
<td></td>
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<tr>
<td>Prereq.:</td>
<td>652 and 666</td>
<td></td>
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<tr>
<td>Study of selected transient and steady-state performances of direct current, synchronous and induction machines. Smith.</td>
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<tr>
<td>669</td>
<td>Electrical Laboratory VIII</td>
<td>U 2</td>
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<tr>
<td>W, Sp.</td>
<td>1 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>658 and 716</td>
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<tr>
<td>Laboratory study of feedback amplifiers, control systems and their components, operational amplifiers, and analog computers. Bacon.</td>
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<tr>
<td>707</td>
<td>Advanced Circuits</td>
<td>UG 3</td>
</tr>
<tr>
<td>A.</td>
<td>3 cl.</td>
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<tr>
<td>Prereq.:</td>
<td>627</td>
<td></td>
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<tr>
<td>Introduction to network synthesis. W. Deris.</td>
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<tr>
<td>716</td>
<td>Introduction to Feedback</td>
<td>UG 3 or 4</td>
</tr>
<tr>
<td>A, W.</td>
<td>3 or 4 cl.</td>
<td></td>
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<tr>
<td>Prereq.:</td>
<td>615 and 628, or 644 and Math. 544 with permission of instructor.</td>
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<tr>
<td>Feedback systems, block diagrams and signal flow graphs, stability criteria, frequency response and pole-zero analysis; application of feedback to amplifiers and control systems; non-linear considerations.</td>
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<tr>
<td>718</td>
<td>Radiation from Antennas</td>
<td>UG 3</td>
</tr>
<tr>
<td>W.</td>
<td>3 cl.</td>
<td></td>
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<tr>
<td>Prereq.:</td>
<td>619, concur. 719</td>
<td></td>
</tr>
<tr>
<td>Dipole, loop, aperture, reflector, lens, surface wave and other antennas; array theory; radiation resistance, directivity and input impedance. Kraus.</td>
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<tr>
<td>719</td>
<td>Antenna Laboratory</td>
<td>UG 1</td>
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<tr>
<td>W.</td>
<td>1 cl., 3-hr. lab.</td>
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<tr>
<td>Prereq.:</td>
<td>664, concur. 718</td>
<td></td>
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<tr>
<td>Measurements and interpretation of antenna field patterns, impedances, gains, and current distribution. Kraus.</td>
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<tr>
<td>723</td>
<td>Digital Computer Laboratory</td>
<td>UG 2</td>
</tr>
<tr>
<td>Sp.</td>
<td>1 cl., 1-3 hr. lab.</td>
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<tr>
<td>Concur.</td>
<td>742</td>
<td></td>
</tr>
<tr>
<td>Laboratory study of counting, arithmetic and digital circuits. Coutts.</td>
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</tbody>
</table>
724 Microwave Circuits Laboratory  U G 1
    A.  1 3-hr. lab.
    Prereq.: 619 and 664, concur. 739 or permission of instructor.
    Measurement of field and power distribution in waveguides; impedances, components and microwave generator properties. D. Davis.

725 Control Systems Laboratory I  U G 2
    W.  1 cl., 1 3-hr. lab.
    Concur. 728 or 733.
    Experiments chosen by student interest from the course content of open cycle control and instrumentation and feedback control systems. Weed, Weimer.

728 Open Cycle Control and Instrumentation  U G 3
    W.  3 cl.
    Prereq.: 651 and concur. 716, or 643 and 644 with permission of instructor.
    Industrial electronic control and instrumentation using semiconductor, vacuum and gaseous electron devices; timing, pulse counting circuits; trigger methods; programmed sequence control; radio frequency heating; X-ray. Weed.

731 Magnetic Amplifiers  U G 3
    Sp.  3 cl.
    Prereq.: 652, 716, or 643 and 644, with permission of instructor.

733 Feedback Control Systems  U G 3
    W.  3 cl.
    Prereq.: 716 and 652 or 643 with permission of instructor, Math. 608 or 611.
    Application of feedback principles to control systems; performance criteria; compensation, carrier systems, multi-variable systems. Weimer.

734 Control Systems Laboratory II  U G 2
    Sp.  1 cl., 1 3-hr. lab.
    Concur.: 731 or 733.
    May be taken without 725.
    Experiments chosen by student interest from the course content of advanced control systems and magnetic amplifiers. Weimer, Weed.

738 Advanced Control Systems  U G 3
    Sp.  3 cl.
    Prereq.: 733.
    Practical control systems with non-ideal components; non-linear systems. Weed.

739 Microwave Circuits  U G 3
    A.  3 cl.
    Prereq.: 619, concur. 724 or permission of instructor.
    Advanced waveguides, waveguide devices, amplifiers, generators and detection devices; special microwave techniques. D. Davis.

740 Logic Circuit Theory  U G 3
    A. W.  3 cl.
    Prereq.: 628 or 644 with permission of instructor.

741 Economics and Organization of the Electrical Industry  U G 4
    W, Sp.  4 cl.
    Prereq.: 614 or 643.
    Not for graduate credit to students majoring in Elec. E. Principles of engineering economy and financial analysis applied to electrical industry in its principal divisions; power supply, communications, manufacturing and merchandising. Aprue.

742 Theory and Design of Digital Computers  U G 3
    W, Sp, Su.  3 cl.
    Prereq.: 740.
    Number systems, introduction to computer programming, design of arithmetic units, counters, and digital control systems, use of redundant codes and redundant equipment. Congriff.

743 Communication Theory  U G 3
    W.  3 cl.
    Prereq.: 628.
    Theory of communication, information content, frequency spectra, noise, methods of modulation, modulators, and demodulators. D. Davis.

744 Communications Laboratory I  U G 2
    W.  1 cl., 1 3-hr. lab.
    Prereq.: 638 and 667.
    Theory and laboratory study of non-linear amplifiers and oscillators, modulators, and detectors. D. Davis, Gilbert.

746 Space Communications  U G 3
    Sp.  3 cl.
    Prereq.: 743.
    A study of space communication systems. Long-distance transmission, wave propagation, and system considerations. D. Davis, Feake.

747 Communications Systems  U G 3
    Sp.  3 cl.
    Prereq.: 745.
    A study of the synthesis of amplitude and frequency modulated communication systems, with emphasis on transmitters and receivers. W. Davis.

748 Communications Laboratory II  U G 2
    Sp.  1 cl., 1 3-hr. lab.
    Prereq.: 744.
    Laboratory study of communications systems. D. Davis, Gilbert.

756 Elements of Radio Wave Propagation  U G 3
    W.  3 cl.
    Prereq.: 619.
    Practical calculations and procedures for predicting refraction and reflection by a plane or spherical earth; tropospheric, ionospheric, and scatter propagation. Levar.

760 Advanced Theoretical Study in Electrical Engineering  U G 3
    A.
    Prereq.: Permission of instructor.

761 Advanced Theoretical Study in Electrical Engineering  U G 3
    W.
    Prereq.: Permission of instructor.

762 Advanced Theoretical Study in Electrical Engineering  U G 3
    Sp, Su.
    Prereq.: Permission of instructor.

763 Circuit Theory of Solid State Devices  U G 3
    W, Sp.
    Prereq.: 628 and 769 or equiv.
COURSES OF INSTRUCTION
ELECTRICAL ENGINEERING

764 Solid State Device Laboratory U G 2
W. 1 cl., 1 3-hr. lab.
Prereq.: 667, concur. 763.
Laboratory study of solid state devices and materials. Bowers, Denison.

765 Special Advanced Laboratory U G Arr.
A.
Prereq.: Professional division standing and permission of instructor.

766 Special Advanced Laboratory U G Arr.
W.
Prereq.: Professional division standing and permission of instructor.

767 Special Advanced Laboratory U G Arr.
Sp., Su.
Prereq.: Professional division standing and permission of instructor.

768 Electron Device Physical U G 3 or 4
Theory I
A, Sp., Su. 3 or 4 cl.
Vacuum electron devices; potential distribution; device current analysis; vacuum device circuit parameters; electron and ion motion in vacuum devices; gaseous conductors.

769 Electron Device Physical U G 3 or 4
Theory II
A, W.
Prereq.: 768.
Applications of band theory of electron energy states; junction theory applications to transistors; photoconduction; thermoelectric, piezoelectric, and ferroelectric devices; dielectric and magnetic phenomena.

781 Advanced Electronic Circuits U G 3
Prereq.: 628.
Integrating and differentiating circuits; counting circuits; timing circuits; pulse circuits; wave-forming and wave-shaping circuits. W. Davis.

782 Advanced Electronic Circuits U G 2
Laboratory
Sp.
Prereq.: 628 and 667, concur. 781.
Laboratory study of integrating and differentiating circuits; counting circuits; timing circuits; pulse circuits wave-forming and wave-shaping circuits. W. Davis.

784 Radio Astronomy Instrumentation U G 3
A. 3 cl.
Prereq.: 615, 619, and 657, or Physics 612 and 713, or permission of instructor.
Theory and design of radio telescope antennas and receivers for radio astronomy and space research. Kraus, Ko.

787 Quantum Electron Devices U G 4
A. 4 cl.
Prereq.: 768, Physics 610 and Math. 669 or equive.
Electronic energy levels in quantum electron devices; application to energy transitions in crystalline and gaseous media; applications to semiconductors, masers, and lasers. Chang.

788 Microwave Electronics U G 3
W. 3 cl.
Prereq.: 619, 768.
Interaction between electromagnetic fields and electron beams: transit time effects, velocity modulation phenomena, and space charge waves; klystrons, magnetrons, and traveling wave devices. Corbett.

789 Parametric Electron Devices U G 3
W. 3 cl.
Prereq.: 619 and Physics 610 or equive.
Coupled modes of oscillation, parametric interactions in lumped circuit devices, coupled modes of propagation, parametric interactions in traveling wave devices, microwave and optical parametric devices. Hsu.

790 Introduction to Electric Power Systems U G 3
A. 3 cl.
Prereq.: 619 and 652.
System stability and related calculations of transmission line and apparatus constants. Ayres, Smith.

791 High Voltage Laboratory U G 2
W. 1 cl., 1 3-hr. lab.
Prereq.: 619 and 653.
A laboratory study of high-voltage insulation. Ayres, Smith.

792 Electric Power Networks U G 3
W. 3 cl.
Prereq.: 619 and 653.
Fault calculations, network analysis, relaying studies, and traveling wave analysis applied to electric power system problems. Ayres, Smith.

793 Power System Laboratory U G 2
Sp. 1 cl., 1 3-hr. lab.
Prereq.: 668, 752.
A laboratory study of power system engineering problems. Ayres, Smith.

794 Problems in Electric Power Systems U G 3
Sp. 3 cl.
Prereq.: 652.
Analog and digital computer applications to design and operation. Recent developments in engineering techniques to meet current changes in systems and apparatus. Ayres, Smith.

801 Advanced Theoretical Study in Electrical Engineering A.

802 Advanced Theoretical Study in Electrical Engineering W.

803 Advanced Theoretical Study in Electrical Engineering G Arr.

805 Advanced Laboratory Study of Electrical Engineering Equipment G Arr.

806 Advanced Laboratory Study of Electrical Engineering Equipment W.
ELECTRICAL ENGINEERING

841 Methods of Analysis of Electron Tubes G 3
A 3 cl.
Prereq.: 768 and 832 or permission of instructor.
Conformal transformations; space-charge effects; noise; induced currents and Ramo's Theorem; electron inertia effects. Boone.

842 Theory of Electron Guns and Electron Beams G 3
W 3 cl.
Prereq.: 768 and 832 or permission of instructor.
Electron optical principles; effect of thermal velocities; effect of space charge; electron guns; periodic focusing. Cornetet.

844 Plasma Dynamics G 3
W 3 cl.
Prereq.: 768 or 832, or equiv.
Motion of ions and electrons, ionization processes, electromagnetic phenomena in plasma, electron beams in plasma. Ko, Potere.

845 Velocity Variation Electron Tubes G 3
W 3 cl.
Prereq.: 841.
Transit time effects at high frequencies; velocity variation and theory of bunching; klystrons and related devices; harmonic generation. Boone, Cornetet.

846 Electron Interaction with Traveling Waves G 3
Sp 3 cl.
Prereq.: 845.
Theory of electron interaction with traveling waves; applications to traveling-wave tubes; klystrons, magnetrons, and linear accelerators. Davis.

847 Theory and Design of Feedback Control Systems G 3
W 3 cl.
Prereq.: 718 and 815, or permission of instructor.
Linear feedback theory, signal-flow graphs, return difference, stability studies with parameter variation, independent control of transmission and sensitivity functions, multi-variable systems, approximation methods. Weiner.

848 Synthesis of Linear Feedback Control Systems G 3
Sp 3 cl.
Prereq.: 847.
Sampled-data systems, the Z-transform, digital compensation; synthesis of systems with statistical inputs and constraints; advanced topics. Weiner.

850 Waveguides and Resonators G 3
W 3 cl.
Prereq.: 832.
General theory of waveguides, modes, discontinuities, losses, cavities, and power considerations. Feshe.

851 Radiation and Radiating Systems G 3
Sp 3 cl.
Prereq.: 832.
Radiation theory; dipole, linear, loop, helical, biconical, and aperture antennas; beam shaping, aperture distribution, self and mutual impedance, microwave optics; radio telescope, antenna temperature. Kron.

852 Propagation of Electromagnetic Waves G 3
Sp 3 cl.
Prereq.: 758 and 832.
Advanced study of transmission and reception of radio waves in the presence of the earth and its atmosphere; tropospheric, ionospheric, and scatter propagation. Letts.

A-85
853  Theory of Microwave Components  G 3
    Sp. 3 cl.
    Prereq.: 850.
    General circuit theory of one port and multi-ports; impedance and
    scattering concepts; reciprocity in microwave circuits; impedance
    transformations; directional devices; non-reciprocal devices; non-linear elements. Faake.

854  Solid State Electron Devices I  G 3
    A. 3 cl.
    Prereq.: 626, 787, concurs. 769, Math. 609, or equiv.
    Introduction to solid state electronic devices; conduction mechan-
    isms; magnetic effects; electrical properties of impurities; dynamics of single crystals at high tempera-
    tures; control of impurity distributions. Thurston.

855  Solid State Electron Devices II  G 3
    W. 3 cl.
    Basic analysis of conduction phenomena in semiconductors, carrier
    lifetimes; theory of p-n junction rectifiers, and junction
    transistors. Thurston.

856  Solid State Electron Devices III  G 3
    Sp. 3 cl.
    Prereq.: 855.
    Design theory of junction diodes, junction transistors, unipolar
    transistors, four-layer switches, variable capacitance diodes, and
    parametric amplifiers. Thurston.

857  Quantum Electron Devices  G 3
    A. 3 cl.
    Prereq.: 787, 832, Math. 733 and Physics 728, or equiv.
    Analysis of energy of atomic gases as applied to gas lasers; crystal

858  Quantum Electron Devices  G 3
    W. 3 cl.
    Prereq.: 857.
    Quantum mechanical and statistical analysis of energy levels in
    solids and of microwave and optical energy conversions in masers
    and lasers.

859  Quantum Electron Devices  G 3
    Sp. 3 cl.
    Prereq.: 858.
    Theory and design of masers and lasers; current research in
    quantum electron devices.

860  Theory and Analysis of Magnetic  G 3
    W. 3 cl.
    Prereq.: 628, 815, or equiv.
    Theory of magnetic materials. Steady state and transient analysis
    of magnetic amplifiers; suppressed and free harmonics; power
    gain, resistive, inductive and capacitive load. Weed.

861  Analysis of Magnetic Amplifiers,  G 3
    Memory Devices and Components
    Sn. 3 cl.
    Prereq.: 860 and 847, or equiv.
    The analysis of magnetic amplifiers with extrinsic and intrinsic
    feedback; a-c, d-c, or combination control; switching properties,
    and applications. Weed.

870  Advanced Antenna Design  G 3
    A, Su. 3 cl.
    Prereq.: 851.
    Repeatable to a maximum of 6 cr. hrs.
    Topics selected from such subjects as traveling wave antennas,
    excitation of surface waves, interaction of antennas with dielectric
    and metal bodies. Richmond, Walter.

881  Seminar in Electrical Engineering  G 1-3
    Prereq.: Permission of instructor.
    Repeatable.
    a. Research Topics in Electromagnetics.
    W. Keswagh.
    Sp. Thurston.
    c. Information Theory.
    d. Nonlinear Quantum Electronics.
    Sp. Hsu.
    e. Modern Control Theory.
    f. Recent Developments in Quantum Electronics.
    g. Electrodynamics of Moving Media.
    W. Konopinski.

895  Interdepartmental Seminar in Radio  G 1-5
    Astronomy
    (See under Interdepartmental Seminars.)
    Radio Astronomy Theory I
    See under Astronomy 896.
    Radio Astronomy Theory II
    See under Astronomy 897.

989  Interdepartmental Seminar  G 1-5
    (See under Interdepartmental Seminars.)

950  Research in Electrical Engineering  C Arr.
    Research for thesis or dissertation purposes only.
ENGINEERING MECHANICS

504 Technical Drawing U 4
A. 4 3-hr. cl. and lab.
Prereq.: 409 or 442.
Dimensioning applied to detail and assembly drawings with an introduction to limits and tolerances. Technical sketching of machine parts; representation and specifications of gears, piping and welding. Kearns.

506 Structural Drawing U 4
W. 4 2-hr. cl. and lab.
Prereq.: 504 or 442.
Introduction to structural drafting. Includes steel and frame structures; riveted, bolted and welded connections; terminology and erection requirements. Kearns.

508 Production Illustration U 4
Sp. 4 2-hr. cl. and lab.
Prereq.: 506 or permission of instructor.
Commercial and industrial applications of pictorial representation. Instrument drafting techniques, rendering, templates, automated drafting and reproduction methods. Baldwin.

537 Graphic Presentation U 5
A. 5 3-hr. cl. and lab.
Prereq.: 2nd yr. standing.
Representation of three-dimensional subjects by precise graphics; orthographic and pictorial; shades and shadows. Parkinson.

755 Chemical Plant Design U G 3
Sp. 2 3-hr. cl. and lab.
Sketching and preliminary layout for industrial chemical plants, including design and selection factors for equipment and process auxiliaries. Parkinson.

Engineering Mechanics

Office: 200 Boyd Laboratory, 155 West Woodruff Avenue
PROFESSORS: WEST (Chairman), FOULK, GRAHAM, LEISSA, OTT (Emeritus), and PEWELL (Emeritus); ASSOCIATE PROFESSOR TUCKER (Emeritus); ASSISTANT PROFESSORS BARNES, BUSSMAN, CHINN, CLAUSEN, FREIT, GRAFF, KORDA, MAHIG, ROBBINS, STEVENS, and WU; and INSTRUCTORS.

511 Applied Mechanics U 4
A. 3 cl., 2 1-hr. labs.
Prereq.: Math. 440.
Statics of force systems by analytical and graphical methods; centroids and moment of inertia; stresses and strains of structural members; combined stresses by Mohr's Circle; columns; deflections and statically indeterminate beams by area moments. Deming.

512 Applied Mechanics U 4
W. 3 cl., 2 1-hr. labs.
Prereq.: 511.
Continuation of 511.
513 Applied Mechanics U 4
   Sp., 3 cl., 2 1-hr. labs.
   Prereq.: 512.
   Continuation of 512.

521 Statics U 5
   A., W., Sp., Su., 3 cl.
   Prereq.: Physics 531 and/or concur. Math. 543.
   Resultants and equilibrium of coplanar and noncoplanar force
eysystems; trusses, frames, and connected bodies; friction; centroids
and moment of inertia of masses and areas. Barnes.

602 Strength of Materials U 5
   A., W., Sp., Su., 4 cl., 2 1-hr. labs.
   Prereq.: 521.
   Normal and shearing stress and strain; energy; torsion; flexural
stress; beam deflections; combined stress; theories of failure;
columns.

605 Stress Analysis I U G 3
   A., W., Sp., 3 cl.
   Prereq.: 602.
   Statically indeterminate and variable section beams by area
moments; bending of non-symmetrical section; energy of bending
and shear; beam limit design; torsion of open and closed non-
circular sections. Mahig.

606 Stress Analysis II U G 3
   A., W., Sp., 3 cl.
   Prereq.: 602.
   Not open to students with credit for 714.
   Failure theories; Mohr's circle for strain rosettes; thick cylinders;
non-circular torsion; curved beams; Castigliano's theorem. Folk.

607 Dynamics U 3
   A., W., Sp., 3 cl.
   Prereq.: 521.
   Linear and angular motion from constant and variable forces;
connected bodies; impulse; momentum; energy. Chin.

617 Dynamics U G 5
   W., Sp., 5 cl.
   Prereq.: 602 or concur. Math. 544 or 611.
   Dynamics of particles and rigid bodies; impulse, momentum, work,
energy; three dimensional vector analysis; conservative systems;
single degree of freedom vibration analysis. Chin.

650 Digital Computer Programming: Engineering Applications U 3
   Engineering Applications
   A., W., Sp., Su., 2 cl., 1 2-hr. lab.
   Prereq.: Professional division standing.
   Algebraic language programming. Processing of programs using
facilities of the Numerical Computation Laboratory. Engineering
applications. Graham, Barnes.

703 Experimental Stress Analysis U G 2
   A., W., Sp., 4 lab. hrs.
   Prereq.: 602.
   Experiments with electric strain gages, stress coat, brittle models,
and photoelastic analysis of structures; determination of fatigue
limits. Barnes.

704 Photelasticity U G 2
   W., Sp., 4 lab. hrs.
   Prereq.: 602.
   Construction of two and three dimension models and analysis of
stress distribution by photoelastic methods. Clark, Barnes.

707 Mechanical Vibrations U G 3
   A. 3 cl.
   Prereq.: 607 and Math. 544 or 611.
   Acceleration, velocity, and displacement from variable excitic
forces; free and forced vibrations; torsional vibrations; dynamic
balance; vibration and whipping of shafts. West, Chin.

712 Advanced Strength of Materials U G 3
   W. 3 cl.
   Prereq.: 602 and/or concur. Math. 609 or 689.
   Beams on elastic foundations; beam columns; deflection curves
by trigonometric series; limitations of superposition. Mahig, Wu.

715 Theory of Elastic Stability U G 3
   A. 3 cl.
   Prereq.: 605 or 606, Math. 544 or 611.
   Buckling of bars under axial and lateral loads; effect of curvature
and eccentricity; determination of critical loads by energy; cable
and beam buckling. Niedenführ, Graß.

716 Elastic Energy Theory U G 3
   A. 3 cl.
   Prereq.: 605 and one of: Civil Eng. 701, 711, Aeron-
Astro. E. 710.
   Deformations and stress in frames, beams, beams, rings, arches,
and columns; redundant beams and frames; combined direct and
torsional stresses; shear deformations. Clark, Grahame.

717 Advanced Engineering Dynamics U G 3
   W. 3 cl.
   Prereq.: 607 and Math. 544 or 611.
   Three dimensional vector statics; kinematics and kinetics of
particles and rigid bodies; energy, momentum, stability; application
of Lagrange's equations to machinery, vehicles, ballistics;
gyroscopes. West.

718 Theory of Dynamic Stability U G 3
   Sp. 3 cl.
   Prereq.: 707.
   Study of the criteria for dynamic stability. Methods of stabilizing
critical mechanical systems. Applications to space mechanics,
structures, and vehicles. Niedenführ.

725 Theory of Thin Elastic Plates U G 3
   Sp. 3 cl.
   Prereq.: 605 and Math. 544 or 611.
   Pure bending of rectangular plates; thermal stresses; equations
for small deflections for various edge conditions and shapes; large
deflections; approximate methods. Mahig.

727 Elements of Inertial Guidance and Navigation U G 3
   Sp. 3 cl.
   Prereq.: 717.
   Moment of momentum of rigid bodies; perturbing torques in the
angular equations of motion of a rigid body; gyrodynamic:
accelerometers, inertial platforms and surface and subsurface
navigation systems; control systems dynamics; a survey of modern
mathematical techniques in the study of dynamical systems. Chin.

735 Elementary Theory of Continuous Media U G 3
   Sp. 3 cl.
   Prereq.: 602, 607, Math. 544.
   Stress, deformation, and conservation laws for a general continua,
Consitutive equations. Formulation of problems of field
dynamics, plasticity and elasticity. Niedenführ.

740 Applied Elasticity I U G 3
   A. 3 cl.
   Prereq.: 605 or 606, and/or concur. Math. 609.
   Not open to students with credit for 813.
   Analysis of stress and strain, laws of elasticity; torsion; plate
stress and strain. Niedenführ, Mahig.
741 Applied Elasticity II U G 3
W. 3 cl.
Not open to students with credit for 814.
A continuation of 740.

750 Methods of Engineering Analysis U G 3
W. 3 cl.

799 Special Problems in Advanced U G 2-5
Engineering Mechanics
Prereq.: 13 cr. hrs. of 600 level in Engr. Mech. and permission of instructor.
Repeatable to a maximum of 15 cr. hrs.
The student must register for specific problems in the areas indicated below, and may register for more than one at a time.

a. Experimental Stress Analysis
b. Dynamics
c. Fluid Mechanics
e. Applied Elasticity
f. Strength of Materials
g. Vibrations
h. Elasticity
i. Plates and Shells
j. Continuous media

801 Advanced Theoretical Mechanics
G 2-5
A, W, Sp, Su.
Prereq.: 605, 607, 610, and Math. 611 or equiv. and evidence of sufficient background in area of study chosen, and permission of chairman.
Repeatable to a maximum of 15 cr. hrs.
The student must register for specific subject in the areas indicated below and may register for more than one at a time.

a. Advanced Experimental Methods
b. Advanced Dynamics
c. Hydrodynamics and Fluid Mechanics
e. Applied Elasticity
f. Strength of Materials
g. Vibrations
h. Elasticity
j. Plates and Shells
k. Continuous Media

807 Vibrations of Continuous Media G 3
W. 3 cl.
Prereq.: 707 and/or concour. Math. 609 or 636.
Equations of motions for strings, membranes, prismatical bars, and plates for various boundary conditions; approximate methods for complicated shapes; wave propagation in elastic media. Leissa.

808 Non-Linear Vibrations G 3
Sp. 3 cl.
Prereq.: 707 and Math. 607 or equiv.
Vibrations of damped and undamped systems with non-linear restoring forces; self-sustained oscillations; application of Hill's equation to stability of non-linear oscillations. West.

810 * Classical Hydrodynamics G 3
Sp. 3 cl.
Prereq.: 717, Math. 606, 622, 624 or equiv.
Basic equations and concepts of inviscid fluid flow, solutions to two and three dimensional problems; conformal transformations; approximate methods. Leissa.

817 * Analytical Dynamics G 3
Sp. 3 cl.
Prereq.: 717.
Lagrange's equations of motion for particles and rigid bodies; impulsive; small oscillations; non-holonomic and dissipative systems. Hamiltonian systems; applications to intricate engineering problems. West.

820 Theory of Plasticity G 3
W. 3 cl.
Prereq.: 813.
Plastic range stress-strain relations; elasto-plastic behavior of beams, trusses; torsion of prismatic bars; plane strain; shear lines; limit analysis. Graham, Niedenfuehr.

824 Plates and Shallow Shells G 3
A. 3 cl.
Prereq.: 725.
Advanced methods for the analysis of bending in thin, elastic plates having arbitrary shapes, loading, and boundary conditions; bending theory of shallow shells and problem solutions. Leissa.

825 Theory of Thin Elastic Shells G 3
W. 3 cl.
Prereq.: 725, 813.
Equation of deformation of an arbitrary shell; thermal effects; exact and approximate solutions; Rayleigh's bending theory; membranes; shells of variable thickness, orthotropic shells. Niedenfuehr.

827 Random Vibrations G 3
A. 3 cl.
Prereq.: 807.
Description of random processes; statistical properties of the response of mechanical systems; optimization of systems subjected to random inputs; instrumentation. West.

830 † Energy Principles in Mechanics G 3
A. 3 cl.
Prereq.: 605 or 608 or 716 and Math. 544.
Theoretical development of energy principles in mechanics; strain energy and complementary energy with related minimal principles; applications to problems in elasticity, dynamics, vibrations. Graham.

840 Advanced Elasticity I G 3
W. 3 cl.
Prereq.: 740.
Complex variable methods; anisotropic elasticity; three-dimensional elasticity; mixed boundary value problems; thermoelasticity. Leissa.

841 † Advanced Elasticity II G 3
Sp. 3 cl.
Prereq.: 840.
Continuation of 840.

845 † Non-Linear Theory of Elasticity G 5
Sp. 5 cl.
Prereq.: 741 and/or concour Math. 722.
Finite displacements; finite strain; non-linear interaction of stress states. Niedenfuehr.

850 † History of Mechanics G 3
A. 3 cl.
Prereq.: 10 cr. hrs. 700-800 level in Engr. Mech. and reading knowledge of French or German.
Evolution of concepts in engineering mechanics; impact on scientific thought; effect on engineering analysis and design; critical study of original literature. West.

A, W, Sp, Su.
Research for thesis or dissertation purposes only.
ENGLISH

406 General English for Foreign Students U 5
Review of English structure for foreign students. Proceeds from basic oral and aural patterns to their application in writing. Adams, Director.

407 Advanced English for Foreign Students U 5
Develops academic and social effectiveness in the use of advanced patterns in written and spoken English. Adams, Director.

408 Special Problems in English for Foreign Students U 3
A, W, Sp, Su.
Attention is given to the special academic problems of foreign students. Concentrated work on idiomatic structure and diction in writing reports, themes, examinations, and theses. Adams, Director.

416 Composition and Reading U 3
A, W, Sp, Su.
Not open to students with credit for 401, 402, 410, or 505.
Training in the fundamentals of expository writing, as illustrated in the student's own writing and in the essays of professional writers. Corbett, Director.

417 Composition and Reading U 3
A, W, Sp, Su.
Prereq.: 416 or 410.
Not open to students with credit for 401, 402, 411, 413, 419, or 505.
Continued training in expository writing with emphasis on the logical elements in exposition. Corbett, Director.

418 Composition and Reading U 3
A, W, Sp, Su.
Prereq.: 417 or 411.
Not open to students with credit for 401, 402, 413, 414, 430, or 505.
Continued training in expository writing, approached specifically through the study of imaginative literature. Corbett, Director.

419 Composition and Reading U 3
A. 3 cl.
Prereq.: Em credit for 416.
Not open to students with credit for 401, 402, 411, 413, 417, or 505.
Designed for proficiency students only, as a substitute for 417.
Training in expository writing, with emphasis on the logical elements in exposition. Corbett, Director.

420 Composition and Reading U 3
W. 3 cl.
Prereq.: 419 or Em credit for 417.
Not open to students with credit for 401, 402, 413, 414, 418, or 505.
Designed for proficiency students only, as a substitute for 419.
Continued training in expository writing, approached specifically through the study of imaginative literature. Corbett, Director.

GENERAL PREREQUISITES FOR COURSES NUMBERED 500
Unless otherwise indicated, the prerequisites for 500 courses are English 401 and 402, or 418 or 512, or 420.

505 Informative Writing U 5
A, W, Sp, Su.
Prereq.: 3rd yr. standing and 401, 430, 412, or 418 or the equiv.
Not open to students with credit for 506.
Intensive advanced training in the art of informative writing. Passe, Director.

506 Critical Writing U 5
A, W, Sp, Su.
Prereq.: 418 or equiv., 3rd yr. standing, English majors only.
Not open to students with credit for 505.
Intensive practice in writing various kinds of analyses of literary texts. Shapiro, Director.

507 Narrative Writing U 5
A, W.
Prereq.: Permission of instructor.
Guided practice in the writing of short fiction. Schorr, Stegner.

508 Verse Writing U 5
W.
Prereq.: Permission of instructor.
The technique of writing verse. Students will write in various forms and meters and study the works of established poets as models. Parks.

510 Masterpieces of American Literature U 5
A, W, Sp, Su.
Not open to students with credit for 511, 600, 615, 615.
A critical study of some major American writers chosen from among the following: Poe, Hawthorne, Emerson, Thoreau, Melville, Whitman, Dickinson, Twain, James, Frost, Eliot, Faulkner and Hemingway. Markels, Director.

519 Technical Writing U 3
A, W, Sp, 2 cl., 1 hr. conf.
Prereq.: 3rd yr. standing in the Bachelor of Science curricula.
Training in practical writing for industry, business, and research, with emphasis on the special requirements and techniques for the professional report. Eckle, Director.

520 Introduction to Poetry U 5
A, W, Sp, Su.
A course designed to help students to understand and appreciate poetry through intensive study of a representative group of poems. Wheeler, Director.

521 Introduction to Fiction U 5
A, W, Sp, Su.
Intensive study of a number of short stories and novels to acquaint the general student with some of the important themes and techniques of fiction. Beis, Director.
529  The English Bible  U  5
     Sp.
A study of the King James version of the Bible with respect to
literary questions, historical development, and religious concepts.
Gebel.

540  Masters of Modern Literature  U  5
     A, W, Sp, Su.
An introduction to modern poetry, drama, and fiction through
the study of five or six authors: Shaw, O'Neill, Frost, Conrad,
Eliot, Robinson, Yeats, and Foster. Utley, Director.

550  Introduction to Shakespeare  U  5
     A, W, Sp, Su.
Not open to students with credit for 555. Students majoring in
English in the College of Arts and Sciences should elect 676 instead of 550.
Intensive study of selected plays of Shakespeare designed to give
an understanding of drama as theatrical art and as an interpreta-
tion of fundamental human experience. Wilson, Director.

555  Introduction to Drama  U  5
     A, W.
Not open to students with credit for 550.
A critical analysis of selected dramatic masterpieces from Greek
antiquity to the present, designed to clarify the nature and major
achievements of western dramatic art. Graham.

563  Masterpieces of English Literature  U  5
     A, W, Sp, Su.
Not open to students with credit for 561 and 561.
Designed to lead to an appreciative understanding of some great
poetry and prose written before 1875; emphasis upon Spenser,
Chaucer, Shakespeare, Milton, and selected lyricists. Webber, Director.

564  Masterpieces of English Literature  U  5
     A, W, Sp, Su.
Not open to students with credit for 561 or 563.
A continuation of 563, but may be taken separately.
Selections of prose and poetry will be drawn from works of major
British writers from 1875 to 1900. Webber, Director.

GENERAL PREREQUISITES FOR COURSES
NUMBERED 600
Unless otherwise indicated, the prerequisites for 600 courses are
English 415 and 531 in literature, history, history of fine
arts, history or appreciation of music, anthropology or philosophy.

609  The American Renaissance in
     Literature  U  5
     A.
The readings of this course do not duplicate those of
510.
An introduction to the major American writers of the mid-
nineteenth century: Poe, Hawthorne, Melville, Emerson, Thoreau,
Whitman, Markels.

610  American Literature, 1865-1914  U  5
     W, Su.
The readings in this course do not duplicate those in
511.
Studies in fiction and poetry emphasizing such major figures as
Twain, Howells, James, Dickinson, Robinson, Crane, Dreiser,
and Willa Cather. Charvet.

614  Twentieth Century British Writers  U  5
     A, Sp.
A study of the development of British literature from the end
of the nineteenth century to the present, with emphasis on the
major poets and novelists. Bein.

615  Twentieth Century American Writers  U  5
     W, Sp.
A study of the development of American literature after World
War I, with emphasis on the major poets and novelists. Charette,
Munoz.

616  A Writer's Approach to Fiction  U  5
     W.
Prereq.: 307 or equiv. or permission of instructor
The writing and analysis of fiction. Although the emphasis is
upon student writing, there will be reading and discussion of the
works of contemporary writers, Contzen.

620  Folklore  U  5
     W.
A critical examination of some of the outstanding English and
American folk songs and international folk tales. Lectures and
class discussions will be supplemented by recordings, Nicolsen.

621  History of Literary Criticism  U  5
     A, Su.
Intensive study of the basic texts in literary criticism from Plato
to T. S. Eliot. Wheeler.

625  English Usage  U  5
     A, W, Sp, Su.
Prereq.: The general prerequisites for 600 courses as
listed above, or Jour. 505 or 602.
Usage and stylistic variety in written and spoken English, for
student interested in writing and teaching. Adema, Rabecllo.

6261  Structure of English  U  5
     W.
An investigation of the linguistic structure of modern English.
Stevens.

627  History of the English Language  U  5
     W.
Prereq.: the general prerequisites for 600 courses as
listed above, or Jour. 505 or 602.
A study of the historical development of the English language
and the internal and external influences which have determined its
characteristics. Nicolsen.

635  The Age of Wit and Satire  U  5
     Sp, Su.
The skeptical mind of the Early Enlightenment as shown in lyric
and satiric verse, essays, and drama, from Dryden to Pope,
Maurer.

636  Literature of the Eighteenth Century  U  5
     A, W.
The ideas and artistry of the Age of Reason as reflected in the
work of major figures: Swift, Pope, Fielding, Sterne, Boswell,
Johnson, Blake, Gibbon, Maresco.

640  Nineteenth Century Prose  U  5
     A.
Selections from the principal romantic and Victorian non-fictional
prose writers, read both as literary art and as documents of con-
temporary thought. Kincold.

641  Romantic Poetry  U  5
     A, Su.
English literary and intellectual romanticism as seen in the poetry
of Wordsworth, Coleridge, Byron, Shelley, and Keats, and selected
critical documents of the period. Martin.

A-91
642 Victorian Poetry U G 5
W, Sp.
Readings in the poetry of Tennyson, Browning, Arnold, Swinburne, Rossetti, Meredith, Hopkins, and Hardy, as seen against the background of Victorian ideas and literary taste. Forney, Shapiro.

643 The Writing Laboratory U G 5
Sp. 3 cl., conf.
Prereq.: Permission of instructor.
Detailed analysis in conference and class discussion of work presented by students. Six novels are discussed as types in modern writing. Varndyke.

648 Playwriting U G 5
A, B.
Prereq. or concurs.: One of the following, 676, 677, or 679.
Elementary laboratory course in playwriting. Methods of play analysis with attention to dramatic technique. An historical consideration of the major forms of drama.

653 Introduction to Chaucer U G 5
Sp.
Not open to students with credit for 753.
A close study of Troilus and Criseyde and The Canterbury Tales as introduction to the artist and his period. Ushery.

654 Introduction to Medieval Literature U G 5
A, Su.
The study of masterpieces from the Middle Ages, chosen for their values in interpreting medieval culture as well as for their independent literary worth. Enrich, Duffield.

656 The Nineteenth Century English Novel U G 5
W, Su.
Readings in a group of major novelists, such as Austen, Dickens, Thackeray, and others, with special emphasis upon social and humanitarian values. Logan.

670 Modern Drama U G 5
Sp.
An historical and critical examination of the major developments, personalities, and achievements in the drama of Europe and America since the advent of Ibsen. Graham.

671 Early Seventeenth Century Literature U G 5
Sp.
A study of the lyric modes of Jonson and Donne, the principal achievements in English literary prose, and the works of John Milton. Robbins.

674 The English Renaissance U G 5
Sp., Su.
A study of Tudor prose and poetry as they exemplify literary art and as they reflect the creative and inquiring temper of the age. Webber, Galbel.

676 Shakespeare U G 5
A critical consideration of the art, personality, and achievement of Shakespeare in the light of Renaissance and modern significance. Wilson, Galbel.

677 English Drama: Medieval and Renaissance U G 5
W.
Prereq.: 550 or 555 or equiv.
A study of English popular drama from its origins to 1642, with special emphasis upon the evolution of dramatic concepts and theatrical art. Robbins.

678 English Drama: Restoration and Eighteenth Century U G 5
Sp.
Prereq.: 550 or 555 or equiv.
A study of English drama from 1660 to 1800: Restoration heroic drama and wit comedy, eighteenth century sentimental drama, the comedy of Goldsmith and Sheridan. Wilson.

689 Literary and Cultural Heritage of the Middle East U G 5
A, 5 cl.
An introduction to Assyrian-Babylonian, Arabic, and Persian literature in their historical and cultural settings. Varndyke.

690 Senior Seminar and Tutorial U 5
Prereq.: Engl. majors in their last qtr.
Not open to students with credit for 562.
A reading course designed to unify the student's knowledge of English and American literature and to clarify his understanding of problems of interpretation and criticism. Grigsby, Director.

GENERAL PREREQUISITES FOR COURSES NUMBERED 700.
Except for 705, 706, 707, all 700 courses are designed primarily for graduate students. They are open also to seniors who have credit for ten hours of literature courses on the 600 level. Permission of the English Department Graduate Committee Chairman is necessary for registration in them.

701 Minor Problems in English U G 1-5
Prereq.: Senior standing and permission of the Department Graduate Committee.
With approval of participating faculty member and Departmental Graduate Committee, students may register for individual directed study under this number for work not normally offered in courses.

702 Principles and Methods of Linguistic Analysis U G 3
Su.
Prereq.: Permission of Director.
The study of the principal methods of the analysis of the English language.

703 Structural Analysis of English Expository Prose U G 3
A.
Prereq.: Permission of the Director.

704 Principles and Methods of Literary Analysis U G 3
A.
Prereq.: Permission of Director.
Principles and methods of the study of English poetry, drama, and prose fiction.

705 Honors Course U G 3-10
A.
Prereq.: 4th yr. standing; the record of A is at least half of his Engl. courses and an average of B in all of his courses; the permission of the professor under whose supervision the work is to be completed. Open only to candidates for distinction in Engl. who have in their junior year completed with high grades a program approved by the Committee on Honors.
A program of reading arranged for each student, with individual conferences, reports, and honors thesis. Grigsby, Director.
ENGLISH

706  Honors Course  U G  3-10  
W.  
See Prereq. for 705.

707  Honors Course  U G  3-10  
Sp.  
See Prereq. for 705.
A continuation of 706.

708  Studies in the American Renaissance  U G  5  
A.  
Prereq.: 609 or equiv.
An intensive study of several authors drawn from the following list: Cooper, Poe, Hawthorne, Melville, Emerson, Thoreau, Whitman. Chaucer.

709  Studies in American Literature, 1865-1914  U G  5  
W, Su.  
Prereq.: 610 or equiv.
An intensive study of several major authors of the period, including Twain and James. Grigsby.

710  Studies in Critical Theory  U G  5  
W, Su.  
A review of theory and practice in some of the principal forms of literary analysis. Wheeler.

715  Studies in English or American Literature  U G  5  
A, W, Sp, Su.  
Prereq.: Permission of the Chairman of the Department Graduate Committee.
Under this number, the Department occasionally offers an intensive course on some phase of English or American literature.

717  The Writing of Fiction  U G  5  
Sp.  
Prereq.: Submission of a manuscript to the instructor before enrollment. 307 and 616 are recommended.
A course for those who have already demonstrated some proficiency in the writing of fiction. Canzonieri.

727  Twentieth Century Poetry  U G  5  
A, Sp.  
Prereq.: Acquaintance with the major poets studied in 615 or 614 is assumed.
An intensive study of a representative body of modern poetry, with emphasis on several major poets of England and America. Muster, Wheeler.

728  Studies in Twentieth Century Fiction  U G  5  
W, Sp, Su.  
Prereq.: Some acquaintance with modern continental novelists is recommended.
Tendencies in modern fiction as seen in the works of such major figures as Proust, Joyce, Mann, D. H. Lawrence, Virginia Woolf, Hemingway, and Faulkner. Belo, Stagner.

735  Dryden  U G  5  
A.  
A detailed study of the poems, plays, and essays of John Dryden, as exemplifying the principles and practices of the Early Enlightenment. Wilson.

736  * Pope  U G  5  
A.  
Pope's poems considered formally and as representative documents of his age. Maresce.

737f  * Swift  U G  5  
Sp.  
An intensive critical study of Swift's work and its relation to the intellectual and political movements of the Age of Reason.

738  Studies in the Eighteenth Century  U G  5  
Sp.  
Intensive work in an important aspect of eighteenth century literature of thought. Gibson.

742  Studies in Victorian Poetry  U G  5  
A.  
The artistic values of the poetry, its place in the romantic tradition, its reflection of the contemporary intellectual and social milieu. Topic varies each year. Parks.

744  * Studies in Nineteenth Century Prose  U G  5  
A, Su.  
Selected non-fictional prose, read as examples of literary art and as documents of the age's religious, political, social, and aesthetic thought. Topic varies from year to year. Bens, Martin.

745  Studies in Romantic Poetry and Poetics  U G  5  
Sp, Su.  
Literary romanticism, as represented by one or more of the poets (Blake, Coleridge, Wordsworth, Byron, Shelley, Keats), in relation to contemporary intellectual and political movements. Topic varies from year to year. Top for 1965-66: Wordsworth. Logan.

746  * Introduction to Middle English Language and Literature  U G  5  
Sp.  
A study, with some cultural background, of important Middle English writings, in their original form. Delphi.

747f  * Studies in Early English Literature  U G  5  
Su.  
Prereq.: 751, 746, or 653 or equiv.

749  * Introduction to Old English Language and Literature  G  5  
W.  5 cl.  
The reading of Old English prose with special attention to the language and to cultural backgrounds. Uley.

750  Masters' Thesis  G  1-5  
A, W, Sp, Su.

751  * Old English Poetry  U G  5  
Sp.  
Prereq.: 749 or equiv.
A critical reading of the major Old English poems, form, content, and style. Estrich.

754f  * Beowulf  U G  5  
Sp.  
Prereq.: 751 or equiv.
A close study of the text of Beowulf and its background. Estrich.

755f  * Linguistics and English  U G  5  
W.  
An advanced approach to linguistics, language and culture, phonetics, the history and structure of English, and the teaching of English language and literature. Gunter.

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<th>Prerequisite(s)</th>
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<td>Linguistics and English</td>
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<td>757</td>
<td>Studies in Chaucer</td>
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<td>771</td>
<td>Studies in Renaissance and Early</td>
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<td>Seventeenth Century Poetry</td>
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<td>A close study of significant verse of late Sixteenth and</td>
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<td>early Seventeenth centuries. Webber.</td>
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<td>772</td>
<td>Studies in Renaissance Prose</td>
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<td>Spenser</td>
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<td>significance and its relation to foreign, classical,</td>
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<td>and native English poetic traditions. Hughey.</td>
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<td>Milton</td>
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<td>Milton, viewed against his social and literary</td>
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<td>776</td>
<td>Shakespeare</td>
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<td>scholarly study of Shakespeare. Hugely.</td>
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<td>Studies in Eighteenth Century Literature</td>
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<td>Research in the Restoration Period</td>
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<td>Individual research in Restoration literature, Dryden</td>
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<td>to Pope; oral and written reports. Maunier.</td>
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<td>838†</td>
<td>Research in the Restoration Period</td>
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<td>842</td>
<td>Studies in Nineteenth Century Literature</td>
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<td>Reading and research in the literary production of the</td>
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<td>century and its intellectual and social backgrounds.</td>
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<td>Studies in the Medieval Period</td>
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<td>Individual research in a major aspect of Old and Middle</td>
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<td>English literature; Topic for 1965-66: The Alliterative</td>
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<td>Studies in the Medieval Period</td>
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<td>854</td>
<td>Research in Chaucer</td>
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<td>Individual research in various aspects of medieval</td>
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<td>literature, with Chaucer as center. Topic for 1964-65:</td>
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<td></td>
<td>Chaucer and the Literature of Italy. Utley.</td>
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<td>855</td>
<td>Research in Chaucer</td>
<td>G 5</td>
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<td>Sp. 5 cl.</td>
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<td>A continuation of 854.</td>
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<td>865</td>
<td>Studies in American Literature and Cultural History</td>
<td>G 5</td>
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<td></td>
<td>Individual research in American literature. Markels.</td>
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<td>866</td>
<td>Studies in American Literature and Cultural History</td>
<td>G 5</td>
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<td>A, Su.</td>
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<td>Prereq.: 865.</td>
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<td>Continuation of 865. Markels, Brucoli.</td>
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<td>875†</td>
<td>Studies in the Age of Shakespeare</td>
<td>G 5</td>
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<td>Exploration of the problems, materials, and methods</td>
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<td>relevant to a scholarly study of Shakespeare's work</td>
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<td>and cultural environment, culminating in individual</td>
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<td>research, Walley.</td>
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<td>876†</td>
<td>Studies in the Age of Shakespeare</td>
<td>G 5</td>
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<td>Prereq.: 875.</td>
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<td>Continuation of 875, Walley.</td>
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<td>877†</td>
<td>The English Renaissance</td>
<td>G 5</td>
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<td>W. 5 cl.</td>
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<td>Reading and research in non-dramatic literature of the</td>
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<td>English Renaissance. Topics may vary from year to year.</td>
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<td>Hughey.</td>
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<td>878†</td>
<td>The English Renaissance</td>
<td>G 5</td>
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<td>Sp. 5 cl.</td>
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<td>A continuation of 877. Hughey.</td>
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<td>880</td>
<td>Bibliography and Method</td>
<td>G 5</td>
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<td></td>
<td>A course for the advanced graduate student in the</td>
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<td>methods and tools of literary research. Altick.</td>
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<td>881</td>
<td>Textual Criticism and Editing</td>
<td>G 5</td>
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<td>Prereq.: 889.</td>
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<td>Evaluation of literary editorial methods, past and</td>
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<td>present; training in skills requisite to the textual</td>
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<td>critic and scholarly editor; practice in textual</td>
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<td>editing. Hughey.</td>
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Entomology

Office: 101 Botany and Zoology Building, 1735 Neil Avenue. PROFESSORS SWIARTON (Chairman), IBORR, IBRIGOS, CUTCROFT (Emeritus), DAVIDSON, DELLUM (Emeritus), HOLDsworth, KNULL (Emeritus), C. R. NEISWANDER (Emeritus), R. B. NEISWANDER (Emeritus), PETERSON (Emeritus), IRINGS, IROTHENBEUHLER, ISLESMAN, STEPHEN, VENARD; ASSOCIATE PROFESSORS BRITT, DUNHAW (Emeritus), FINK, KNULE, PINOLIVIA, ISHAMBAUGH, TIEECE, TRIPLEHORN, TWARE and TWBAYER; ASSISTANT PROFESSORS BARRY, BLAIR, FOSYTHE, FREYTAG, JOHNSON, NIEMCZYK, LIASTARS, STILL, TVALENTINE, INSTRUCTORS ROSE and ASSISTANTS.

For related courses see Biology.

550 General Entomology U 5
A. W., Sp. 3 cl., 2 2-hr. lab.
Preq.: Zool. 400 or Biol. 402 or equiv.
The biology and habits of insects, the use of insects in scientific research, and the interrelations of beneficial and harmful species with man. Triplehorn, Valentine.

551 Economic Entomology U 5
A. W., Sp. 5 cl.
Preq.: Zool. 400 or Biol. 402 or equiv.
A basic course dealing with the economic aspects, analyzing and solving of common insect problems. Davidson, Holdsworth.

566 Horticultural Entomology U 3
Sp. 3 cl.
Preq.: 551.
A detailed study of insects and mites attacking horticultural crops. Davidson.

600 Insect Physiology U G 5
A. 3 cl., 2 2-hr. labs.
The general physiology of insects and other arthropods. The laboratory will stress the use of insects to demonstrate fundamental physiological processes. Fink.

608 Biology of the Honey Bee U G 3
Sp. 3 cl.
Preq.: 400 or 551, Zool. 400 or Biol. 402 and 10 additional cr. hrs. of Biol. Sc.
The behavior, social organization, morphology, physiology, reproduction, diseases and genetics of the honey bee studied from a comparative and evolutionary viewpoint. Rothenbuhler.

640 Advanced Economic Entomology U G 5
A. 3 cl., 2 2-hr. labs.
Preq: 20 cr. hrs. Biol. Sc., 551 or equiv. recommended.
The principles of insect control. Field and laboratory studies will be made of major insect control problems. Davidson.

650† Entomology for Biology Majors U G 5
Su. 3 cl., 2 2-hr. labs.
Preq.: Zool. 404 or equiv. and 10 additional cr. hrs. of Biol. Sc.
Not open to students with credit for 550.
The biology, morphology, metamorphosis and habits of insects. Methods of collecting, preserving, culturing and identifying the more important families. Staff.

651 External Morphology of Insects U G 5
A. 2 cl., 8 hrs. lab.
Preq.: 10 cr. hrs. of Zool. and 10 cr. hrs. of Entom.
A study of the comparative external morphology of insects with special emphasis on evolutionary trends and on taxonomic applications of morphology. Burror.

653 Principles of Insect Toxicology U G 5
W. 3 cl., 2 2-hr. labs.
Deals with the physicochemical properties and physiological action of insecticides, miticides, and acaricides. Methods of securing, evaluating, and presenting toxicological data are stressed. Ware.

655 Medical Entomology U G 3 or 5
Sp. 3 cl., or 3 cl. and 2 2-hr. labs.
Preq.: Zool. 404 and 10 additional cr. hrs. in Microbiol. or Entom. or Parasitol.
A consideration of the recognition characteristics, biology, and control of insects and other arthropods of importance to the health of man, livestock, and wildlife. Venard.

670 Field Entomology U G 4
Su (1st Term). 3 all day classes.
Preq.: 550 or equiv. and 15 additional cr. hrs. of Biol. Sc.
Given only at the Frasa Theodore Stone Laboratory.
This course deals primarily with collecting, identification and field methods. Field trips are made to various islands of Lake Erie and the mainland.

671 * Aquatic Entomology U G 4
Su.
Preq.: 670 or equiv. and 15 additional cr. hrs. of Biol. Sc.
*Given only at the Frasa Theodore Stone Laboratory.
A course designed for preparation in the teaching of biology or research on aquatic resources. Taxonomy and ecology of aquatic larvae are stressed.

701 Special Problems U G 2-5
A. W., Sp. Su.
Individual work in the field of the chosen problem.
A. Agriculture and biology of the honey bee. Rothenbuhler, Stephen.
C. Insects causing or transmitting diseases of animals. Holdsworth, Davidson, Venard.
D. Insects causing or transmitting diseases of plants. Briggs, Davidson, Holdsworth.
E. Insect control. Davidson, Ware, Holdsworth.
g. Insect morphology. Burror, Fink.

A-95
COURSES OF INSTRUCTION

ENTOMOLOGY

k. Insect physiology and toxicology. Fisk, Shambaugh, Ware.
i. Insect taxonomy. Borror, Davidson, Triselhorn, Valentine.
i. Laboratory technique and rearing methods. Fisk.
k. Insect behavior. Fisk, Holdsworth, Rothenbuhler.
l. Field and Experiment Station Problems. Davidson, Forsthe, Niemczyk, Policka, Rings, Shambaugh, Sloosman, Treese, Ware.
n. Insect pathology and biological control. Briggs.

705 * Systematic Entomology U G 5
W. 2 cl., 6 lab. hr.
Prereq.: 651.
A survey of all orders except Diptera, Lepidoptera, and Hymenoptera, with emphasis on the determination of insects to family and subfamily; collecting and preserving insects. Borror.

706† Systematic Entomology U G 5
W. 2 cl., 6 lab. hrs.
Prereq.: 651.
Continuation of 705, covering the Diptera, Lepidoptera, and Hymenoptera. Borror.

712 * Immature Insects U G 5
A. 1 cl., 4 2-hr. lab.
Prereq.: 705 and 706 or equiv.
A survey of immature stages of insects with emphasis on the anatomy and taxonomy of holometabolous larvae. Valentine.

801 Special Problems C 2-5
A, W, Sp, Su.
Prereq.: Permission of instructor.
Individual work in the field of the chosen problem. See topics under 701.

814 Biological Control G 5
W. 3 cl., 2 3-hr. labs.
Prereq.: Permission of instructor.

816 Research Methods: Living Insects G 5
Sp. 3 cl., 2 2-hr. labs.
Prereq.: Permission of instructor.
Deals with current field and laboratory research methods of trapping, sampling, handling, and rearing insects; conducting life history studies; and measuring environmental factors. Fisk.

817 * Internal Morphology of Insects G 5
Sp. 1 cl., 3 2-hr. labs.
Prereq.: 651.
Deals with the internal structures of insects, including anatomy, function, histology, embryology, and metamorphosis. Laboratory includes preparation of permanent microscopic slides of insect tissues. Fisk.

850 Advanced Insect Physiology G 5
W. 3 cl., 2 2-hr. labs.
Prereq.: 600 or equiv. and 20 additional cr. hrs. of Biol. Sci. including Agr. Biochem. 610 and 611 or equiv.
Topics include insect integument, water balance, excretion, digestion, nutrition, respiration, growth and metabolism. The project type laboratory provides experience in techniques of insect physiology. Fisk.

Fine Arts

Office: 146 Fine Arts Building, 138 North Oak Drive

PROFESSORS: AUSMAN (Director), FANNING (Emeritus), FREY (Emeritus), HOPKINS (Emeritus), ROBISON (Emeritus), BARKAN, BOGATAY, CHAFETZ, CSURI, R. CATRELL, KAPLAN, KING, HILLETTEFIELD, LUDDEEN, LEVERINO, SHEARMAN, and WOOD; ASSOCIATE PROFESSORS: BLACK, COPE, LECKER, FREEMAN, FRILEY, M. CATRELL, HEGWITZ, HOFF, KUMM, MELNICK, MENDEZ, MORGAN, PATTON, and ZIMMER; ASSISTANT PROFESSORS: BAGHELL, BAUMGARTNER, CLIFTON, FLANDER, FETZER, FITZPATRICK, FRANCO, WALLIS, HATCHETT, HERBER, HORSLEWN, KREUGER, MCBRINE, MITCHELL, RUBRIGHT, SMITH, TEMPLETON, WALLSCHLAGER, and WYNNE; INSTRUCTORS: CHAFEE, HORN, PETERSEN, SANDBERG, and WRENZ.

The courses in Fine Arts may be grouped as follows:
Art Education: 459, 548, 549, 569, 570, 600, 710, 714, 715, 718, 790.
Professional Design: 400, 401, 430, 433, 530, 554, 555, 556, 558, 576, 577, 582, 585, 584, 600, 660, 666, 668, 698, 699, 709, 710, 813, 814, 815, 816.
Sculpture: 461, 554, 562, 726, 729, 810, 813, 820.
703-2-3, A.C.D.E.G.P.S.
850.
400 Field Experience
A, W, Sp, Su.
Prereq.: Six weeks full-time work experience or the equate in Medical Illustration, Product Design, Space, and Enclosure Design, or Visual Communication Design. Permission of instructor.
Field experience in the various professional design fields.

401 Introduction to Fine Art Activities U 0
A, W, Sp, Su. 1 cr., 4 1-hr. lab.
Prereq.: Not open to candidates for the degrees B.F.A. and B.S. in Ed. with Fine Arts as a major, nor to students with credit for 421 or 430.
An investigation of visual form, its perception, development, and use. Holleman and Staff.

402 Drawing U 3
A. 6 hr. lab.
Prereq.: Arch. 2nd yr. standing.
Visual fundamentals as expressed through drawing. Emphasis upon configuration and visual relationships.

406 Form Organization P 3
A. Sp.; 3 2-hr. lab.
Prereq.: Dart. 1st yr. standing or Arch. 2nd yr. standing.
Drawing and sculpture, with emphasis on visual organization. Black, Bogaty, Fripp, Sherman.

407 Water Color U 3
Sp. 2 3-hr. lab.
Prereq.: 404 or 423.
Not open to majors in Fine Arts.
Painting from still life, models, and landscape. Lectures, laboratory work, and criticism.

411 Drawing from Life U 3
W. 6 lab. hrs.
Prereq.: Arch. 2nd yr. standing, and 402.
Drawing from the human figure, study of gesture and planar relationships in two and three dimensional space.

421 Drawing and Fine Arts Orientation U 5
A, Sp. 5 2-hr. lab. plus 1 cr. in A. Qtr.
Introduction to studio activity. Laboratory experience, with emphasis on drawing and design. Lectures and discussion about fields of specialization in fine arts.

423 Drawing U 5
A, W. 5 2-hr. lab.
Prereq.: 421 or permission of instructor.
The use of various drawing media with continuation of the underlying principles as utilized in 421. Laboratory and field problems.

430 Fundamentals of Art U 5
A, W, Sp, Su. 5 2-hr. lab.
Prereq.: Not open to majors in Fine Arts or to students with credit for 569.
An introduction to art through studio experience, exploring two-dimensional and three-dimensional media, analysis of form, and modes of expression.

431 Elementary Design U 5
A. 5 2-hr. lab.
Prereq.: 401 or 421.
An introductory course in design, with special attention given to the fundamentals of visual organization and the inventive use of art materials.

432 Intermediate Design U 5
W. 5 3-hr. lab.
Prereq.: 430 or 431.
Three-dimensional design with special emphasis upon the inventive use of various hand tools, materials and techniques.

433 Elements of Design III U 5
Sp. 5 3-hr. lab.
Prereq.: 432.
A continuation of 432.

459 Orientation of Art Education U 3
Sp. 3 cr.
Prereq.: 2nd yr. standing.
Historical introduction to the art education program, with attention to the orientation and professional preparation of an art teacher.

461 Sculpture U 5
A, W, Sp, Su. 5 3-hr. lab.
Prereq.: 421.
Not open to students with credit for 561.
An introduction to the principles of sculpture, emphasizing basic forming processes and materials. Black, Freeman, Wemble.

484 Introduction to Ceramic Art U 3
A, W, Sp, Su. 1 cr., 6-lab. hrs.
An introduction to pottery making. Laboratory practice in building pottery by hand, with short lectures giving a broad survey of the ceramic arts.

490 Elementary Ceramic Art U 5
An introduction to the art phases of the ceramic field. Laboratory practice in the hand forming process.

491 Ceramic Art Laboratory U 5
A, W, Sp, Su. 15 lab. hrs.
Prereq.: 484 or 490.
Introduction to more-involved forming processes such as the potter's wheel, model and mold making.

494 Introduction to Art U 3
A, W, Sp, Su. 3 cr.
Not open to juniors, seniors or students with credit for 497.
A study of meaning of visual form and imagery in architecture, sculpture, and painting. Patton and Staff.

497 Historic Styles in Art U 3
A, W, Sp, Su. 3 cr.
Not open to juniors, seniors, Fine Art majors, or students with credit for 494.
An introduction to the principal artistic styles of the Western world. Staff.

500 Painting U 5
W, Sp. 5 2-hr. lab.
Prereq.: 423, 431.
Not open to students with credit for 437.
Emphasis on the use of color, drawing, and design in the development of a personal idiom of expression. Opaque media. Laboratory and field problems.

501 History of Western Art I U 3
A, W, Sp. 3 cr.
Prereq.: 3rd yr. standing or 494 or 497.
A survey of Ancient and Early Medieval Art. Staff.
502 History of Western Art II  U 3
A, W, Sp, Su.  3 cl.
Prereq.: 3rd yr. standing or 494 or 497.
A survey from Renaissance through Renaissance Art. Staff.

503 History of Western Art III  U 3
A, W, Sp, Su.  3 cl.
Prereq.: 3rd yr. standing or 494 or 497.
A survey of Baroque and Modern Art. Staff.

505 Life Drawing  U 5
A, W, Sp, Su.  5 3-hr. lab.
Prereq.: 493.
Drawing from the human figure, using a variety of media. Discussion of drawing as related to important historical styles. Laboratory problems and field trips.

509 History of Oriental Art  U 3
A, Sp.  3 cl.

526 Introduction to Printmaking  U 5
Sp.  5 2-hr. lab.
Prereq.: 433 and 434.
The basic tools, methods, and materials of printmaking. Study and examination of original prints. Chafetz.

527 Water Color Painting  U 5
Sp, Su.  5 3-hr. lab.
Prereq.: 427 or 432, and 500.
Special emphasis on water color's unique capacities for personal expression. Problems in landscape, still life, and the figure.

528 Oil Painting  U 5
A, W, Sp, Su.  5 3-hr. lab.
Prereq.: 500.
Painting for still life, with the object of developing the color sense and acquiring directions of presentation. Problems in the organization and execution of pictures.

530 Orientation to Environmental Design and Planning  U 3
A.  3 cl.

534 Sculpture Design Materials  U 5
A, W.  5 2-hr. lab.
Prereq.: 430 or 431.
Study of three-dimensional form through the use of power and hand tools.

548 Art Education Laboratory  U 5
A, W.  5 3-hr. lab.
Prereq.: 459.
Laboratory problems with a variety of design materials, with attention to the nature of different media and their educational potential. Mitchell.

549 Art Education Laboratory  U 3
Sp.  7 lab. hrs.
Prereq.: 549.
Laboratory analysis of children's developmental characteristics in their art work in relation to the elementary school curriculum; participation in an art program for children.

554 Visual Communication Design  U 5
A.  5 2-hr. lab.
Prereq.: 550 and 558.
Not open to students with credit for 451, 452, or 550.
Development of knowledge and skills in the application of color, lettering, typography, illustration, graphic technology to diverse two and three-dimensional graphic communication problems. Wallach/Naiger, Zimmerman.

555 Visual Communication Design  U 5
W.  5 2-hr. lab.
Continuation of 554.

556 Visual Communication Design  U 5
Sp.  5 2-hr. lab.
Prereq.: 555.
Continuation of 555.

558 Lettering  U 3
A, W.  1 cl., 3 2-hr. lab.
Prereq.: 431.
The principles of lettering and its application to advertising design.

562 Intermediate Sculpture  U 5
A, W.  5 3-hr. lab.
Prereq.: 461, 565, 534.

599 Art for Elementary Teachers  U 5
A, W, Sp, Su.  5 2-hr. lab.
Laboratory experiences with two-dimensional and three-dimensional materials toward understanding the visual arts as background for teaching in the elementary schools.

570 Art for Elementary Teachers  U 3
A, W, Sp, Su.  5 2-hr. lab.
Prereq.: 430 or 599.
Problems of teaching in terms of personal knowledge about art, insight into children's art work, and understanding of elementary school curriculum. Barkan, Mitchell, Ecker.

572 Elements of Weaving  U 5
A, W, Sp.  5 2-hr. lab.
Prereq.: 431.
An introduction to the creative and functional aspects of hand-weaving. Experience in the construction, weaving, threading, and the manipulation of both standard and modern design techniques. Baughman.

573 Weaving  U 3
A, W, Sp.  3 2-hr. lab.
Prereq.: 431.
The use of weaving materials and equipment, with an emphasis on creative design of functional and decorative fabrics. Baughman.

570 Space and Enclosure Design  U 5
Sp.  1 cl., 5 2-hr. lab.
Prereq.: 507.
Not open to students with credit for 608.

577 Fundamentals of Design  U 3
A.  3 2-hr. lab.
Prereq.: 401 or 430 or permission of instructor.
The application of principles of design in the decorative arts. Study of textiles, home furnishings, and other phases of contemporary design. Baughman.
582 Product and Environmental Design U 5
A. 5 2-hr. lab.
Prereq.: 538, 558.
Basic principles and theories of three-dimensional design as applied to products and enclosures.

583 Product and Environmental Design U 5
W. 5 2-hr. lab.
Prereq.: 532.
Basic principles and theories of three-dimensional design as applied to products and enclosures.

584 Product and Environmental Design U 5
Sp. 5 2-hr. lab.
Prereq.: 533.
Basic principles and theories of three-dimensional design as applied to products and enclosures.

585 History of American Art U 3
Sp. 3 cl.
A study of architecture, painting, and sculpture in America during the eighteenth, nineteenth, and twentieth centuries. Baigell.

587 Ceramic Laboratory U 3
A, W, Sp, Su. 9 lab. hrs.
Prereq.: 484, 490.
Specific problems in the ceramic art field dealing with form, and processes such as the potter's wheel.

590 Advanced Ceramic Laboratory U 5
Sp. 15 lab. hrs.
Prereq.: 484 or 490.
Laboratory practice in designing ceramic wares, with emphasis on the use of the potter's wheel.

591* Ceramic History U 5
W. 5 cl.
A survey in the historical classification of Ceramic Art, emphasizing impulses and influences, with a comparative study of results achieved and means of achievement. Atkinson.

592 Advanced Ceramic Laboratory U 5
A. 15 lab. hrs.
Prereq.: 590 or permission of instructor.

593* Ceramic Composition U 5
A. 5 cl.

594* Ceramic Composition U 5
W. 2 cl., 4 2-hr. lab.
Prereq.: 484 or 490 and 593.
Laboratory practice in development of the aesthetic aspects of ceramic glazes and bodies; methods of presenting their fired composition and correction of faults. Littlefield.

595* Ceramic Composition U 5
Sp. 3 cl., 4 2-hr. lab.
Prereq.: 594.
Laboratory study and development of individual projects leading to creation of ceramic compositions of aesthetic merit. Further studies in texture and color. Littlefield.

600 Theory of Art Education U G 4
A. 9 hr. lab.
Prereq.: 349 and Ed. 514, 533.
Problems of art education in the public schools; observation in the public schools. Barkan, Ecker.

603 Interior Environment I U 5
A. 1 cl., 11 lab. hrs.
Prereq.: 503, 576.

604 Interior Environment II U 5
W. 1 cl., 11 lab. hrs.
Prereq.: 603.

605 Development of Interior Design I U 3
A. 3 cl.
Prereq.: 501, 502, 503 or Hist. 401, 402 or equiv.
A survey of European interiors from 1500 to 1850, followed by a study of French design from Louis XIII through the Empire period.

606 Development of Interior Design II U 3
W. 3 cl.
Prereq.: 605.
A study of the Tudor, Jacobean, Carolinian, Georgian, and Regency Periods—considering the aesthetic, political, and economic implication. Krumm.

607 Development of Interior Design III U 3
Sp. 3 cl.
Prereq.: 606.
A survey of American interiors since 1850, followed by a study of the development of interior design in the Western world since 1890. Field trips. Krumm.

608 Product Design—Models U 5
A. S 2-hr. lab.
Prereq.: 507.
Study of materials, construction techniques, and fabrication of products, Fractional scale studies and model construction. Planning and presentation of environmental products. Kitts, Wood.

609 Advanced Product Design—Mass Production U 5
W. 5 2-hr. lab.
Prereq.: 608.

610 Product Design—Furniture U 5
Sp. 5 2-hr. lab.
Prereq.: 606.
Independent research and developmental work in furniture and related environmental products. Analysis, planning, design, and prototype development up to production phase. Kitts, Wood.

625 Advanced Life Drawing U 5
A, W, Sp, Su. 5 3-hr. lab.
Prereq.: 505.
Advanced problems in drawing from life and figure composition.
626 The Art of India and Indonesia UG 5
A. 5 cl.
A cultural art history of India in terms of monuments, people, and
religious philosophies. Kaplun.

627 The Art of China UG 5
W. 5 cl.
A cultural art history of China in terms of monuments, people, and
ideals. Kaplun.

628 The Art of Japan UG 3
Sp. 3 cl.
A cultural art history of Japan in terms of monuments, people, and
beliefs. Kaplun.

629 Contemporary Art UG 5
A, Su. 5 cl.
Twentieth Century European Art. A study of the major achievements
in painting, sculpture, and architecture since 1900.

630 Advanced Water Color Painting UG 5
Sp., Su. 5 3-hr. lab.
Prereq.: 505, 527.
Painting from still life, models, and landscapes. Special problems in
organization and development of pictures.

632 Early Christian and Byzantine Art UG 3
A. 3 cl.
Not open to students with credit for 673.
The Christian art of the Mediterranean region to the eighth century
and the art of the Byzantine Empire to the fifteenth century.
Ludden.

633 Romanesque and Gothic Art UG 3
W. 3 cl.
Not open to students with credit for 673.
The art of Western Europe from the Carolingian period to the
fourteenth century. Ludden.

635 Advanced Visual Communication UG 5
A. 5 2-hr. lab.
Prereq.: 507 and 556.
Explorations coordinating graphic media, technology, and techniques in advanced two dimensional and three-dimensional graphic
problems. Research and development projects. Wallisch/Laeger,
Zimmer.

636 Advanced Visual Communication UG 5
W. 5 2-hr. lab.
Prereq.: 635.
Continuation of 635.

637 Advanced Visual Communication UG 5
Sp. 5 2-hr. lab.
Prereq.: 636.
Continuation of 636.

643 Graphic Processes UG 5
W. 5 3-hr. lab.
Prereq.: Senior standing. Graduate students must have 15 cr. hrs.
in drawing and painting.
Lithography and serigraphy explored by students as part of their
professional experience in print-making. Garell.

644 Advanced Water Color Painting UG 5
Sp. 5 3-hr. lab.
Prereq.: 527.
Further practice in the water color medium, with emphasis on the
critical capacity of the student. Laboratory problems and field
trips.

A-100

654 Renaissance Arts in Italy UG 5
A. 5 cl.
A study of architecture, sculpture, and painting in Italy during the
fifteenth and sixteenth centuries, with emphasis upon works by
major artists in Florence, Rome, and Venice. Melnikov.

660 Advanced Oil Painting UG 5
A, W, Sp., Su. 5 3-hr. lab.
Prereq.: 565, 528.
Painting in oil from still life and the costume model. Advanced
problems in composition.

661 Special Problems UG 2-5
Prereq.: Permission of instructor.
Repeatable to a maximum of 45 cr. hrs.
Advanced study for students in specialized programs. Housman
and Staff.

669 Twentieth Century American Art UG 3
W. 3 cl.
Prereq.: 503 or 585.
A study of significant developments in twentieth century American
architecture, painting, and sculpture. Basgall.

670 The Art of Ancient Egypt and the Near East UG 5
W. 5 cl.
The specialized study of the art and archaeology of the valleys of
the Nile and Tigris-Euphrates in ancient times. Rubright.

671 Ancient Greek and Roman Art UG 5
Sp. 5 cl.
The development of Greek and Roman art from Minoan to late
Roman times; the contribution of architecture to the knowledge of
Greek and Roman art. Rubright.

675 Latin American Art UG 3
W, Su. 3 cl.
A survey of the Pre-Columbian, Colonial, and Modern periods in
Hispanic America and Brazil. Basgall.

678 Nineteenth Century European Art UG 5
W, Su. 5 cl.
A study of European art from NeoClassicism through Post
Impressionism. Emphasizing the study of the works of the major
painters. Patton.

679 Primitive Art UG 3
Sp. 3 cl.
Prereq.: Two basic courses in the history of Art, or two basic courses in Anthrop., or permission of in-
structor.
The art of various ethnic groups from prehistoric times to the present. Kaplun.
684 Northern Renaissance Arts U G 5
   Sp. 5 cl.
The art of The Netherlands, France, Germany, and England from 1400 to 1600—with emphasis on Jan van Eyck, Rogier van der Weyden, Fouquet, Durer, Holbein, Bosch and Breughel. Ludden.

685‡ Museum Problems U G 3
   W.
   An introduction to professional work in museums. Kaplan.

686 Art of the Seventeenth Century in Europe U G 5
   A. 5 cl.
   Baroque Art in Italy, France, and the Lowlands—with emphasis on the major artists. Cope.

687 Comprehensive Drawing U G 5
   A. 5 3-hr. lab.
   Prereq.: 505.
   Exploration of the structure and interrelationships of visual form in drawing, painting, and sculpture. The principal historical modes of drawing will be examined.

688 Graphic Processes U G 5
   A. 5 3-hr. lab.
   Prereq.: 500. Graduate students must have 15 cr. hrs. in drawing and painting.
   Woodcuts, etchings, and engravings explored by students as means for individual expression. Chafets.

689 Greek Archaeology U G 5
   A, W. 5 cl.
   Minoa-Mycenaean civilization as revealed by archaeology. Classical Greek sites with emphasis on the arts and social, economic, religious data provided by the archaeological material. Rubright.

701 Minor Problems G 1-5
   A, Su.
   Repeatable to a maximum of 15 cr. hrs.
   Hausman and staff.
   A. History
   C. Ceramics
   D. Design
   E. Art Education
   G. Graphic Arts
   P. Painting
   S. Sculpture

702 Minor Problems G 1-5
   W.
   Prereq.: 701.
   Repeatable to a maximum of 15 cr. hrs.
   Continuation of 701.

703 Minor Problems G 1-5
   Sp.
   Prereq.: 702.
   Repeatable to a maximum of 15 cr. hrs.
   Continuation of 702.

704 Spanish Art U G 3
   W. 3 cl.
   Not open to students with credit for 673.
   A selective study of the architecture, sculpture, painting, and minor arts of Spain. Cope.

705 Perception-Art Form Seminar G 2
   W. 2 cl.
   Seminar utilizing the Ames Visual Demonstration Center as a basis for discussion of perception and aesthetic form. Sherman.

708 Italian High Baroque Art U G 3
   Sp, Su. 3 cl.
   Selected problems in the painting, sculpture, and architecture of Italy in the 17th century. Cope.

710 Art Education in the Elementary Schools G 5
   A, Su.
   Not open to students with credit for 713.
   The role of the Art Supervisor for curriculum development and instruction in the elementary school program. Barkan, Hausman.

714‡ Art Education in the Secondary Schools G 5
   A, Su (1st term).
   The role of the Arts Supervisor for curriculum development and instruction in secondary school programs. Barkan, Hausman.

715 Minor Seminar for the Practicing Art Teacher G 3-5
   A, Su.
   Curriculum problems in teaching the visual arts. Studio work in related arts; theoretical considerations. Barkan, Ecker.

718 Research Problems in Art Education G 3-5
   Sp.
   Problems of art education at the elementary, secondary, and college level. Individual student problems will be initiated in light of current educational needs. Barkan, Ecker, Hausman.

720 Research Methods G 3
   A.
   Investigation of source materials and bibliography of the fine arts. Cope.

721 Art Theory and Criticism G 3
   W.
   Investigations of theories of Art and their applications. Ludden.

722 Ceramic Design Techniques G 3-5
   A.
   Personal development in the techniques and processes of the ceramic designer with emphasis upon quality as evidenced in form, color, and decoration. Bogaty.

723 Ceramic Design Techniques G 3-5
   Sp.
   Prereq.: 722.
   Continuation of 722.

724 Painting G 3-5
   A.
   The painter's development as a creative artist, the relation of theory and practice, individual and group criticism on work in progress. Lectures and field trips. Gutrell, King, Sherman, Court.

725 Painting G 3-5
   W.
   Prereq.: 724.
   Continuation of 724.
726 Mural Painting G 3-5
Sp.
Studies in wall decoration for specific architectural setting. Presentation sketches and fullscale execution. Traditional and contemporary media.

727† Mural Painting G 3-5
Su.
Prereq.: 726.
Continuation of 726.

728 Advanced Sculpture U G 3-5
A. 9-15 lab. hrs.
Prereq.: 565, plus 10 hrs. enrollment in 661S and 663S, or 663S.
Advanced sculptural projects with the choice of a wide range of techniques and materials—casting, wood and metal construction, wood and stone carving, etc. Black, Freeman, Thompson, Wenks.

729 Advanced Sculpture U G 3-5
A, W. 9-15 lab. hrs.
Prereq.: 728.
Continuation of 728.

730 Renaissance Painting in Tuscany U G 5
A. 5 cr.
Prereq.: 654 or permission of instructor.
Painting tradition in Florence and Sienna (from Duccio and Giotto to Michelangelo and Mannerists); emphasis on how paintings of major Tuscan artists reflect cultural trends. Meknikas.

799† Art Workshop for Elementary Teachers U G 4
Su (2nd term).
Prereq.: Elem. Ed. 4th yr. standing.
Full time of student for first three weeks of second term. Not open to students with credit for 620.
Laboratory experiences with a media toward understanding the visual arts; study of children's art expression; problems of teaching the arts in the elementary school program.

801 Research Problems G 3-5
A, Su.
Repeatable to a maximum of 15 cr. hrs.
801C Ceramics
801D Design
801E Art Education
801G Graphic Art
801P Painting
801S Sculpture

Hausman and Staff.

802 Research Problems G 3-5
W.
Prereq.: 801.
Repeatable to a maximum of 15 cr. hrs.
Continuation of 801.

803 Research Problems G 3-5
Sp.
Prereq.: 802.
Repeatable to a maximum of 15 cr. hrs.
Continuation of 802.

804 Seminar in History and Criticism of Art G 2-5
A, W, Sp, Su.
Repeatable to a maximum of 15 cr. hrs.
804A Oriental Art
W.
Kaplan.
Ladden.
804C Medieval and Northern Renaissance Art W.
Ladden.
804D Modern Art A.
Ladden.
804E American Art A.
Fallon.
804F Italian Renaissance Sp.
Meknikas.

813 Problems in Ceramic Composition G 3-5
W.
Research in the development of special ceramic compositions pertinent to particular problems in ceramic design. Littlefield.

814 Problems in Ceramic Composition G 3-5
Sp.
813.
Continuation of 813.

815 Historical Materials and Processes G 3-5
W.
Original research in derivation and use of historical ceramic materials and processes with specific relation to the problems of the ceramic industrial designer or the practicing potter.

816 Historical Materials and Processes G 3-5
Sp.
Prereq.: 815.
Continuation of 815.

817 Painting G 3-5
W.
Emphasis on the principles of abstraction in pictorial organization. Attention to the relationship of subject matter and abstraction as related to contemporary and traditional approaches. Gatrell, King, Sherman.

818 Advanced Sculpture G 3-5
A.
Advanced sculpture with a wide range of choice in media. Freeman.

819 Advanced Sculpture G 3-5
W.
Prereq.: 818.
Continuation of 818.

820 Advanced Sculpture G 3-5
Sp.
Prereq.: 819.
Continuation of 819.
950  Research in Fine Arts  U  G Arr.
A, W, Sp, Su.
Research for thesis and dissertation purposes only.

Forestry

PROFESSORS HOWLETT (Chairman), TALBAN, BEATTIE, TIBBON, SCHADWICK, HOULDE, SHARTMAN, TILL, KIRKLINGER, and LAURIE (Emeritus); ASSOCIATE PROFESSORS CARDOZO, IGELSMAN, IKRITCHMAN, and KREISCH; ASSISTANT PROFESSORS DONOHUE, GCCALLANDER, and TOUSE.

408  Hardwood Dendrology  U  5
Sp.  2 cl., 1 2-hr. lab.
Prereq.: Bot. 401.
A study of the principal species of Angiosperms in the United States with emphasis on identification, range, and silvical characteristics. Touse.

409  Coniferous Dendrology  U  5
A.  3 cl., 1 2-hr. lab. One Saturday field trip.
Prereq.: Bot. 401 and 402.
A study of the principal species of Gymnosperms in the United States with emphasis on identification, range, and silvical characteristics. Touse.

410  Principles of Forestry  U  5
A.  3 cl., 2 2-hr. lab.
History of American forests, their character and occurrence; underlying fundamentals of silviculture and forest management; introduction to forest management and protection. Touse.

421  Silviculture  U  5
A.  3 cl., 2 2-hr. lab.

423  Forest Mensuration  U  5
W.  5 cl.

425  Forest Management  U  5
Sp.  5 cl.
Prereq.: 421 and 423. Lawon.

431  Wood Structure and Properties  U  5
A.  5 cl.
Prereq.: 405, 409. Touse.

432  Manufacturing Forest Products  U  5
W.  5 cl. Touse.

433  Analysis of Forest Industry Management  U  5
Sp.  5 cl.
Prereq.: 431, 432. Touse.

502  Silvics  U  5
Sp.  3 cl.
Prereq.: Bot. 401-402.
The effect of site factors on forest vegetation and action of forest cover on the site. Characteristics of individual trees and forests stands. Touse.

701  Minor Investigations  U  C  2-5
A, W, Sp, Su.
Prereq.: Permission of instructor.
Special problems in the field of pomology, vegetable gardening, horticulture, and ornamental horticulture, horticultural products of forestry.

887† Interdepartmental Seminar in Natural Resources  G  1
(See under Interdepartmental Seminars.)

898† Interdepartmental Seminar in Nutrition and Food Technology  G  1
Sp.
(See under Interdepartmental Seminars.)

950  Research in Horticulture and Forestry  C Arr.
A, W, Sp, Su.
Research for thesis and dissertation purposes only.

French
Office: 116 Derby Hall, 154 North Cool Drive.

PROFESSORS BABCOCK (Chairman),&BULATKIN, CARLTON, DAVIDSON, DEMOREST (Emeritus), HAVEN (Emeritus), and MOORE (Emeritus); ASSOCIATE PROFESSORS MEIDEN, and PMSCLEUR, ASSISTANT PROFESSORS ASTIER, and MITCHELL.

401  Elementary French  U  5
A, W, Sp, Su.  5 cl.
May not be taken concur. with Span. 401-402, Ital. 401-402. Not open to students who are not eligible to take Eng. 416. Credit in 401 will be counted toward graduation only if followed by successful completion of 402, or if taken after successful completion of the fourth regular university course in another foreign language.
Elements of French grammar, with oral and written exercises. Attention to oral training and oral practice. Elementary reading based on French geography, history, and customs.

402  Elementary French  U  5
A, W, Sp, Su.  5 cl.
Prereq.: 401.
May not be taken concur. with Span. 401-402, Ital. 401-402.

403  Intermediate French  U  5
A, W, Sp, Su.  5 cl.
Prereq.: 402.
Course conducted in French.
Review of salient points of elementary grammar, attention to French idioms. Reading of short stories, plays, and novels.

A-103
404 Intermediate French U 5
A, W, Sp, Su. 5 cl.
Prereq.: 403.
Course conducted in French.

410 Elementary French U 5
Conversation and Composition
A, W, Sp, Su. 5 cl.
Prereq.: 404.
Course conducted in French.
Intensive practice in oral and written French, based on texts and periodicals concerned with French life of today. Grammar and idiom review.

415 Elementary-Intermediate French for Selected Students W. 5 cl.
Prereq.: Grade of "A" in 401 and permission of department.
Successful completion of 415-416 fulfills language requirements and satisfies prereq. for 500 courses.

416 Elementary-Intermediate French for Selected Students Sp. 5 cl.
Prereq.: 415.
Successful completion of 415-416 fulfills language requirements and satisfies prereq. for 500 courses.
Continuation of 415.

517 Introduction to Modern French Literature U 5
A, W, Sp, Su. 5 cl.
Prereq.: 404.
Not open to students with credit for 417.
Rapid reading and discussion of French literary movements and masterpieces of the nineteenth century and their relation to modern France.

518 Review Grammar and Composition U 3
A, W, Sp. 3 cl.
Prereq.: 410.
Review of French grammar; composition on assigned topics and practice in translation.

521 Intermediate French Conversation and Composition U 3
A, Sp. 3 cl.
Prereq.: 410.
Vocabulary building, practice in speaking French, conversation and composition dealing with social and economic aspects of French life.

522 Intermediate French Conversation and Composition W. 3 cl.
Prereq.: 410.
Vocabulary building, practice in speaking French, conversation and composition dealing with intellectual and artistic aspects of French life.

529 Masterpieces of French Literature: Middle Ages and Renaissance Sp. 5 cl.
Prereq.: 517.
Bulaktin.

530 Masterpieces of French Literature: Seventeenth and Eighteenth Centuries W. 5 cl.
Prereq.: 517.

532 Elementary French Pronunciation U 5
A, W, Sp. 5 cl.
Prereq.: 410.
Not open to students with credit for 532.
Formation of French sounds, rules of pronunciation and diction; lectures and practical exercises; use of phonetic symbols.

535 * La civilisation française des origines à nos jours U 5
A. 5 cl.
Prereq.: 518 or 521 or 532.
Course conducted in French.
Major developments of French culture down to 1900. Carlist.

570 French Classics in Translation W. 3 cl.
Not open to juniors, seniors, or French majors.
Reading, analysis and discussion of major French works in translation, beginning with the Song of Roland and continuing with authors such as Montaigne, Pascal, Molière, Voltaire, Rousseau, and Mitchell.

571 Reading of French (Basic) G 0
A, W, Sp, Su. 5 cl.
Prereq.: Graduate standing.
Repeatable.
Designed primarily for students who have no formal preparation in French, covering basic grammar and vocabulary.

572 Reading of French (Intermediate) G 0
A, W, Sp, Su. 3 cl.
Prereq.: Grade of C or above in 571, or equivalent preparation demonstrated by a placement test.
Repeatable twice.
Satisfactory completion of this course (grade of A or B) will be accepted as evidence of a dictionary reading knowledge in fulfillment of Ph.D. language requirement.

573 Reading of French (Advanced) G 0
A, W, Sp. 3 cl.
Prereq.: Grade of A or B in 572, or equivalent preparation demonstrated by a placement test.
Repeatable twice.
Satisfactory completion of this course (grade of A or B) will be accepted as evidence of a thorough reading knowledge in fulfillment of Ph.D. language requirement.

6031* The Romantic Period in French Literature, 1800-1850 U G 5
W. 5 cl.
Prereq.: 517 and either 529 or 530.
The development of romanticism and rise of realism in the first half of the nineteenth century in the novel, poetry, and drama. Carlist.

604 * French Literary Currents 1850-1914 U G 5
W. 5 cl.
Prereq.: 517 and either 529 or 530.
Realism, naturalism, symbolism, and the movements of reaction in the novel and in literary criticism. Carlist.

616* French Literature of the Renaissance U G 5
A. 5 cl.
Prereq.: 517 and either 529 or 530.
Selections from Marot, Babelais, the Fille de Raphael and Montaigne as they reflect the age of humanism and illustrate the transition from medieval to modern forms and ideas.

617 * French Classicism, 1600-1715 U G 5
A. 5 cl.
Prereq.: 517 and either 529 or 530.
The formation of the classic spirit. The perfection of dramatic form and the seventeenth century portrait of man. Davidson.
618* French Literature of the Enlightenment
   U G 5
   A. 3 cl.
   Prereq.: 517 and either 529 or 530.
   A study of the ideas of the eighteenth century in their relation to modern times. Special emphasis on Montesquieu, Voltaire, Diderot, and Rousseau. Davidson.

619 French Translating
   U G 3
   W. 3 cl.
   Prereq.: 628 or equiv.
   Translations from French to English and from English to French. Astier.

628 Modern French Syntax
   U G 5
   A, W, Sp. 5 cl.
   Prereq.: 518.
   Systematic review of French grammar with composition and other exercises, based on contemporary authors. Modern tendencies in syntactic analysis. Meiden.

634* Contemporary French Drama
   U G 3
   Sp. 3 cl.
   Prereq.: 517 and either 529 or 530.
   Plays of Lorrain, Racine, Molière, Giraudoux, Cocteau, Mounier, Anouilh, Sartre, Camus and Ionesco. The different theatres and directors from Copeau to the present day. Astier.

636* La civilisation française contemporaine
   U G 3
   A.
   Prereq.: 518 and 521 or 532.
   Course conducted in French.
   Life, institutions, and culture of contemporary France. Carlut.

638 Advanced Spoken and Written French
   U G 3
   Sp. Su. 3 cl.
   Prereq.: 521, 529 and 629 or equiv.
   Intensive practice in speaking and writing French. Based on contemporary usage.

639* Explication de textes
   U G 3
   Sp. Su. 3 cl.
   Prereq.: 517 and either 529 or 530.
   Repeatability to a maximum of 6 cr. hrs.
   Intensive linguistic and literary exploration of representative passages from modern French authors. Davidson.

640* Contemporary French Literature
   U G 5
   Sn. 5 cl.
   Prereq.: 517 and either 529 or 530.
   Twentieth century literary currents, and their significance, with special attention given to the novels of Proust, Gide, Malraux, Mauriac, Bernanos, Saint-Exupéry, Camus, Sartre and others. Astier.

642 Advanced French Pronunciation
   U G 3
   Sp. 2 cl., 1 lab. hr.
   Prereq.: 522 or permission of instructor.
   Training in auditory and oral aspects of French pronunciation. Special emphasis on analysis of different types of spoken French.

645* French Literature
   U G 3-5
   Sp. Su. 5 cl.
   Prereq.: 517 and either 529 or 530.
   Repeatability to a maximum of 15 cr. hrs.

651* Modern French Poetry
   U G 3
   A. 3 cl.
   Prereq.: 517 and 529 or 530.
   Source and processes of poetic creations as exemplified in selected works of French poets from Baudelaire to the present time. Astier.

701 Minor Problems in French
   U G 1-5
   Prereq.: Permission of instructor.

705 Honors Course in French
   U 3-10
   A.
   Prereq.: 4th yr. standing, with a grade of A in at least half of the French course and an average of B in the remainder, and permission of the department.
   Offers undergraduates with special aptitudes a greater opportunity to do independent study than is possible in the ordinary course. Work in conference, library, or poetics laboratory.

706 Honors Courses in French
   U 3-10
   W.
   Continuation of 705.

707 Honors Courses in French
   U 3-10
   Sp.
   Continuation of 706.

717* Topics and Problems in 17th Century French Literature
   W. 3 cl.
   Prereq.: 617 or permission of instructor.
   Intensive exploration of a special topic or problem, with readings in literary works and in relevant criticism and scholarship. Davidson.

718* Topics and Problems in 18th Century French Literature
   W. 3 cl.
   Prereq.: 618 or permission of instructor.
   Intensive exploration of a special topic or problem, with readings in literary works and in relevant criticism and scholarship. Davidson.

719* Topics and Problems in 19th Century French Literature
   Sp. 3 cl.
   Prereq.: 603 or 604 or permission of instructor.
   Intensive exploration of a special topic or problem, with readings in literary works and in relevant criticism and scholarship. Carlut.

720* Topics and Problems in 20th Century French Literature
   A. 3 cl.
   Prereq.: 640 or equiv.
   Intensive study of a specific topic or problem, with readings of selected literary and critical works. Astier.
COURSES OF INSTRUCTION

FRENCH

729 History of the French Language: G 3
Introduction
A. 3 cl.
Prereq.: M.A. Candidates in French; others by permission of instructor.
Basic concepts of historical linguistics; major factors of change in the history of the French language from Roman times to the present. Bulletin.

731 Introduction to Methods in the History G 5
and Criticism of Literature
A. 4 or 5 cl.
Selected readings in basic literary history, criticism and theory, with practice in the use of standard bibliographical aids to scholarship. Davidson.

801 History of the French Language: G 3
Phonology
W. 3 cl.
Prereq.: Knowledge of Latin.
The evolution of sounds from Latin to Modern French.

802 History of the French Language: G 5
Morphology
Sp. 5 cl.
Prereq.: 801.

803 Old Provençal G 3
W. 3 cl.
Prereq.: 802 or Span. 500.

804 Old Provençal G 3
Sp. 3 cl.
Prereq.: 803.
Troubadour lyric in the thirteenth century. Increased attention to non-lyric genres, and to prose. Continuation of linguistics, with greater emphasis on semantic problems. Bulletin.

805 Middle French Literature G 3
W. 3 cl.
Prereq.: 813.

811 Seminar in French Literature G 2-5
A. (1-3 cr. hrs.), Su. (1-3 cr. hrs.)
Prereq.: Permission of instructor.
Carlat.

812 Seminar in French Literature G 2-5
W. (1-3 cr. hrs.), Su. (1-3 cr. hrs.)
Prereq.: Permission of instructor.

813 Old French Literature G 3
A. 3 cl.

817 Seminar in French Literature G 3-5
Sp.
Prereq.: Permission of instructor.
Davidson.

880 Bibliography and Method G 3
Sp. 3 cl.
A course to acquaint graduate students with tools, problems, and methods of linguistic and literary research. Davidson.

950 Research in French Language or G Arr.
Literature
A. V, Sp, Su.
Research for thesis and dissertation purposes only.

Geodetic Science

Office: 256 Graduate School, 164 West 19th Avenue
Professors: Jouilla, Chairmen; Heiskanen (Emeritus) and Laflavia, Associate Professor I. Mueller; Assistant Professors: Ighosh and J. Rap.

GENERAL PREREQUISITES FOR ALL 500 AND 600 COURSES
Prerequisites for all 500 and 600 courses include Mathematics 539 or 543, Physics 413 and 415 or 532 and 533 and Civil Engineering 502. Civil Engineering 502 may be waived for students who can demonstrate through previous experience a comprehensive understanding of the topics in this course.

511 Geodesy I U 3
W. 2 cl., 1 3-hr. lab.
Not open to students with credit for 549 or 611.
The principles, purposes, and methods of geodesy. Geodetic instruments and observations.

521 Photogrammetry I U 3
A. 2 cl., 1 3-hr. lab.
Not open to students with credit for 545 or 631.

612 Geodesy II U G 3
Sp. 2 cl., 1 3-hr. lab.
Prereq.: 511 or 540 or 611.
Not open to students with credit for 640.
Techniques and formulas for horizontal survey on the sphere. Methods of horizontal and vertical survey.

617 Geodetic Astronomy U G 4
Sp. 3 cl., 1 3-hr. lab.
Prereq.: 511 or 510 or 611, Astron. 611.
The determination of time, latitude, longitude, and azimuth from astronomical observations. Application of eclipses and occultations in Geodesy.

652 Photogrammetry II U G 3
W. 2 cl., 1 3-hr. lab.
Prereq.: 511 or 540 or 611, 521 or 545 or 631; concur. 659.
Not open to students with credit for 645.
Radial triangulation, Rectification, Map compilation, Single oblique photogrammetry, Terrestrial photogrammetry. Introduction to second order stereoscopic instruments.

A-106
GEODETIC SCIENCE

623 Photogrammetry III U G 3
Sp. 2 cl., 1 3-hr. lab.
Prereq.: 622 or 645.
Not open to students with credit for 745.

625 Photo Interpretation U G 3
W. 2 cl., 1 3-hr. lab.
Prereq.: 521 or 645 or 621, Geol. 401 or 435, 451.
Not open to students with credit for 655.
The use of air photographs for material surveys, route and site locations, soil mapping, geologic mapping, urban planning and special studies.

631 Map Projections U G 3
A. 3 cl.
Not open to students with credit for Geog. 612.
The description of the various map projections used for major map series.

653 Adjustment Computations I U G 4
W. 3 cl., 1 3-hr. lab.
Prereq.: 611 or concur. 611.
Not open to students with credit for 600.
The principles of the theory of errors and of adjustment computations.

654 Adjustment Computations II U G 3
Sp. 2 cl., 1 3-hr. lab.
Prereq.: 653 or 600 or 612, concur. 612.
Not open to students with credit for 760.
Matrices in adjustment computations; adjustment of observed data with method of variation of parameters and of correlates; standard error of unknowns and functions.

656 Field Work in Geodesy U G 5
Su (1st term). 4 cl., 5 4-hr. lab.
Prereq.: 612 or 640.
Not open to students with credit for 602a.

657 Field Work in Geodetic Astronomy U G 5
Su (2nd term). 4 cl., 5 4-hr. lab.
Prereq.: 612 or 640.
Not open to students with credit for 603a.

658 Field Work in Photogrammetry U G 5
Su (2nd term). 4 cl., 5 4-hr. lab.
Prereq.: 612 or 640.
Not open to students with credit for 603b.

659 Field Work in Distance Measurements U G 5
Su (1st term). 4 cl., 5 4-hr. lab.
Prereq.: 758.

PREREQUISITES FOR ALL 700 COURSES
Prerequisites for all courses in this group include Geodetic Science 622 or 645, 654 or 760, or permission of instructor, and at least five hours of Mathematics courses beyond Mathematics 543.

711 Geodesy III U G 3
A. 2 cl., 1 3-hr. lab.
Not open to students with credit for 740.
Computations concerned with the reference ellipsoid, including various latitudes, the geodesic curve, normal sections, the direct and inverse problem.

721 Aerial and Terrestrial Photography U G 3
W. 2 cl., 1 3-hr. lab.
Prereq.: 623 or 745.
Not open to students with credit for 757.
Design, calibration, and testing of photogrammetric cameras. Physical characteristics, processing, and quality control of photography. Photogrammetric aircraft and auxiliary devices.

723 Stereophotogrammetry I U G 4
A. 3 cl. 1 3-hr. lab.
Prereq.: 623 or 745 or permission of instructor.
Not open to students with credit for 864.
Design and operation of first-order instruments; laboratory problems utilizing the Wild Autograph A-7.

725 Photogrammetry in Practice U G 3
A. 2 cl., 1 3-hr. lab.
Prereq.: 623 or 745.
Not open to students with credit for 756.
Organization and execution of photogrammetric projects. Consideration of accuracy and economy.

751 Physical Geodesy U G 4
W. 3 cl., 1 3-hr. lab.
Prereq.: Geol. 735 and Geol. Sc. 711.
Not open to students with credit for 600.
Basic potential theory and the principles of applying gravimetry in Geodesy.

753 Advanced Adjustment Computations U G 3
A. 2 cl., 1 3-hr. lab.
Not open to students with credit for 860.
Combination of observation equations and condition equations; quasinormals; error ellipsoids.

758 Electronic Surveying I U G 3
W. 3 cl.
Prereq.: 711 or 740.
Not open to students with credit for 742.

759 Electronic Surveying II U G 3
Sp. 2 cl., 1 3-hr. lab.
Prereq.: 742 or 758.
Not open to students with credit for 743.
Special problems, soil conductivity, curvature of ray path, propagation velocity of electromagnetic waves, maximum range. Reduction of spatial data onto the ellipsoid. Applications.

Prereq.: Permission of instructor.
Repeatable.
Assigned reading, laboratory, or field work, under the guidance of a staff member, arranged to meet the requirements of individual students.

795 Seminar in Geodetic Science U G 1-3
A, W, Sp, Su.
Prereq.: Permission of instructor.
Repeatable.

A-107
GENERAL PREREQUISITES FOR COURSES
NUMBERED 800 AND 900
Geodetic Science 711 or 740 must be taken prior to or concurrent with any course numbered 800 or 900.

811 Advanced Geometric Geodesy
G 3
Sp. 3 cl., 1 3-hr. lab.
Not open to students with credit for 861.
Determination of the size and shape of the earth; effect of changes in size, shape and orientation of the reference ellipsoid; computation of super-long distances; spatial triangulation.

823 Stereophotogrammetry II
W. 3 cl., 1 3-hr. lab.
Prereq.: 723 or 864.
Not open to students with credit for 865.
Theory of errors in photogrammetry; laboratory problems utilizing the WMD Autograph A-7.

824 Aerial Triangulation
G 3
Sp. 2 cl., 1 3-hr. lab.
Prereq.: 823 or 865.
Not open to students with credit for 866.
Aerial triangulation with first-order instruments. Aeropolygon, aeroleveling, block triangulation. Advanced methods of radial triangulation.

825 Analytical Photogrammetry
G 4
Sp. 3 cl., 1 3-hr. lab.
Prereq.: 623 or 745.
Not open to students with credit for 877.

831 Advanced Map Projections
W. 3 cl., 1 3-hr. lab.
Prereq.: 631 or Geo. 612.
Use of complex variables in map projections; projection from an ellipsoidal; revolution; projection to projection transformations; state plane coordinate systems.

851 Advanced Physical Geodesy
Sp. 3 cl., 1 3-hr. lab.
Prereq.: 751, 752 or 842.
Not open to students with credit for 843.
Applications of gravimetry in geodesy; modern theories in physical geodesy; analysis of the gravity field of the earth; description of gravity field at high elevations.

855 Satellite Geodesy
A. 3 cl., 1 3-hr. lab.
Prereq.: 617.
Not open to students with credit for 862.
Geometric and dynamic applications of artificial satellites.

950 Research in Geodetic Science
G. Arr.
A, W, Sp, Su
Research for thesis and dissertation purposes only.

Geography
Office: 136 Hagerty Hall, 1775 South College Road.
PROFESSORS TAAFFE (Chairman), BASELIE, HOFFMAN, ZWUNKER, and TRANDALL; ASSISTANT PROFESSORS BROWN, KINN, IPATEN, and SEAWALL; ASSISTANT PROFESSORS COX, DEMKO, GAUTHIER, LENTNEK, SHECK, and VAN DOREN.

401 Introduction to Geography
U 5
A, W, Sp, Su. 5 cl.
The elements of the natural environment, their characteristics, distribution, and significance in the human habitat.

403 Economic Geography
U 5
A, W, Sp, Su. 5 cl.
Prereq.: 401.
Not open to students with credit for 503 or 504.
Economy of the world's principal commodities; a survey of the economic activities of the major political areas in relation to their geographic conditions.

503 Fundamentals of Economic Geography
U 3
A, W, Sp. 3 cl.
Prereq.: 3rd yr. standing.
Not open to students with credit for 403 or 504.
Elements of the human habitat with particular emphasis on world resources. Geographical and economic factors in the development of the major industrial areas of the world.

504 World Regional Geography
U 5
A, W, Sp, Su. 5 cl.
Not open to students with credit for 403 or 503.
A comparative study of representative regions of the world. An examination of the cultural, social, economic, and political developments in relation to the geographical conditions.

505 Geography of the United States and Canada
U 3
A, W, Sp, Su. 5 cl.
Prereq.: 4th yr. standing in a Social Science or 401, 403.
A geographical analysis of the United States and Canada; the correlation of their natural resources and other environmental factors with their economic and cultural development.

510 An Introduction to Cartography
U 3
A, W. 3 cl.
Cartographic techniques, map compilation, scales, generalization, symbolization, grid systems, reproduction, and map-making instruments and equipment.

603 Localization of Manufacturing Industries
UG 3
A. 3 cl.
Prereq.: 4th or 5th yr. standing in Engineering or 401, 403, or Econ. 401-402, or 501-502.
The changing character and concentration of industrial districts. Representative industries in relation to labor supply, sources of raw material and power, transportation, and markets.

604 Conservation of Natural Resources
UG 3
A. 3 cl.
Prereq.: 401, 403, or 15 cr. hrs. of allied subjects.
Economic and geographic appraisal of resource conservation in the United States. Regional and national planning for resource utilization.
505 Geography of Ohio U G 3 Sp. 3 cl.
Prereq.: 401, 403, or 15 cr. hrs. of allied subjects.
An appraisal of geographic factors in the development of Ohio's natural resources, agriculture, manufacturing, and commerce. Historical development of the major economies.

511 Cartography and Map Interpretation U G 3 W. 3 cl.
Prereq.: 401, 403, or 10 cr. hrs. of allied subjects.
Map projections and their uses for particular maps and the map series published by the United States government, by foreign countries, and by private map-producing organizations.

615 Climatology U G 4 A, W. 4 cl.
Prereq.: 15 cr. hrs. of natural or social science, including one of the following: 401, Physics 420, Bot. 402, or Agron. 501.
The elements and the controls of climate. Types of climate and their distribution. Climates and their effects on the economic and other activities of man.

620 Geography of Eastern Europe U G 3 Sp. 3 cl.
Prereq.: 4th yr. or grad. standing in a Social Science, or 401, 405.
Resources, their assessment, and development, and related problems in Eastern Europe. The geographic significance of each state to the Communist bloc and to the West.

621 Geography of Western Europe U G 3 W. 3 cl.
Prereq.: 4th yr. or grad. standing in a Social Science or 401, 403.
Geographic factors in the economic, social, and political progress of the nations of Western Europe. Major problems of the area in the light of their geographic background.

622 Geography of the Soviet Union U G 3 W, Sp. 3 cl.
Prereq.: 4th yr. or grad. standing in a Social Science or 401, 402.
The major regional divisions of the Soviet Union. The resource base in relation to the economic and political aims of the Soviet State.

624 Geography of Latin America U G 3 A, W. 3 cl.
Prereq.: 4th yr. or grad. standing in a Social Science or 401, 403.
Geographic analysis of Middle and South America emphasizing the interrelationships of the resource base, cultural characteristics, and outside influences upon economic development.
A. A. Middle America
B. W. South America

625 Geography of the Far East U G 3 Sp. 3 cl.
Prereq.: 4th yr. or grad. standing in a Social Science or 401, 403.
The geographic divisions of southern, southeastern, and eastern Asia. The major activities of the people in the regions of densest population and greatest economic importance.

626 Geography of the Middle East U G 3 W. 3 cl.
Prereq.: 4th yr. or grad. standing in a Social Science or 401, 403.
The Middle East and its natural regions in relation to local and international problems. Physical and cultural patterns in relation to the current economies.

627 Geography of Africa U G 3 W. 3 cl.
Prereq.: 4th yr. or grad. standing in a Social Science or 401, 403.

630 Geography of Transportation U G 3 W. 3 cl.
Prereq.: 401, 403, or 504, or 15 cr. hrs. of allied subjects.
A geographical analysis of the nature and distribution of rail, water, highway, pipeline, and air transport facilities and their importance in regional development.

631 The Historical Geography of Commerce U G 3 A. 3 cl.
Prereq.: 401, 403, or Hist. 401-402.
Geographic factors in commerce to 1800. Resources and production in the ancient and medieval world. Trade routes and the exchange of goods and ideas.

633 The Geography of Modern Commerce U G 3 A, W. 3 cl.
Pre req.: 4th yr. standing in Econ. or Pol. Sci. or 401, 402.
Basic factors in foreign and domestic commerce. Raw materials and other important commodities in international trade. The development of major trade areas and trade routes.

634 Urban Geography U G 3 A, W, Sp. 3 cl.
Pre req.: 4th yr. standing and 401, 403.
Origin and growth of cities. Structure and function of urban centers, their areal expansion, and intertrade center relations, each examined in relation to city planning.

Natural Resources Problems, Programs, and Policies.
(See Agricultural Economics 997.)

700 Field Work in Geography U G 4 Sp. 2 cl. Sat. lab.
Pre req.: 12 cr. hrs. in Geog.
The practice of field observation and geographic mapping.

Pre req.: 18 cr. hrs. in Geog.
Repeatable with permission of instructor.
Individual study of a special problem or of a particular region.
702 Individual Studies in Cartography U G 3-5
Prereq.: 15 cr. hrs. in Geog. or closely allied fields and permission of instructor.
Individual study of cartographic subjects: map compilation, map design, color separation, map reliability, analysis of source materials, toponomy, graphical symbolism, photogeographic drawing, etc.

National Security Policy Studies
(See National Security Policy Studies 702, 703, 801.)

712 Political Geography U G 3
W, Sp. 3 cl.
Prereq.: 401, 403, or Pol. Sci. 613, or 10 cr. hrs. in Hist.
The geographical characteristics of nation states. The geographic factors in the evolution, structure, and function of states. The relation of geopolitics to political geography.

798 Group Studies in Geography U G 3
Prereq.: 18 cr. hrs. in Geog. and permission of instructor.
Repeatable by seniors to a maximum of 6 cr. hrs. by grad. students to a maximum of 12 cr. hrs.
Group study of special topics in various fields of Geog.

802 Application of Quantitative Methods in Geography G 4
A, W. 2 cl. 2 lab.
Prereq.: Course in introductory statistics and permission of instructor.
Application of quantitative methods to geographic problems. Spatial statistics, area sampling, maps of residuals, regionalization methods, simulations maps.

To be taken in sequence:
A. Applications I
B. Applications II

803 Seminars in Economic Geography G 3-5
Prereq.: Permission of instructor.
Readings and research in specific aspects of economic geography.
A. Location Theory
B. Transportation Theory
C. Resource Analysis
D. Special Topics

804 Seminars in Regional Geography G 3-5
Prereq.: Permission of instructor.
Geographical investigation of a selected area. The region under study will be announced.

805 Seminars in Political and Historical Geography G 3-5
Prereq.: Permission of instructor.
Readings and research in political and historical geography.

806 Seminars in Urban Geography G 3-5
A, W, Sp., Su. 3 cl.
Prereq.: Permission of instructor.
The development of theory in urban geography and its application to selected problems.
A. Theory of Urban Geography
B. Problems in Urban Geography

807 Seminars in Physical Geography G 3-5
Prereq.: Permission of instructor.
A. Problems in Climatology
B. Problems in Soils Geography
C. Special Problems

811 Development of Geographic Thought G 4
Sp. 3 cl.
Prereq.: Permission of Instructor.
The evolution of concepts concerning the nature, scope, and methodology of geography; present focus and trends as reflected in current literature.

812 Cartography and Map Intelligence G 3-5
Sp.
Prereq.: 30 cr. hrs. in Geog. and closely allied fields.
Readings and research in cartography, graphics, and map intelligence.

850 Seminars in Geography G 3-5
Topics to be announced each quarter.

896 Interdepartmental Seminar in Polar and Alpine Studies Sp.
(See under Interdepartmental Seminars.)

897 Interdepartmental Seminar in Natural Resources G 1
(See under Interdepartmental Seminars.)

950 Research in Geography G Arr.
Research for thesis and dissertation purposes only.

Geology
Office: 107 Mendenhall Laboratory, 125 South Oval Drive.
Professors: THOMAS (Chairman), HALL, MEIER, LAMBERT (Emeritus), P.H. ROBERTO, J. MOORE, J. PINCUS, K. WRIGHT, PETTERSSON, and STEWART (Emeritus); ASSOCIATE PROFESSORS N. SWEET, I. WEISS, and J. WITHE; ASSISTANT PROFESSORS J. LEHR, J. MARPLE (Emeritus), M. ISHRAK, S. GLYNN, and J. STEPHENS, and J. SUMMERS.

In 1966-67, several courses will be given under the geology section. For a full list of offerings, please consult the catalog.

416 Introduction to Geology U 5
A. W, Sp. 4 cl., 1-hr. lab., 1 half-day field trip.
Prereq.: Permission of Math. 459.
Not open to students with credit for 401 or 451.
The materials of the earth's crust, the processes that produce and modify them, and the development of the earth and its life forms through time. See and Staff.

417 Physical Geology U 5
A, W, Sp. 4 cl., 1-2-hr. lab., 1 half-day field trip.
Prereq.: 416.
Not open to students with credit for 401 or 451.
Minerals and rocks and their origin; land forms and how they are produced; structural features of the earth's crust.
418 Historical Geology U 5
A. W. Sp. 4 cl., 1 2-hr. lab., 1 half-day field trip.
Prereq.: 419 or 421 or 461.
Not open to students with credit for 402.
The history of the earth and its inhabitants through geologic time.

505 Study of Geologic Maps U 5
A. Sp. 5 2-hr. lab.
Prereq.: 417, 418.
Geologic structures as interpreted from geologic maps and aerial photographs. Summerson.

520 Invertebrate Paleontology U 5
A. Sp. 5 cl.
Prereq.: 418.
A systematic survey of groups of the invertebrate animals significant in the geologic record. La Rocque, Sweet.

524 The Common Minerals and Rocks U 3
W. 3 2-hr. labs.
Prereq.: 417 and Chem. 411.
Not open to Geol. majors or students with credit for 526.
A study of the common minerals and rocks, their associations, occurrences, identifying properties, and origin. Moore.

525 The Common Rocks U 3
Sp. 3 2-hr. lab.
Prereq.: 401 or 451 or 416 and Mineral. 511, 512.
Not open to students with credit for 524.
A study of the common rocks, their associations and occurrences, and elementary concepts regarding origin. Moore.

533 Geology of Water Resources U 3
W. 3 cl., 1 half-day field trip.
Prereq.: 401 or 451 or 416.
Not open to students with credit for 533.
A study of the geology and hydrology of surface and subsurface waters, with application to conservation programs. Lehr.

600 The Common Mineral Deposits U 3
A. 3 2-hr. lab.
Prereq.: 525.
Not open to students with credit for 526.
A study of the components of the common mineral deposits, their associations and relations; elementary concepts regarding origin of mineral deposits. Fawcett.

601 Geomorphology U G 5
A. 4 cl., 1 2-hr. lab., field trips.
Prereq.: 417 or permission of instructor.
Detailed study of processes which shape the land surface and the forms produced. These are inspected on topographic maps and aerial photographs and in the area near Columbus, White.

602 Structural Geology U G 5
W. 4 cl., 2 2-hr. lab.
Prereq.: 505 and Math. 459.
Not open for graduate credit to Geol. majors.

605 Economic Geology: Metals U G 5
W. 5 cl.
Prereq.: 526 or 680.
A study of the characteristics and origin of metallic mineral deposits. Shultz.

607 Economic Geology: Petroleum U G 5
Sp. 3 cl., 2 2-hr. lab.
Prereq.: Senior standing in Petr. E. or 602, 618, and 619.
A study of the principles of petroleum geology. Bates.

613 Glacial Geology U G 5
Sp. 5 cl., field trips.
Prereq.: 601.
The features produced by glaciers, present or past, with special references to features produced in Ohio. Goldthwait.

618 Paleozoic Stratigraphy U G 3
W. 3 cl.
Prereq.: 520.
Not open for graduate credit to Geol. majors.
The principles of stratigraphy and related historical geology, developed by study of selected American and European Paleozoic examples. White.

619 Mesozoic and Cenozoic Stratigraphy U G 3
S. 3 cl.
Prereq.: 520.
Not open for graduate credit to Geol. majors.
The principles of stratigraphy and related historical geology, developed by study of selected American and European Mesozoic and Cenozoic examples. Collinson.

622† Vertebrate Paleontology U G 5
W. 3 cl., 2 2-hr. labs.
Prereq.: 4th yr. standing in Zool. or Anat. or 530 and Zool. 491.
A study of the phylogenetic development of the fossil vertebrates throughout geologic time; the evolution of the vertebrate skeleton and various paleoecologic relationships. Stephens.

623‡ Micropaleontology U G 5
Sp. 2 cl., 3 1-hr. labs.
Prereq.: 529.
A study of fossil microorganisms, especially the foraminifers, ostracodes and conodonts; structure, habits, taxonomic relationships, and phylogenetic development; preparation of faunas and their use in stratigraphic correlation. Sweet.

624 Advanced Invertebrate Paleontology U G 5
A. 3 2-hr. lab.
Prereq.: 530.
Laboratory study of fossil fauna, including paleontological techniques and procedures. La Rocque.

625 Paleobotany U G 5
Sp. 2 cl., 2 3-hr. lab. and labs., 1-day field trip.
Prereq.: 418 and 10 cl. hrs. in Biol. Sc.
Terrestrial importance of plants, history of the plant kingdom, and evolution of major groups; laboratory demonstration of plant fossils, their preservation, and methods of preparation. Schopf.

A-111
627A Field Geology U 6
Su (1st term). Requires full time of student.
Prereq.: 505, 525 and 615 and permission of instructor; 520, 619 and 619 recommended.
Not open for graduate credit to Geol. majors.
Concentrated training in the basics of field observation and mapping. The work is done in central Utah, with headquarters in Ephraim, Wees.

627B Field Geology U 6
Su (2nd term). Requires full time of student.
Prereq.: 627A.
Not open for graduate credit to Geol. majors.
Continuation of 627A.

629 Geologic Report U 3
A. 2 cl., conf.
Prereq.: 627B.
Not open for graduate credit to Geol. majors.
Preparation of geologic report based on field data collected in Geol. 627A and 627B. Wees and Steff.

630 Field Geology for Science Teachers G 3
Sp. 5 day period during recess between W. and Sp. pre-trip meeting and post-trip report.
Prereq.: 416. Open only to students registered in the Academic Year Institute, or permission of instructor.
Not open to Geol. majors.
Application of geographical principles in the field. Interpretation of features observable on a traverse crossing the Appalachian Mountain system. Bates.

632 Field Work in Earth Science U G 5
Su. (1st term). Requires full time of student for 5 weeks.
Prereq.: 30 qtr. hrs. in Geol., Geog., Astron. or Meteor. with a minimum of 15 qtr. hrs. in Geol.; Educ. 604, and permission of instructor; Geol. 520, 524 and 601 recommended.
Not open for graduate credit to Geol. majors.
Essentials of field observation, mapping and data accumulation in the solution of earth science problems. The work is done in selected off-campus field localities.

634 * Fundamentals of Geophysics U G 3
A. 3 cl.
Prereq.: 461 or 451 or 416 and Physics 412 or 413 or 532 or 533.

635 Exploration Geophysics, Principles U G 3
W. 3 cl.
Prereq.: 461 or 451 or 416 and Physics 412 or 413 or 532 or 533.
Principles and techniques of exploration geophysics, with emphasis on gravimetric, geophysical, seismic, electrical, and radioactivity surveys. Corbato.

635B Exploration Geophysics, Practical U G 2
Sp. 2 3-hr. lab.
Prereq. or concurs.: 635A or permission of instructor.

636 * Engineering Geology U G 5
W. 5 cl.
Prereq.: 4th yr. standing in Civil E., Min. E. or Petr. E. or 602 or concurs. 603.
Principles and techniques of geology in support of engineering. Fincus.

637 Hydrogeology U G 5
Sp. 5 cl. 2 3/4-day field trips.
Prereq.: Senior standing in Geol., or 417 and 4th yr. standing in Eng., or 417 and 533.
Geologic and hydrologic factors controlling the occurrence and behavior of ground water and surface water. Leiby.

695 Paleocology U G 5
W. 3 cl., 2 hrs.
Prereq.: 622, 633, 634, or 625.
A study of the principles of paleocology with illustrations from the literature and selected faunas. LaRocque.

701 Special Problems U G 1-5
Prereq.: Permission of instructor.
Special problems in any branch of geology for which the student has the proper qualification.

705* Coal Geology U G 3
Sp. 2 cl., 2 3-hr. loc. and demonstration.
Prereq.: Permission of instructor.
Origin, occurrence, and variation in carbonaceous deposits; geology and economic application of coal; analytic and resources data. Schapp.

706 * Glaciology U G 4
Sp. 2 3-hr. cl.
Prereq.: 603, Physics 413, 413, Math. 440 or 536, Mineral. 511, or permission of instructor.
Types of glaciers, their feeding, mass budget, climatic relations, motion, and existing structures. Bull.

708 * Stratigraphic and Economic Geology of Ohio U G 5
A. 10 day period preceding A; post-trip readings and report.
Prereq.: 535, 618 or permission of instructor.
Not open to students with credit for 603.
Concentrated field study of Ohio Paleozoic rocks and their economic products. Steff.

709 * Economic Geology: The Industrial Minerals U G 3
A. 3 cl.
Prereq.: 526 or 600.
Not open to students with credit for 606.
The occurrence, origin, and distribution of the nonmetallic or industrial minerals, and their properties and uses. Bates.

713 * Mechanical Analysis of Sediments U G 3
Sp. 2 cl., 1 3-hr. lab.
Prereq.: 609, 618 and 619.
The theory and application of various techniques in the laboratory study of sediments and sedimentary rocks, chiefly by microscopic methods. Summers.
720 Topics in Oceanography and Marine Geology  U G 3
Sp. 3 cl.
Prereq.: Senior standing in Geol. or permission of instructor.
Repeatable to a maximum of 9 cr. hrs.
Lectures and seminars on the origins, development, and structure of ocean basins and their contents, and on contemporary oceanic processes of geological significance. Anderson.

725 * Analysis of Structural Problems  U G 3
A. 3 2-hr. lab.
Prereq.: 602, 618 and 619 and Math. 439 or 440.
Solution of structural problems by stereographic projection and other methods; structural interpretation of isopach, paleogeologic, facies, and other maps. Solution of areal and resource problems. Fincus.

735 Geophysics, Gravimetry  U G 3
A. 3 cl.
Prereq.: 4th yr. standing in Geol. and Math. 440 or 536 and Physics 412 or 413 or 532 or 533; or 4th yr. standing in Geol. or Physics and 401 or 451 or 455; or 4th yr. standing in Civil E., Min. E., or Petr. E.

736+* Advanced Geophysics  U G 3
A. 3 cl.
Prereq.: 634 or 635A or permission of instructor.
A study of selected topics and problems in geophysics. Buhl.

740 * Introduction to Isotope Geology  U G 5
W. 3 cl.
Prereq.: Senior standing in Geol., Mineral., or related fields.
Theory of natural isotope abundance variations and applications to problems in the Earth sciences. Foure.

820* Precambrian Geology  G 3
Sp. 4 cl.
Prereq.: 602, 609, 618, and 619.
A study of the principles of Precambrian geology, and the Precambrian geology of important areas. Foure.

821 * Paleozoic Geology  G 3
W. 3 cl.
Prereq.: 602, 618, and 619.
A study of the Paleozoic systems of the United States, subdivision, faunal sequences, and correlation with homotaxial deposits abroad. Bates.

822 * Mesozoic and Cenozoic Geology  G 3
W. 3 cl.
Prereq.: 602, 618, and 619.
A study of the outstanding Mesozoic and Cenozoic sections of the world, with emphasis on principles of nomenclature, subdivision, correlation, and interpretation. Colliouer.

823+* Quaternary Geology  G 3
W. 3 cl.
Prereq.: 613.
Chronology of Pleistocene glacial and interglacial events throughout the world; the use of animal and plant remains, soils, and radiocarbon in determining this chronology. Goldthwait.

825+* Advanced Structural Geology  G 3
A. 3 cl.
Prereq.: 602, 609, 618, or 619, and Physics 411 or 531.
Recognition and interpretation of geological structures; application of theoretical analysis, field observation, and experimental methods to selected problems. Fincus.

827 * Advanced Geomorphology  G 3
W. 3 cl.
Prereq.: 601.
A seminar devoted to current and classical problems in geomorphology, such as, the origin of submarine canyons or pediments. Goldthwait.

851 Seminar in the History of Geology  G 3
W. 3 cl.
Discussion of the development of geology, intended to give the student a firm basis for comprehension of the science as it exists today. Lalouque.

896 Interdepartmental Seminar in Polar and Alpine Studies  G 1-3
Sp.
(See under Interdepartmental Seminars.)

950 Research in Geology  G Arr.
A, W, Sp, Su.
Research for thesis and dissertation purposes only.

Problems in the Teaching of Earth Science
(See Education 606)
(Offered in cooperation with the Department of Education)
German

Placement and Proficiency Examinations
Students with two years of high school German register for German 401; however, in order to insure proper registration, placement tests are required of all students who continue their study of German in the department after beginning their language in high school. Such tests are given on the first day of instruction in each quarter. Consult Arts College section.
Students who are given advanced standing in the department as a result of the placement and proficiency examination become eligible for University credit.

Excess Entrance Credits in German
Freshmen who have excess credits in foreign language are eligible for examination for advanced standing. The examination is given at the same time as the placement tests mentioned above.

401 Elementary German U 5
A, W, Sp, Su. 5 cl.
Credit in 401 will be counted toward graduation only if followed by successful completion of 402, or if taken after successful completion of the fourth regular University Course in another foreign language.

403 Elementary German U 5
A, W, Sp, Su. 5 cl.
Prereq.: 401 or equiv.

404 Intermediate German U 5
A, W, Sp, Su. 5 cl.
Prereq.: 402 or 403 or 412.
Reading of narrative prose; oral and written practice; grammar building.

409 Elementary German Conversation U 2
A, W, Sp, Su. 2 cl.
Prereq.: 402, grade of A in 401. No audit.

412 Intensive German U 15-10-5
Su. Enrollment limited to 20 students.
Prereq.: Permission of chairman.
Students with no prior credit in German must register for 15 cr. hrs. Students with credit for 401 or 402 may register for 5 or 10 cr. hrs., although the course must be completed. Register before May 11.
Elementary and Intermediate German for students desiring comprehensive knowledge of German in shortest possible time. Students will devote their entire time to this course.

417 Elementary-Intermediate German for Selected Students U 5
W. 5 cl.
Prereq.: Grade of A in 401.

418 Elementary-Intermediate German for Selected Students U 5
Sp. 5 cl.
Prereq.: 417.
Successful completion of the sequence 401-417-418 fulfills language requirements and provides eligibility for 500 courses.
Continuation of 417.

420 Intermediate Scientific German U 5
Sp. 5 cl.
Prereq.: 402.
Not open to students with credit for 403.
Reading of narrative prose; oral and written practice; introductory readings in scientific German.

421 Intermediate Scientific German U 5
A. 5 cl.
Prereq.: 420, 402, or 412.
Not open to students with credit for 404.

499 Basic German for Graduate Students G 0
A, W, Sp, Su. 5 cl.
Prereq.: Grad. standing.
The fee for this course will be the same as that for a free credit hour course. No audit.
The fundamentals of German grammar, as required for the reading of German texts in the sciences and humanities.

501 Rapid Reading for Graduate Students G 0
A, W, Sp, Su. 3 cl.
Prereq.: Grade of C or above in 499 or equiv.

402 Review Grammar and Composition U 3
A. 3 cl.
Prereq.: 403, 418, or equiv.
Review of German grammar; syntax; assigned topics for composition.

503 Intermediate German Conversation U 3
A, W, Sp, Su. 3 cl.
Prereq.: 404 and 409 or equiv. with a minimum grade of C.
503 may be taken concur. with 504. No audit.
Practice in spoken everyday idiomatic German, based on texts and periodicals concerning German life today.

504 German Composition U 2
A, W, Sp. 2 cl.
Prereq.: 404 and 409 or equiv. with a minimum grade of C.
504 may be taken concur. with 503. No audit.
Practice in simple writing with some conversation.

571*: German Civilization I U 3
A. 3 cl.
Taught in English.
The cultural heritage of the German people from the beginning to about 1500. Institutions, phases of civilization, interrelationship of social and literary history. Cunz.

572*: German Civilization II U 3
W. 3 cl.
Taught in English.
German civilization from Luther to the Age of Goethe. Cultural trends, social changes, historical development to the end of the Holy Roman Empire. Cunz.
575 Introduction to German Literature; U 5
German Literature of the Classical Period
A, W, 5 cl.
Prereq.: 404, 418, or equiv.
Students with special aptitude are advised to register also in 503, 504.
Readings from Goethe and Schiller.

576 Introduction to German Literature; U 5
German Literature of the Nineteenth Century
W, Sp, 5 cl.
Prereq.: 404, 418, or equiv.
Students with special aptitude are advised to register also in 503, 504.
Readings from Keller and Meyer.

577 Introduction to German Literature; U 5
Modern German Literature
Sp, 5 cl.
Prereq.: 404, 418, or equiv.
Students with special aptitude are advised to register also in 503, 504.
Readings from representative authors such as Mann, Schmitzler, Duerrenmatt.

590 German Literature in Translation from U 3
Goethe to Thomas Mann
A, Sp, 3 cl.
Not for credit on a major in German.
Social and intellectual forces in Germany as reflected in German literature from the Age of Enlightenment to the present. Masterpieces from Goethe to Thomas Mann. Hoffmann, Maucher.

GENERAL PREREQUISITES FOR COURSES NUMBERED 600 AND 700
Unless otherwise indicated, the prerequisites for 600 and 700 courses are ten hours of 500 courses in the department. Exception may be allowed by instructors for students with special qualifications.

617* Survey of German Literature UG 3
Sp, 3 cl.
A historical survey of German literature from the earliest times to the Baroque. Bekker, Belkin.

650 Proseminar UG 1 or 3
Su, 3 cl. 3 cr. hrs.
Fr. (first term), 3 cl. 1 cr. hr.
Staff.

656* Introduction to the Historical Study of German UG 3
Survey of the history of the German language with an outline of the Germanic languages. Relations between German and English (phonology, word, and meanings). Groenke.

661 The German "Novelle" UG 3
W, 3 cl.
Reading and analysis of masterpieces of the 19th and 20th centuries: Kleist, Eichendorff, Stifter, Keller, Thomas Mann. Seidlin.

662 The German Drama A, 3 cl.
Reading and analysis of masterpieces of the 19th and 20th centuries: Schiller, Kleist, Grillparzer, Hebbel, Brecht. Withowski.

663 German Lyrics UG 3
Sp, 3 cl.
Analysis of German lyrics from 1200 to the present; study of specific forms: Volklied, ballad, sonnet and individual great lyrists. Hoffmann.

685 Advanced Conversation and Composition UG 3
W, 3 cl.

691 Practical German Pronunciation UG 2
Sp, 2 cl.

701 Minor Problems UG 2-10
A, W, Sp, Su.
Prereq.: Permission of chairman.
Repeatable.
Investigation of minor problems in the various fields of German literature and philology. Staff.

705* Introduction to the Study of Language UG 3
Sp, 3 cl.
Elements of linguistics with emphasis on the historical study of languages and on semantics; the position of Germanic in the Indo-European family of languages. Groenke.

721* German Literature of the Eighteenth Century UG 3
A, 3 cl.
Prereq.: Grad. standing, or 4th yr. standing with 9 cr. hrs. in German at the 600 level and permission of department chairman.
The literature of the Enlightenment and Storm and Stress; Lessing, Klopstock, Wieland, young Goethe and Schiller. Giese.

722* German Classical Literature UG 3
W, 3 cl.
Prereq.: Grad. standing, or 4th yr. standing with 9 cr. hrs. in German at the 600 level and permission of department chairman.
Achievement of Goethe's and Schiller's major works. Their significance for modern times. Seidlin.

723* Goethe's Faust UG 3
Sp, 3 cl.
Prereq.: Grad. standing, or 4th yr. standing with 9 cr. hrs. in German at the 600 level and permission of department chairman.
Biographical of the Faust legend from the sixteenth century to Goethe. Reading and discussion of the play. Withowski.

724* German Romanticism UG 3
A, 3 cl.
Prereq.: Grad. standing, or 4th yr. standing with 9 cr. hrs. in German at the 600 level and permission of department chairman.
The romantic revolt against the idea of classicism. Novalis, the Schlegel's, Tieck, Kleist, Eichendorff, E. T. A. Hoffmann. Seidlin.

725* German Literature of the Nineteenth Century UG 3
W, 3 cl.
Prereq.: Grad. standing, or 4th yr. standing with 9 cr. hrs. in German at the 600 level and permission of department chairman.
Literary forces and trends from Goethe's death to the founding of the German Reich (Grillparzer, Beechmer, Hebbel, Rainer, Moerike, Stifter, Keller, Meyer). Withowski.

726* Contemporary German Literature UG 3
Sp, 3 cl.
Prereq.: Grad. standing, or 4th yr. standing with 9 cr. hrs. in German at the 600 level and permission of department chairman.
Main currents of German thought and literature from Nietzsche to the present; Hauptmann, Schmitzler, Mann, Rilke, George, Hofmannsthal, Kafka, Brecht. Hoffman.

A-115
Greek

Office: 217 Derby Hall, 154 North Oval Drive.

PROFESSORS: MITCHENER (Chairman), EVABROTT, P. FORBES, and W. R. JONES; ASSOCIATE PROFESSORS: L. JENKINS, and T. LENARDON; ASSISTANT PROFESSORS: BERKOWITZ, BRUNNER, HOLINSFRA, and T. MORFORD.

See also Classical Languages and Literatures.

401 Elementary Greek
A. 5 cl.
Credit in 401 will count toward graduation only if followed by successful completion of 402, or if taken after successful completion of the fourth regular University course in another foreign language.

Grammar and practice in translation of the Greek idiom.

402 Elementary Greek
U 5
W. 5 cl.
Prereq.: 401.

Continuation of grammar and selected reading.

403 Intermediate Greek
U 5
Sp. 5 cl.
Prereq.: 492.

Reading in the easier dialogues; the personalities of Socrates and Plato and their work.

415 Intensive Introduction to Greek
U 15
Su. 10 cl. and 10 or more hrs. of supervised study.
Full time of student req'd.
Prereq.: Permission of chairman.

Not open to students with credit for 401, 402, 403.

Intensive drill in forms, syntax, vocabulary, and idiom, leading to an ability to translate the dialogues of Plato by the end of the quarter.

504 Homer
U 5
A. 5 cl.
Prereq.: 493.

Reading in the Iliad and Odyssey; the epic of Greece. Barmann.

506† New Testament Greek
U 3
A. 3 cl.
Prereq.: 493.


603* Greek Orators
U G 3
A. 3 cl.
Prereq.: 401, 402, 403, 504.

The theory and practice of the grand and the plain style in oratory; Demosthenes and Lysias. Forbes.

604* Herodotus
U G 3
W. 3 cl.
Prereq.: 401, 402, 403, 504.

Reading and discussion; assessment of the nature of Herodotus' contribution to literature and history. Morford.

606* Sophocles
U G 3
W. 3 cl.
Prereq.: 491, 403, 405, 504.

The tragedies of Sophocles with Aristotle's analytic criticism. Forbes.

Graduate School Course

Office: 164 West 19th Avenue.

701 College Teaching
G 2
A. W. 2 cl.
Prereq.: Permission of director of course.

Designed to acquaint prospective college teachers with the major problems involved in college teaching.

A-116
Health Education

Officers: (Men) 124 Physical Education Bldg., 537 West 17th Ave. (Women) 315A Pomona Hall, 1760 Neil Avenue.

PROFESSORS ALLENBAUGH, BEYER, CUHMAN, and ROBERTERFUR, ASSOCIATE PROFESSORS FOGLE, and SOLLEDER; ASSISTANT PROFESSOR NOLTE; INSTRUCTORS CARROLL, COOLEY, HUKILL, and STAFF.

400 Hygiene
A, W, Sp. Su. 1 cr., 1 lab. hr.  
Designed to influence knowledge, attitudes, and behavior related to individual health. Solleder, Coordinator.

473 First Aid
A consideration of first aid practices to the injured. Completion leads to Red Cross certificates in first aid. Staff.

510 Hygiene
A, W, Sp. 5 cr.  
Not open to students with credit for 410.  
Designed to establish a basis for positive health and efficiency through a consideration of various conditions and factors which affect health. Cuhman, Beyrer.

609 Health Education for Elementary Teachers
A, W, Sp. Su. 3 cr.  
Not open to undergraduate or graduate minors or majors in Phys. Ed. or Health Ed.  
The teacher’s responsibility for health of school child. Screening, referral, vision and hearing, nutritional problems, instructional programs, emergency care, teacher’s health. Cuhman, Beyrer, Allenbaugh, FOGLE, Beyrer, Solleder, Hukill, Carroll.

610 Health Education for Secondary Teachers
A, W, Sp. Su. 3 cr.  
Not open to students preparing for secondary school teaching of Health Ed. or Phys. Ed.  
A study of health problems as they relate to the individual secondary school student. Emphasis on the role of the teacher in the secondary school health program. Cuhman, BeYER, Solleder, Noble, Carroll.

641 Personal Health Problems
A, Su. 3 cr.  
An advanced course in personal health problems. Extensive reading and reporting in selected health areas. Cuhman, Beyrer.

644 The Teaching of Health
Sp. Su. 5 cr.  
Prereq.: 410 or 510 or equiv.  

645 Organizational Relationships in School Health Education
W, Su. Sp. 3 cr.  
Prereq.: 698.  
The relation of the school health program to the total community health program. Official and non-official health agencies are studied. Beyrer, Noble.
692 School Health Services U G 3
A, W, Su. 3 cl.
Prereq.: 410 or 510 or equiv.
Consideration of healthful school living and health services, including health appraisal, counseling, educational adjustment, communicable diseases, and emergency programs. Cushman.

701 Minor Problems in Health Education U G 1-4
A, W, Sp, Su.
Prereq.: 4th yr. or grad. standing and permission of advisor.
Investigation of selected professional problems.

705 Current Progress in Disease Control U G 2
Sp. 2 cl.
Prereq.: 4th yr. or grad. standing in a health science area.
 Authorities in medicine and health sciences will interpret how current findings may affect disease prevention and control. Newer knowledge of cancer, dental caries, etc., will be discussed. Cushman, Fogel.

799 School Health Education Workshop U G 4
Su. 3 cr. workshop.
Prereq.: Permission of instructor.
Repeatable to a maximum of 8 cr. hrs.
A team approach to school health education with emphasis on instruction, health services, environment, methods, materials, resources, evaluation, interpersonal relationships, and others. Individual and group study. Fogel.

801 Seminar in School Health Education G 2
A, Su. 2 cl.
Beyrer, Cushman.

820 Problems in School Health Education G 3
A, W, Sp, Su.
Advanced problems in school health education. Individual or group participation.

820J Curriculum in Health Education Su.
Nolte, Cushman.

820K Survey of Research in Health Education W.
Beyrer, Solleder.

820L Evaluation in Health Education Sp.
Cushman, Solleder.

950 Research in Health Education G Arr.
A, W, Sp, Su.
Research for thesis and dissertation purposes only.

History

Office: 108 University Hall, 216 North Oval Drive.

PROFESSORS: GRIMM (Chairman), JAFFE, KORDE, KOSKINEN, LORIMER, LUDFORD (Emeritus), MCDONALD, MOORE, MORGAN, OSBORNE, RUGGLES, STANTON (Emeritus), TAYLOR, TAYLOR, RUGGLES, ROSEBOOM (Emeritus), SIEGEL, SILVA, WIESENBURGER, and WOODRING (Emeritus); ASSOCIATE PROFESSORS: BROOKER, BROOKER, BRUCE, HAYES, and YOUNG.

401 History of Western Civilization U 5
(1500 to 1815)
A, W, Sp, Su. 5 cl.
Either 401 or 402 may be taken independently.
Not open to students with credit in 421.
Renaissance, Reformation, Spanish culture; Elizabethan England: French classicism, and early modern natural science; national monarchies, absolutism, and mercantilism; the Enlightenment; the French Revolution; Napoleon.

402 History of Western Civilization U 5
(1815 to the Present)
A, W, Sp, Su. 5 cl.
Either 401 or 402 may be taken independently.
Not open to students with credit in 422 or 423.
Continuation of 401. Restoration; reaction; democracy; economic and political radicalism; Romanticism; nationalism; imperialism; World War I; post-war Europe.

403 History of the United States U 5
(1763 to 1877)
A, W, Sp, Su. 5 cl.
Not open to students with credit in 421 or 422 or 504.
The general political, constitutional, and economic development of the United States from the beginning of the Revolutionary era to the end of the Civil War.

404 History of the United States U 5
(1877 to Present)
A, W, Sp, Su. 5 cl.
Not open to students with credit in 422 or 423 or 504.
A continuation of 403. The two provide a legal sequence but either may be taken independently as an elective.

421 The Western World in Modern Times U 5
A, W, Sp, Su. 5 cl.
Not open to students with credit in 401 or 403 or 504.
From the beginning of modern times through the first third of the nineteenth century. A course in the history of modern Europe and the United States. Emphasis is placed on the history of the United States in a world setting. Major themes include the development of representative government and democracy, the rise of capitalism, the role of organized religion, and the impact of scientific development.

422 The Western World in Modern Times U 5
A, W, Sp, Su. 5 cl.
Not open to students with credit in 402 or 403 or 504.
Continuation of 421. The nineteenth century.

423 The Western World in Modern Times U 5
A, W, Sp, Su. 5 cl.
Not open to students with credit in 422, or 403, or 504.
Continuation of 422. The twentieth century.
HISTORY

608 The Reformation
Sp. 5 cl.
The rise and growth of Protestantism and the Catholic reformation of the sixteenth century against the economic, political, and social developments in western Europe. Grimm.

609 The History of England from Its Beginning to 1688
A. 5 cl.
A study of the religious, political, economic, and intellectual development of the English people from the earliest times to the Glorious Revolution. Roberts.

610 History of England (since 1688)
Sp. 5 cl.
The course of political, social, and intellectual change, of industrial and commercial growth of Hanoverian, Victorian, and Edwardian England. Forster.

611 Constitutional History of England (to 1485)
W. 5 cl.
The development of royal administration; the rise of common law and central courts; the origins and growth of representative and constitutional government to 1485. Fergus.

612 Constitutional History of England (since 1485)
Sp. 3 cl.
Prereq.: 611 or permission of instructor.
The Tudor system, the struggle between king and parliament, cabinet government, electoral reform, and the law of the modern constitution. Roberts.

617 Europe 1660-1789
W. 5 cl.
A study of the rise of the absolute state, the changing diplomatic alignments, and the enlightenment. Rule.

618 American Military Policy
Sp. 3 cl.
The development of American military policy, 1763 to the present, in relation to its political, economic, and social implications. Coles.

619 Medieval Civilization
A. 5 cl.
The decline of the Roman Empire; the rise of Christianity; analysis of feudalism and manorialism; the Great Economic Revival, and the origins of Western Society. Fergus.

620 Europe 1815-1914
A. 5 cl.
Nationalism, the democratic movement, economic growth, imperialism, and cultural advance from the Congress of Vienna to World War I. Ragatz.

622 Africa and the Western World in the Nineteenth and Twentieth Centuries
W. 5 cl.
Economic penetration, the conflict of cultures, political developments, and social advance. Ragatz.

623 Asia, the Pacific Basin, and the Western World in the Nineteenth and Twentieth Centuries
Sp. 5 cl.
The rise and decline of colonialism and contemporary problems. Ragatz.
624 The French Revolution and Napoleon U G 5
Sp, Su. 5 cl.
The background of the Revolution; the social bases and political schemes of the first three revolutionary governments, 1789-1795; the program and role of Napoleon. Rule.

625† France since 1815 U G 5
Sp. 5 cl.
The social and economic evolution of France, 1815-1870; the evolution of French politics and social classes, 1870-1914; the problems of France between two wars; the Fourth Republic. Lerner.

626† The Rise of Islam and the Spread of Muslim Civilization U G 3
A. 3 cl.
Life and teachings of Mohammed; Umayyad and Abbasid empires; the Crusades; Islamic culture and learning through the ages; the decline under the Mongols. Terminal date, 1517. Fisher.

627 The Rise and Fall of the Ottoman Empire U G 3
A. 3 cl.
A study of the significance of the Middle East with respect to Europe from the thirteenth century to World War I. Fisher.

628 The Middle East since 1914 U G 3
W. 3 cl.
National and international problems following the collapse of the Ottoman empire; the Turkish Republic; the state of Israel; Arab unity; and the conflict between East and West. Fisher.

629 Modern Germany (1815 to the Present) U G 5
Sp. 3 cl.
Political, social, economic, and cultural developments; the national and liberal movements; unification; Empire; Weimar Republic; Nazi Regime; present-day Germany. Dorphalen.

630 European Diplomacy, 1871-1939 U G 3
W. 3 cl.
Imperialism and the Alliance systems leading to World War I; the Paris Peace Conference, and the political and economic diplomacy prior to World War II. Fisher.

631† Constitutional History of the United States U G 5
W. 5 cl.
Problems involved in the constitutional growth and development of the United States from the struggle for independence to the present.

632 The Slavery Controversy in the United States U G 3
A, Su. 3 cl.
The social system of the Old South; the various aspects of the controversy; secession and the impact of war. Hancock, Coles.

634 Reconstruction and the New South U G 3
(1863 to the Present)
W. 3 cl.
The controversy over reconstruction; the social and economic readjustments in Southern States during and after reconstruction. Hancock.

635 American Foreign Policy to the Close of the Civil War U G 3
W, Su. 3 cl.
Emphasis on these topics: the revolution, neutral rights, the Monroe Doctrine, the War with Mexico, the Civil War. Coles, Zahniser.

636 American Foreign Policy since the Civil War U G 5
Sp, Su. 5 cl.
Emphasis on these topics: Overseas expansion, U.S. relations with Latin America, the Far East, and with Europe since 1914. Zahniser.

639 The Influence of Immigrant Groups upon United States History U G 5
W. 5 cl.
The share of different immigrant groups in the building of the nation, from the colonial period to the present. Weitemburger.

641 The Westward Movement since 1783 U G 5
Sp. 5 cl.
The westward spread of settlement and the influence of the westward movement on American development. Young.

642 Social and Economic History of the United States, 1815-1865 U G 5
A, W. 5 cl.
The development of economic institutions and their relation to economic growth and to movements for social and political reform. Young.

643† Political Parties in the United States U G 5
Sp. 5 cl.
The origin and growth of national parties and the history of party struggles with emphasis upon presidential elections.

644 The American Colonies U G 5
A, Su. 5 cl.
The transplanting of European civilization to North America, the resultant international rivalries, and the political, social, and economic life of the English colonies to 1763. Brown.

645 Latin America U G 3
A. 3 cl.
The Mayan, Aztec, and Inca Empires; the Spanish and Portuguese conquest; and the development of Hispanic civilization in the New World. TePaske.

646 Latin America U G 5
W, Su. 5 cl.
The development of the South American republics from the Wars of Independence to the present with special emphasis upon Argentina and Brazil. TePaske, Wilkie.

648 The American Revolution and the New Nation, 1763-1825 U G 5
W. 5 cl.
A continuation of 644 but may be taken separately. Primary emphasis is on social, intellectual, and economic factors. Coles, Zahniser.

649 * Greek Civilization U G 3
A. 3 cl.
The Hellenistic Age: A study of Greek institutions from Alexander the Great to the Roman conquest. Readings in the sources in translation. McDonald.

650* Roman Civilization U G 3
A. 3 cl.
A study of the Early Roman Empire, beginning with the Augustan Age and ending with Marcus Aurelia. Readings in the sources in translation. McDonald.

651 History of Modern Japan U G 5
Sp. 5 cl.
Political, social and intellectual history of Japan from the beginning of the Meiji Period (1868) to the present. Eastman.

653* The Ancient History of the Near East U G 3
Sp. 3 cl.
The ancient history of Egypt, Babylonia, Assyria, and adjacent cultures. Readings in the sources in translation. McDonald.

A-120
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>655</td>
<td>Greek History</td>
<td>EG</td>
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<td>A. 5 cl.</td>
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<td></td>
<td>A history of Greece from the early Minoan period to the age of Demosthenes and Philipp of Macedon. Readings in the Greek historians in translation. McDonald.</td>
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<tr>
<td>656</td>
<td>Roman History</td>
<td>EG</td>
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<td>W. 5 cl.</td>
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<tr>
<td></td>
<td>A history of Rome from the early Bronze Age to the fall of the Roman Republic. Readings in the Roman historians in translation. McDonald.</td>
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<tr>
<td>664</td>
<td>The Emergence of Modern America, 1805-1898</td>
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<td>Sp. 5 cl.</td>
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<td></td>
<td>An intensive study of the political, social, and cultural transformation of the United States in the late nineteenth century. Weissenburger.</td>
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<tr>
<td>673</td>
<td>History of American Science Before</td>
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<td></td>
<td>Darwin</td>
<td>G</td>
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<td>A. 3 cl.</td>
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<tr>
<td></td>
<td>Beginnings and flowering of scientific inquiry in colonial America; the Enlightenment; coming of technology and expansion of science in early nineteenth-century America. Burnham.</td>
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<tr>
<td>674</td>
<td>History of American Science Since</td>
<td>U</td>
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<td></td>
<td>Darwin</td>
<td>G</td>
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<td>W. 3 cl.</td>
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<td></td>
<td>The Darwinian Period in America; positivism and pragmatism; The rise of twentieth-century science; American scientific leadership; role of the scientist in twentieth-century America. Burnham.</td>
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<tr>
<td>673</td>
<td>History of Russia (to 1801)</td>
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<td></td>
<td>A. 3 cl.</td>
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<td>Not open to students who have 5 cr. hrs. for Hist. 676.</td>
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<tr>
<td></td>
<td>A survey from the origins of the Russian state to the end of the eighteenth century. Curran.</td>
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<tr>
<td>676</td>
<td>History of Russia (1801-1914)</td>
<td>U</td>
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<td>W. 3 cl.</td>
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<td>A survey from the accession of Alexander I to the outbreak of the First World War. Morley.</td>
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<tr>
<td>677</td>
<td>Soviet Russia</td>
<td>U</td>
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<td></td>
<td>A, Sp, Su. 3 cl.</td>
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<tr>
<td></td>
<td>Beginning with the background and events of the revolution of 1917, this course analyzes developments in Russian history from World War I to the present. Morley, Curran.</td>
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<tr>
<td>678</td>
<td>Modern Poland</td>
<td>U</td>
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<td></td>
<td>A. 3 cl.</td>
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<td></td>
<td>While several background lectures deal with the partitions of Poland and the revolutions of the nineteenth century, emphasis is placed on the period since 1918. Morley.</td>
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<tr>
<td>679</td>
<td>Latin America</td>
<td>U</td>
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<td></td>
<td>Sp. 5 cl.</td>
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<td>The development of Mexico, Central America, and the Caribbean from the Wars of Independence to the present with special emphasis upon Mexico since 1910. TrFiske, Wilkie.</td>
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<tr>
<td>681</td>
<td>Russian Intellectual History</td>
<td>U</td>
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<td></td>
<td>Sp. 5 cl.</td>
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<td></td>
<td>A survey of the main currents of Russian social, political, economic and philosophical thought in the nineteenth century. Liberalism, Conservatism and Socialism. Curran.</td>
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<tr>
<td>686</td>
<td>Contemporary England</td>
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<td>W. 3 cl.</td>
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<td></td>
<td>A study of Britain since 1900 with special emphasis on the rise of the Labour party and the development of the social welfare state. Poirier.</td>
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<tr>
<td>687</td>
<td>The Age of Liberalism</td>
<td>U</td>
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<td>W. 5 cl.</td>
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<td>The main currents of European thought accompanying the transition from eighteenth century absolutism to nineteenth century liberalism; social and cultural criticism of the industrial order. Poirier.</td>
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<tr>
<td>689</td>
<td>The History of Ohio</td>
<td>U</td>
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<td></td>
<td>A. 3 cl.</td>
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<tr>
<td></td>
<td>A general survey of state history—social, economic, religious, and political—from the Indian period to the present. Weissenburger.</td>
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<tr>
<td>693</td>
<td>Major Influences in the History of</td>
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<tr>
<td></td>
<td>Western Civilization</td>
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<td></td>
<td>Sp. 2 cl.</td>
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<tr>
<td></td>
<td>Offered by senior members of the staff and designed to acquaint the student with problems in the interpretation of the history of Western civilization. Rule.</td>
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<tr>
<td>694</td>
<td>History of the Far East to 1800</td>
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<td>A. 5 cl.</td>
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<td></td>
<td>The development of the civilizations of China, Korea, and Japan from the earliest times to the beginning of large-scale Western influence. Eastman.</td>
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<tr>
<td>695</td>
<td>History of the Far East since 1800</td>
<td>U</td>
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<tr>
<td></td>
<td>W. 5 cl.</td>
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<tr>
<td></td>
<td>The transformation of China, Korea, and Japan in modern times under the impact of the West. Eastman.</td>
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<tr>
<td>696</td>
<td>American Social Thought and</td>
<td>U</td>
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<td>Reform, 1890-1929</td>
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<td>W. 5 cl.</td>
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<tr>
<td></td>
<td>Not open to students with credit in 692.</td>
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<td></td>
<td>Philosophy and institutions of social reform in the United States in the late nineteenth and early twentieth century. Bremer.</td>
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<tr>
<td>697</td>
<td>American Social Thought and</td>
<td>U</td>
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<td></td>
<td>Reform since 1929</td>
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<td></td>
<td>Sp. 3 cl.</td>
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<td></td>
<td>A historical examination of trends in American social thought and criticism since the Great Depression. Bremer.</td>
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<tr>
<td>698</td>
<td>History of Modern China</td>
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<td>Sp. 5 cl.</td>
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<td></td>
<td>A study of China's response to the problems generated by contact with the West, emphasizing the rise of nationalism and communism in the twentieth century. Political, social and intellectual history. Eastman.</td>
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<td>700</td>
<td>Minor Problems in History</td>
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<td>A, W, Sp, Su.</td>
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<td>Prereq.: Permission of instructor.</td>
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<td>Individual study in some field of historical development; designed to allow the student to work upon a problem in which he is particularly interested.</td>
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<tr>
<td>705</td>
<td>Honors Course</td>
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<td>A. 3-5</td>
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<td>4th yr. standing and 40 cr. hrs. in Hist. with a grade of A in at least half of the Hist. courses and an average of B in the remainder. At least 2 qtr. of the sequence 705-706-707 are required of candidates for the degree of Bachelor of Arts with Distinction in History. Failure to receive a grade of B in this course is a disqualification for special honors.</td>
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<td>Informal conferences to allow full scope to the initiative of the student. A special topic is assigned and results are tested by papers and special examinations.</td>
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<tr>
<td>706</td>
<td>Honors Course</td>
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<td>W. 3-5</td>
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<td>See prereq. for 705.</td>
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<tr>
<td>707</td>
<td>Honors Course</td>
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<td>See prereq. for 705.</td>
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737 Recent History of the United States G 5
(1898-1928)
A. 5 cl.

738 Recent History of the United States G 5
(since 1928)
Sp. 5 cl.
Continuation of Hist. 737, but may be taken separately. Prosperity and depression, the New Deal, the United States in international affairs, and the Second World War. Brenner, Brody, Burnham.

771 Studies in Russian History U G 3
W. 2 cl.
Prereq.: 6 cr. hrs. of Russian hist. or permission of instructor.
An intensive study of problems in selected periods of Russian history. Morley.
Topics:
A. Catherine the Great through the Crimean War, 1762-1855.
B. Alexander II through the Bolshevik Revolution, 1855-1917.

789 Studies in European History: G 3
1815-1914
Sp. 1 cl.
Open only to graduate students and by permission to seniors majoring in Hist.
Political and social impact of Industrial Revolution; authoritarianism vs. liberalism; Church vs. State; nationalism; imperialism. Emphasis on methods of historical research and documentary analysis. Dorphalen.

790 Studies in European History: G 3
1914 to the Present
A. 1 cl.
Prereq.: Grad. standing, or 4th yr. majors in Hist. with permission of instructor.
Political, social, and economic developments; World Wars I and II; Communism, Nazism; present-day Europe. Emphasis on methods of historical research and documentary analysis. Dorphalen.

809 Seminar in European History G 3
A. 1 cl.
Prereq. or concurs.: 812B.
Research topic to be announced. Grimm.

810 Seminar in European History G 3
Sp. 1 cl.
Prereq. or concurs.: 812B.
Research topic to be announced. Dorphalen.

811 Seminar in European History G 3
W. 1 cl.
Prereq. or concurs.: 812B.

812A Introduction to Historical Research in G 3
American History
A. 3 cl.
Prereq.: 1st qtr. Master's degree candidates in American Hist.
A practice course dealing with the problems involved in the preparation of the Master's thesis. Weisenburger.

812B Introduction to Historical Research in G 3
European History
A. 3 cl.
Prereq.: 1st qtr. Master's degree candidates in European Hist.
A practice course dealing with the problems involved in the preparation of the Master's thesis. Rogats.

813 Great European Historians G 3
A. 1 cl.
A study of the leading historical writers and schools of Europe, with selected readings from representative writers. Roberts.

814 Great American Historians G 3
Sp. Su. 1 cl.
A study of the leading American writers and schools of history. Chapin, Coles.

815 Seminar in European History G 3
Sp. 1 cl.
Prereq.: 812B and reading knowledge of French. Foulier.

816 Seminar in European History G 3
W, Su. 1 cl.
Prereq.: 812B.
Research topic to be announced. Roberts, Rule.

817 Seminar in European History G 3
W, Sp. 1 cl.
Prereq. or concurs.: 812B.
Rule, TePaske.

819 Two Quarter Seminar in American History G 3
W.
Prereq.: 812A and permission of instructor.
819 must be followed by 820.
Brenner.

820 Two Quarter Seminar in American History G 3
Sp.
Prereq.: 812A, 819, and permission of instructor.
Brenner.

821 Seminar in American History G 3
W. 1 cl.
Prereq. or concurs.: 812A.
Research topic to be announced. Weisenburger.

822 Seminar in American History G 3
A. 1 cl.
Prereq. or concurs.: 812A.
Research topic to be announced. Chapin.

823 Seminar in American History G 3
Sp. 1 cl.
Prereq. or concurs.: 812A.
Research topic to be announced. Zahniser.

824 Seminar in American History G 3
A, Su. 1 cl.
Prereq. or concurs.: 812A.
Research topic to be announced. Coles, Young.
506 Household Equipment: Introduction U 5
A, Sp, Su. 4 cl., 1 2-hr. lab.
Prereq.: Permission of Graduate Chairman and the Chairman of the department.

Principles involved in the selection, construction, operation, and care of household equipment and their relationship to the well-being of the family. Bread.

507 Needle Crafts U 2
W. 2 2-hr. lab.
Prereq.: Major standing in Oc. Ther., or permission of instructor.

Not open to majors in Home Ec.

508 Clothing: Fashion and the Ready-to-Wear Market U 5
Sp. 5 cl.
Prereq.: 3rd yr. standing.

Fashion, the ready-to-wear market and current developments in the field of textiles and clothing and their relationship to satisfying consumer needs.

510 Housing U 3
A, W, Sp. 3 cl.
Prereq.: 563 or 10 cr. hrs. social science.

Not open to students with credit for 450.

Housing as it affects family living and is in turn affected by family needs, social and economic trends and the physical environment. Everhart, Blakemore.

511 Home Furnishings: Principles U 3
A, W, Sp. 2 cl., 1 2-hr. lab.
Prereq.: Fine Arts 430 or 431 or permission of instructor. 510 and 505 or concur. is recommended.

Application of art principles to furnishing a home with consideration of aesthetic, economics and social factors affecting choice. Everhart.

513 Home Furnishings: Laboratory U 3
W. 2 3-hr. cl., 1 2-hr. lab.
Prereq.: 512 or permission of instructor.

Continuation of 512; emphasis on economic factors, trends, materials, construction and finishes. Some experience in reconditioning and other techniques. Everhart.

514 Clothing: Elementary Construction U 3
A. 2 3-hr. cl.
Prereq.: Major standing in Oc. Ther., or permission of instructor.

Problems of elementary garment construction.

518 dwelling Elements of Homemaking U 3
A. 3 cl.
Prereq.: 3rd yr. standing.

Not open to majors in Home Ec.

Principles of home management and use of family resources in relation to family well-being. Newark.

520 Costume Design U 3
A, W, Sp. 2 cl., 2 2-hr. lab.
Prereq.: Fine Arts 430 or equiv.

A critical study of aesthetic principles in relation to costume. Mencham.

531 Clothing: Design Analysis U 5
A, W, Sp. 2 cl., 2 2-hr. lab.
Prereq.: 530; passing placement test or prior registration in Techniques Studio required.

Not open to students with credit for 421.

Adaptation of standard patterns to individual proportions, flat pattern designing, and application of principles of design and construction in making garments. Goldsberry.

A-123
COURSES OF INSTRUCTION

HOME ECONOMICS

541 Principles and Methods of Teaching U 5
Applied to Home Economics
A, W, Sp. 2 cl., ½ day arr.
Prereq.: Admission to Home Ec. Teaching Curriculum, reqd. and 25 cr. hrs. in Home Ec.
Consideration of curriculum, methods of teaching, management, and other problems of the home economics teacher.

542 Supervised Home Economics U 10-15
Teaching
A, W, Sp. Full time for one qtr. for 15 cr. hrs.
Not open to students with credit for 543.
40 cr. hrs. in Home Ec. including 541, accumulative point hr. ratio of 3.25 to be attained two qtrs. prior to registration for 543, permission of instructor. For registration, student must report to Room 314, Campbell Hall.
Students registering for 10 cr. hrs. will spend full time for ½ qtr. teaching and will be reqd. to register for 543 for vocational certification. For vocational certification, students must do their teaching in a vocational center and live in the community.
Registration with the Teacher Placement Service of the College of Education.
Guided participation in the responsibilities and activities of the Home Economics teacher in the regular day school and extended school program.

543 School-Community Problems of the Home Economics Teachers U 3
Su. 3 cl. arr. hrs. for observation and participation.
Prereq.: 541.
Not open to students with 15 cr. hrs. for 542.
Responsibilities and activities of the home economics teacher in the extended school program with emphasis on adult education, home experience, related home economics teacher activities. Dick.

545 Introduction to Educational Principles for Home Economics U 4
Sp. 1 1-hr. cl., 1 2-hr. cl., field experience.
Prereq.: 3rd yr. standing.
Principles of education for students whose professional work will require knowledge of techniques for teaching others in non-school situations.

548 Fundamentals of Nutrition U 5
A, W, Sp. 3 cl.
Prereq.: Chem. 407 and 408 or equiv.
Not open to students with credit for 449.
Basic information in the science of nutrition as applied to man. Herr.

549 Food U 5
A, W, Sp. 2 cl., 3 2-hr. lab.
Prereq.: 10 cr. hrs. Chem.
Not open to students with credit for 441.
Application of chemical and physical principles to food preparation and use. Green.

550 Foods: Meal Management U 4
A, W, Sp. 2 cl., 2 3-hr. lab.
Prereq.: 549.
Nutritional, aesthetic, and social aspects of planning, purchasing, preparing, and serving food to family groups at different income levels. Nold.

552 Nutrition: Recent Developments U 3
A, Sp. 3 cl.

555 Food in Different Cultures U 3
A. 3 cl.
Prereq.: 10 cr. hrs. of social science. 548 or equiv. recommended.
Food practices of selected peoples of the world with consideration of the existing social, cultural and economic conditions. Noted.

559 Home Management: The Family and the Market U 3
A, W. 3 cl.
Prereq.: 3rd yr. standing and Econ. 406 or 506 or equiv.
The market from the family point of view and its relation to home management practices. Newcom

560 Home Management U 5
A, W, Sp. Su. 5 cl.
Prereq.: 3rd yr. standing and Econ. 406 or 506 or equiv.
Management process of utilizing specific resources for family's well-being. Newcomb, Lloyd.

561 Introduction to Child Development U 4
A, W, Sp. 3 cl., 2 morning hrs. arr. for nursery school observation.
Prereq.: Psychol. 401, 548 or equiv. recommended.
Study of the nature, nurture and development of children with emphasis on the preschool years. Greff, Lehr.

562 Family Development U 5
A, W, Sp. 5 cl.
Prereq.: 10 cr. hrs. of social science.
Not open to students with credit for 405.
The dynamics of family interaction at each stage of the life cycle. Emphasis on developmental tasks, socio-economic and cultural influences and other family differences. Taylor, Lehr.

563 Child Development U 5
A, W, Sp. Su. 5 cl.
Prereq.: Psychol. 401.
Not open to students with credit for 561.
Developmental patterns of children with emphasis on physical, social, and emotional maturity, especially during the formative years. Environmental influences and appropriate guidance. Heye, Hendrickson.

570 Introduction to Food Service Management U 2
Sp. 1 3-hr. cl.
Prereq.: 549.
Orientation to the field of food service management. Harger.

571 * Menu Planning for Food-Serving Establishments U 3
W. 3 cl.
Prereq.: 548 or permission of instructor.
549 or concur. recommended.
Principles and practices of menu planning for school, industrial, and commercial food units. Menus planned for each type of institution. Harger.

580 Household Equipment: The Home Economist in Business U 5
Sp. 3 cl., 2 2-hr. lab.
Prereq.: 550, 10 cr. hrs. of household equipment, 5 cr. hrs. Speech, or permission of instructor.
Evaluation and development of the individual's qualifications to meet professional requirements of a home economist in businesses related to household equipment. Bloom.
HOME ECONOMICS

585 Field Work in Home Economics U 3, 5, 10, or 15
A. W., Sp., Su.
Prereq.: Permission of instructor.
Student participation in work of community agencies, county extension programs or business concerns to which home economics is related. Bloom, Haye, Millican, Hargers. Hendrickson.
Credit limited to 5 hrs. except in qtrs. indicated below.

585A Foods 3 or 5
585B Nutrition 3 or 5
585C Textiles 3 or 5
585D Clothing 10
A. 10 cr. hrs.
585E Household Equipment 3 or 5
585G Home Management 3 or 5
585H Institution Management 3 or 5
585I Teaching 3 or 5
585J Family and Child Development 3 or 5
585L Home Economics Extension 15
W. Sp.
Not open to students with credit for 681.

599 Home Economics as a Profession U 2
A. W., Sp. 2 cr.
The nature and status of home economics as a field study and as a profession. Scott.

601 Clothing U G 3
W., Sp. 2 2-hr. lab.
Prereq.: 531 or equiv.
Application of principles of tailoring in the construction of a suit or coat. Millican.

604 Clothing: Advanced Design Analysis U G 5
A., W., Sp., Su. 2 cr., 2 2-hr. lab.
Prereq.: 531 or equiv.
Not open to students with credit for 503.
Creative interpretation of dress design terminating in finished garments developed through the media of flat pattern and draping. Meacham, Millican.

610 Nutrition U G 5
W. 5 cr.
Prereq.: 548, Physiol. 422 or 507, and Agr. Bio. 610 or 621, or equiv.
Modern concepts of normal nutrition. Green.

612 Nutrition: Diet Therapy U G 3
Sp. 3 cr., other hrs. arr.
Prereq.: 610 or equiv. or permission of instructor.
Modern concepts of clinical nutrition and abnormalities treated by modification of the diet. Prudencet.

615 Experimental Work in Food Preparation U G 5
A., Sp. 2 cr., 3 3-hr. lab.
Prereq.: 559, Agr. Bio. 610 or 620, or equiv.
Application of experimental methods to problems involved in preparation of foods. Prudencet.

616 Nutrition of Infants and Children U G 3
Su. 3 cr.
Needs of children for good nutrition from the embryonic stage through adolescence. Prudencet.

619† Household Equipment U G 3
W. 2 cr., 1 2-hr. lab.
Prereq.: 506, 513 or concur.
Application to home situations of the recent development in lighting with emphasis on selection, care, and use of home lighting equipment. Everhart.

622 Household Equipment: Performance U G 5
Testing
W. 2 cr., 3 2-hr. lab.
Prereq.: 506, 550 or equiv., 5 cr. hrs. of Microbiol. and 10 additional cr. hrs. of natural science.
Experienced problems on the performance of the major types of household equipment used in preparation of food. Bloom.

623 Household Equipment: Performance U G 5
Testing
A. 2 cr., 3 2-hr. lab.
Prereq.: 4th yr. standing in Home Ec. or permission of instructor and 505, 506, or equiv.
Experience in the techniques and reporting of experimental investigations dealing with household equipment used in laundering and other cleaning processes. Bloom.

627 Home Management U 4
A. W., Sp., Su. 3 cr., lab. hrs. arr.
Prereq.: Senior standing.
Report to Room 301, Campbell Hall, to make application and to check for eligibility at least two qtrs. in advance.
Application and integration of management principles to operation of a household. Lloyd, Newkirk.

628 Selection of Furnishings for the Home U G 3
Sp. 2 cr., 1 3-hr. lab. Field trips arr.
Prereq.: 512, Econ. 402 or 406, 503 or 506 or equiv.
Consumers’ problems in the selection of home furnishings. Blakenore.

630 Selection of Food and Equipment U G 5
for Institutions
A. 5 cr.
Prereq.: 570, and Econ. 402 or 503 or 406 or 506 or equiv. or permission of instructor.
Principles and standards for selection of food, equipment, and furnishings in institution food service, management and layout. Hargers.

631 Quantity Food Production and Service U G 5
A., W. 1 2-hr. cl., 8 hrs. lab.
Prereq.: 570; 630 or concur.
Individual experience in application of food preparation principles to quantity production, use and care of large equipment, standardized formulae and costs; service to the public. Hargers, Cremer.

632 Institution Organization and Management U G 5
Sp. 3 cr., 6 hrs. lab.
Prereq.: 630, 631 and Bus. Org. or permission of instructor.
Principles of business organization and management and principles of learning applied to the management of food service operations; supervised experience in meal management. Hargers, Cremer.

633† School Lunchroom Management U G 3
Su. 3 cr., 1 hr. arr.
Prereq.: 551 or 610, 570, or equiv., and permission of instructor.
A general course on management problems in a school lunch program. Cremer.

A-125
COURSES OF INSTRUCTION
HOME ECONOMICS

634  Sanitation for Food Serving Establishment  U G 3
Sp.  1 1-hr., 1 2-hr. cl.
Prereq.: Microbiol. 607 or equivo.
Application of principles involved in sanitary food handling. Practical problem concerned with protection of health and with prevention of food spoilage and contamination. Cremer.

640  Food and Nutrition Seminar  U 2
Sp.  2 cl.
Prereq.: 4th yr. standing.
Reports based on current research, recent summaries and articles which give perspective in food and nutrition.

662  Child Development  U G 3
W.  3 cl., 2 1-hr. observation periods.
Prereq.: 561, or equivo.
Growth and development of children from six through adolescence with emphasis on maturation patterns and individual differences. Hendrickson.

663  Infant Guidance and Care  U G 3
A.  2 cl., 1 2-hr. lab. arr.
Prereq.: 548, 561, and Microbiol. 506, or equivo.
Pattern of development during infancy and the second year of life, and responsibilities of adults for providing a home environment favoring optimum development. Hendrickson.

664  Nursery School Activities  U 3
A. W, Sp, Su.  3 cl.
Prereq.: 581 or 563 and 665 or concour.
Not open to students with credit for 661.
Application of principles of development to program planning. Modification of activities for age level, ability, experience, group and individual needs. Dickcheid.

665  Nursery School Practicum  U 2
A. W, Sp, Su.  1 conf. hr., 2 2-hr. lab.
Prereq.: 561 and 664 or concour.
Not open to students with credit for 661.
Participation in the nursery school as a student teacher applying theory covered in 664. Sawyer, Dickcheid.

666  Seminar in Child Development  U 1
W.  1 cl.
Prereq.: 561, 563, 664 or permission of instructor.
Review, interpretation, and evaluation of current literature and research in defined areas, with emphasis on recommended professional standards in group care of children. Staff.

670  Clothing: Fashion  U G 3
W.  3 cl.
Prereq.: 5 cr. hrs. Fine Arts and 10 cr. hrs. social science.
Fashion as a social force—its influence on production, distribution and consumption of textiles and clothing. Gilmore.

671 * Textiles  U G 3
W.  1 cl., 2 2-hr. lab.
Prereq.: 505 or equivo. and 10 cr. hrs. natural science.
Experience in planning and conducting textile tests and in evaluating resulting data. Development, present status, and importance of textile testing. Lapointy.

672  Textiles: Historic  U G 3
W.  2 cl.
Prereq.: 505, 5 cr. hrs. Fine Arts, and 10 cr. hrs. social science.

673  Textiles: Recent Developments  U G 3
Sp., Su. 3 cl.
Prereq.: 4th yr. standing in Home Ec. and 505 or equivo.
Recent developments and research. Discussion and reports based on individual assignments. Lapointy.

680  Textiles and Clothing Seminar  U 2
Sp.  2 cl.
Prereq.: 4th yr. and major standing in textiles and clothing.
Special reports and readings in textiles and clothing which contribute to professional effectiveness and promote integration of information among specialists in the two fields.

681† Home Economics Extension Methods U G 5
Sp.  4 cl., 1 2-hr. lab.
Prereq.: Agr. Ed. 538 or permission of instructor and admission to Home Ec. Education Curriculum.
Home Economics extension methods, relationship of extension education to other educational movements, resources of state, county, and community. Warfield.

701  Special Problems in Home Economics  G 2, 3, or 5
A, W, Sp, Su.  1 conf. or more.
Prereq.: Graduate or senior standing, 6 cr. hrs. in the area of Home Ec. in which the problem is taken, cumulative point hr. average of 2.7 or above, and permission of instructor.
Problems in various phases of home economics chosen for individual study.

701A  Food  

701B  Nutrition and dietetics  

701C  Textiles  

701D  Clothing  

701E  Home Furnishing  

701F  Household Equipment  

701G  Home Management  

701H  Institution Management, equipment, and food buying  

701I  Teaching home economics  

701J  Family and Child Development  

702† Supervision of Home Economics Teaching  G 3
Su.  3 cl.
Prereq.: 741 or permission of instructor.
For experienced teachers of home economics who are interested in supervising student teachers or in working with home economics teachers in service.

705† Research Methods in Nutrition  G 3
A.  3 cl.
Organization, methods, analysis of data and reporting projects in nutrition research. Prudent.

715† Introductory Food Research  G 3
Sp.  1 cl., 2 3-hr. lab.
Prereq.: 615, Agr. Bio. 610 or equivo.
Individual investigations in food preparation, processing in the home and food storage carried out in laboratory, analyzed and reported. Prudent.

A-126
719 **Home Management Development and Theory**
A. 3 cl.
Prereq.: 560 or permission of instructor.
Historical development and present trends in home management with emphasis on theory and practice. Newark, Deacon, Maloch.

720 **Home Management: Activity Analysis**
Sp. Su. 2 cl.
Prereq.: Grad. standing in Home Ec., 10 cr. hrs. in home management or household equipment, and permission of instructor.
Advanced study in application of work principles to design of appliances, work space areas, and methods of work in the home. Maloch.

721 **Family Economic Resources and Functions**
W. 3 cl.
Prereq.: Econ. 655 or equiv. and permission of instructor.
Principles, major problems and trends in the economics of the family. Newark, Deacon.

731 **Food Cost Analysis for Institutions**
A. 2 2-hr. cl.
Prereq.: 633, Acc. 403 or Acc. 510 or equiv.
Records used in large quantity foods service and house units and their use in budgeting and food cost control. Harper.

735 **Recent Developments in Food and Nutrition Research**
Su. 3 cl.
Prereq.: Agr. Bio. 610 or 620, or equiv. or permission of instructor.
Brief survey of recent research. Prudent.

740 **Home Economics in American Education**
A. 2 cl.
Prereq.: 541 or equiv. and permission of instructor.
An overview of home economics at the elementary, secondary, higher education and adult levels. General trends in enrollment, curriculum and guidance, supervision, administration and research.

741 **The Teaching of Home Economics**
Su. 3 cl.
Prereq.: 740 or equiv. and permission of instructor.
Home economics in integrated, core, experimental and other special types of programs.

742 **Evaluation in Home Economics**
Sp. 3 cl.
Prereq.: 740.
Procedure for appraising student progress in the attainment of objectives. Construction of evaluation instruments, analysis and interpretation of data from evaluation programs.

750 **Research Methods in Home Economics**
A. Su. 3 cl.
Prereq.: Master’s degree students in Home Ec.
Nature of research in various areas of the field; criteria for setting up a research problem; techniques for collecting and analyzing data.

761 **The Family: The Early Years**
W, Su. 2 1/2-hr. cl.
Prereq.: Psychol. 670, Soc. 670 or equiv., graduate standing or permission of instructor.
Relationships and adjustments in family living with emphasis on the early and expanding stages of the family life cycle. Graduate Staff.

762 **Administration of Day Care Centers**
A, Su. 3 cl.
Prereq.: 664, 665 or equiv.
Program planning to meet developmental level and needs of young children. Minimum and recommended standards. Hege.

771† **Textiles: Analysis**
W. 1 cl., 2 4-hr. lab.
Prereq.: 671 or equiv., and 30 or 60 hrs. Chem.
Application of chemical techniques to the quantitative and qualitative analysis of textile materials, including analysis of fiber content and non-fibrous materials. Lapitsky.

799 **Home Economics Workshop**
Su. Fulltime for 3 weeks.
Prereq.: Graduate standing in Home Ec. or a closely related field and permission of instructor. Repeatable to a maximum of 12 cr. hrs.
Workshops in the following phases:

799A† **Foods**

799B† **Nutrition**

799C† **Textiles**

799D† **Clothing**

799E **Home Furnishing**

799F† **Household Equipment**

799G† **Home Management**

799H† **Institution Management**

799I† **Home Economics Education**

799J† **Family and Child Development**

801 **Seminar in Textiles and Clothing**
A, Sp, Su. 2-3 cl.
Prereq.: Grad. standing in Home Ec. and permission of instructor. Repeatable.
(Topics listed in 235A Campbell Hall) Gilmore, Lapitsky.

810 **Seminar in Foods and Nutrition**
A, W, Su.
Prereq.: Grad. standing in Home Ec. and permission of instructor. Repeatable.
(Topics listed in 235B Campbell Hall) Prudent, Viscio, Green.

820 **Seminar in Home Management and Family Economics**
Sp. 1-3 cl.
Prereq.: Grad. standing in Home Ec. and permission of instructor. Repeatable.
(Topics listed in 166B Campbell Hall) Deacon, Maloch, Newark.

821 **Seminar in Housing and Equipment**
Sp. 1-3 cl.
Prereq.: Grad. standing in Home Ec. and permission of instructor. Repeatable.
(Topics listed in 166C Campbell Hall) Graduate Staff.
Horticulture


402 General Horticulture
A, W, S. 5 cl.
Principles and practices underlying production and use of tree fruits, small fruits, vegetables, flowers, and ornamental plants, essential for the individual's use in everyday life. Dan, Hartman, Geisman, Hill.

403 Fundamentals of Horticulture
A. A, S. 5 cl.
A study of plant materials used in the horticultural industry emphasizing the development of gross plant structures in relation to cultural practices and the environment. Hartman.

407* Home Gardening. Herbaceous Plants
Floral Design and Lawns
A. Sp. 2 cl., 1 2-hr. lab.
Not open to students majoring in Floriculture and Ornamental Horticulture or to students with credit for 406.
Lawns, house plants and floral design; selection, planting, maintenance and use of herbaceous perennials, annuals and bulbs in the home garden.

408 Appreciation of Ornamental Plants
A. 2 cl.
Not open to students majoring in Floriculture and Ornamental Horticulture.
Value of ornamental plants to the individual and community including culture, identification, and use in planting design. Rice.

423 Principles of Food Preservation
Sp. 1 cl., 2 2-hr. lab.

440 Elementary Plant Propagation
Sp. 4 cl., 1 2-hr. lab.
Prereq. or concur.: Bot. 403. Bot. 402.
The principles and practices involved in the commercial propagation of florist crops, garden flowers, trees, shrubs, evergreens, small and tree fruits, and vegetables. Miller.

503 Principles and Practices of Pomology
A. 4 cl., 2-hr. lab.
Prereq.: 403.
Fundamentals of apple and pear production, including status of the industry, varieties, fruiting habits, soil management and fertilizers, pollination, fruit setting, propagation, pruning, and spraying. Hartman.

504 Principles and Practices of Pomology
W. 4 cl., 2-hr. lab.
Prereq.: 403.
A study of the stone and small fruit industry including the accepted cultural practices and the fundamental principles upon which these practices are based. Hill.
522 Principles of Vegetable and Potato Production
W. 4 cl., 2-hr. lab.
Prereq.: 402.
Practices and principles involved in the production and utilization of vegetables and potatoes, with emphasis on environmental and edaphic factors which influence growing and handling of these crops. Albam.

524 Canning, Freezing, and Dehydration
W. 3 cl., 2 2-hr. lab.
Fundamentals essential to commercial processing and utilization of fruits, vegetables, and related products. Sampling methods and physical quality evaluation techniques are studied. Gould.

526 Vegetable Forcing
W. 3 cl., 4 lab. hr.
A study of the origin and development of the vegetable forcing industry and present-day cultural practices with reference to the more important greenhouse vegetable crops. Albam.

542 Principles and Practices of Floriculture
A. 4 cl., 1 3-hr. lab.
Prereq.: 440 and Bot. 402.
Principles and practices of greenhouse operation including construction, heating, cooling, light, photoperiodism, temperature, humidity, ventilation, moisture, soils, fertilizer deficiencies and excesses, diseases, and insects. Kiplinger.

544 Garden Management
Sp. 3 cl., 2 2-hr. lab.
Prereq.: 403 or permission of instructor.
The identification, culture and landscape use of bulbs, annauls, herbaceous perennials, and garden roses. Identification of lawn grasses and turf management are also covered. Miller.

550 Ornamental Plants
A. 3 cl., 2 2-hr. lab.
Prereq.: 403 and Bot. 402 or permission of instructor.
A detailed study of deciduous trees, shrubs and vines, their identification, growth habits, culture, adaptation to environmental conditions, uses, combinations, and management in landscape plantings. Chadwick, Reisch.

551 Ornamental Plants
W. 3 cl., 2 2-hr. lab.
Prereq.: 403 and Bot. 402 or permission of instructor.
A detailed study of narrowleaf and broadleaf evergreens; their identification, growth habits, culture, adaptation to environmental conditions, uses, combinations, and management in landscape plantings. Reisch.

552 Ornamental Plants
Sp. 3 cl., 2 2-hr. lab.
Prereq.: 550 and 551.
A detailed study of several outstanding genera of woody ornamental plants and the use of deciduous and evergreen plants in simple landscape designs. Reisch.

570 Nursery Industry Experience
Prereq.: Major standing in Ornamental Horticulture, Agr. Ind. curricul. or 1st yr. standing in Hort. but without credit toward graduation.
Ten weeks of planned and supervised practical experience in an approved nursery, including completion of a special problem with a written report. Chadwick, Reisch.

601 Horticultural Plant Breeding
W. 2 cl., 1 2-hr. lab.
Prereq.: 503 or 522 or 542.
Plant breeding methods and genetic principles applied to horticultural plant improvement, including fundamentals of seed production, variety evaluation, certification, and maintenance. W. N. Brown.

609 The Post-Harvest Physiology of Horticultural Crops
A. 2 cl., 2 lab. hrs.
Prereq.: 503, 504, 522 or 512; Bot. 605, or permission of instructor.
The basic principles of post-harvest physiology, handling, and storage of fruits, vegetables, ornamentals, and flowers are stressed along with operational techniques of modern storages. Kretschm.

610 Weed Control in Horticultural Crops
Sp. 3 cl.
Prereq.: 15 cr. hr. Hort. and 10 cr. hrs. Bot.
A study of ecological soil, environmental, and cultural factors which influence weed development in horticultural crops and a review of principles of chemical and mechanical weed control. Albam.

622 Commercial Vegetable Crops
Sp. 4 cl., 1 2-hr. lab.
Prereq.: 522.
The culture of the principal vegetable crops, including history, plant characteristics, physiology, propagation, climatic and edaphic adaptations, and specialized production technology. W. N. Brown.

624 Specialty Products, including Pickling and Fermentation
A. 3 cl., 2 3-hr. lab.
The technology and commercial manufacture of jams, jellies, preserves, syrups, pickles, sauerkraut, beverages, prepared dinners, soups, condiments, dressings and dry pack items. Geisen.

629 Food Products Examination
W. 3 cl., 2 2-hr. lab.
Prereq.: 423.
Food laws, regulations, grade standards, and the technical control of processed foods. Interpretation of laboratory analysis for control of product quality. Gould.

631 Commercial Management and Practices with Horticultural Products
Su. 1 cl., 2 4-hr. lab.
Prereq.: 524.
Technology and commercial processing of the major fruits and vegetables. Emphasis on grade relationships, yield and unit operation. Field trips to commercial processing plants. Gould.

643 Principles and Practices in Floriculture
W. 4 cl., 1 3-hr. lab.
Prereq.: 542 and Bot. 605 and/or concurs, 606.
Not open to students with credit for 543.
Physiological principles and environmental factors in production of azaleas, begonias, bulbs, chrysanthemums, cyclamen, geraniums, hydrangeas, poinsettias, roses, safflowers, and other potted flowering and foliage plants. Kiplinger.

645 Principles and Practices in Floriculture
Sp. 4 cl., 1 3-hr. lab.
Prereq.: 542 and Bot. 605 and 606 or concurs.
Not open to students with credit for 543.
Physiological principles and environmental factors in production of azaleas, carnations, chrysanthemums, orchids, roses, snapdragons and other cut flower crops. Production costs of crops are analyzed. Kiplinger.

650 Principles and Practices of Nursery and Garden Store Management
Sp. 4 cl., 1 3-hr. lab.
Prereq.: 440, 550, 551 and Bot. 605.
Fundamental principles and practices involved in site selection, layout, soils, fertilization, transplanting, pruning, pest control, digging, storage, grading, packaging, inventory control, merchandising and garden store management. Chadwick.
COURSES OF INSTRUCTION

HORTICULTURE

651 Floral Design and Marketing of Florist's Crops  U G 5
Sp. 3 cl., 3 3-hr. lab.
Prereq.: 443 and Econ. 406 or 506.
Not open to students with credit for 546.
Fundamental of floral design; flower shop management; principles and practices in handling, packaging and selling florists' crops and supplies through wholesale and retail outlets. Reich, Kiplinger.

683 Arboriculture  U G 5
A. 4 cl., 1 3-hr. lab.
Prereq.: 550 and Bot. 606.
Study of environmental factors affecting plant growth and the planting, fertilization, pruning, cabling, and pest control practices involved in commercial aboriculture, city forestry, and park maintenance. Chadwick, Reich.

701 Minor Investigations  U G 2-5
A, W, Sp, Su.
Prereq.: Permission of instructor.
Special problems in the fields of pomology, vegetable gardening, floriculture and ornamental horticulture, horticultural products or forestry.

705 Seminar in the Historical Literature of Horticulture  U G 3
A. 3 cl.
Prereq.: 503 or 622 or 643 or 653 or permission of instructor.
History and literature of horticulture from prehistoric times to the present. Trends and events during the 20th Century receive particular emphasis. Hoolett.

710 Theories and Techniques Employed in the Horticultural Processing Industry  U G 2
A, W, Sp, Su.
Repeatable by undergraduates to a maximum of 6 cr. hrs.
b. A. Processing Methodology. Gould
c. W. Packaging Materials and Methodology. Geisman

712 Experimental Horticulture  U G 4
W. 2 cl., 2 3-hr. lab.
Prereq.: Grad. standing and Bot. 605 and 606 or equiv.
Effect of excesses and deficiencies of micro-nutrients upon growth and fruiting of horticultural plants, including the techniques for detecting and correcting such conditions. Hill.

713 Advanced Plant Propagation  U G 5
W. 4 cl., 1 3-hr. lab.
Prereq.: 440 and 550 or equiv., and Bot. 605.
A study of the basic anatomical and physiological principles involved in the propagation of horticultural plants by cuttings, grafts, buds, and seeds. Childwick.

804 Horticultural Seminar  G 1
A, W

810 Advanced Studies in Horticultural Science  G 2 or 3
Prereq.: Permission of instructor.
b. W. Morphological and anatomical studies of vegetative plant parts as influenced by environment. Hartman
c. A. Post-harvest physiology of horticultural crops and plants.
d. A. Advanced vegetable physiology. Alban
e. W. Advanced horticultural crop breeding. Brown

Industrial Engineering

Office: 125 Industrial Engineering Bldg., 190 West 19th Avenue.
PROFESSORS: ADAM (Chairman), BISHOP, CARSON, EDMONDSON (Emeritus), GREEN, LEHOCKY (Emeritus), MOORE, MORRIS, RIEFFERD, and RICKWELL; ASSOCIATE PROFESSOR: MILLER; ASSISTANT PROFESSORS: BROWN, ERNST, GIFFIN, HOOVER, KIBBEY, OVERBY, and ROBT. AND INSTRUCTORS.

404 Foundry Practice*  U 3
A, Sp. 2 cl., 4 lab. hrs.
Prereq.: Educ. 2nd yr. standing or permission of chairman.
Not open to students in the College of Engineering. Safety glasses must be worn in laboratory.
Laboratory practice in bench, floor and machine molding, casting of gray iron and non-ferrous alloys with emphasis on non-ferrous technology.

420 Machine Shop Practice*  U 5
A, Sp. 10 cl. and lab. hrs.
Prereq.: Eng. Dr. 400 or equiv. Educ. 2nd yr. standing or permission of chairman.
Not open to students in the College of Engineering. Safety glasses must be worn in laboratory.
Laboratory practice on basic machine tools. Course objective is to develop skills and knowledge that are essential for the Industrial Arts teacher at the secondary level.
* Courses 404, 420, 519, 521, and Weld E. 415 require the use of safety glasses; however, each student needs only one pair for all courses. In the event that the student must have prescription lenses, he shall obtain his safety glasses during the
quarter preceding their first use. This may be done through the Optometry Clinic, Optometry Building, or through any registered optometrist.

519 Manufacturing Processes* U 4
A, W, Sp. 2 cl., 6 lab. hrs.
Prereq.: Engr. 3rd yr. standing or permission of chair- man. Safety glasses must be worn in the laboratory. Fundamentals and interrelationships of the principal manufacturing processes. Laboratory work in the areas of foundry, machine tools, heat treating and welding.

521 Machine Tool Applications* U 5
W, Sp. 3 cl., 4 lab. hrs.
Prereq.: 519 or permission of chairman. Safety glasses must be worn in laboratory.
Industrial Engineering aspects of machine tool usage. Emphasis upon process choice and economic factors.

602 The Principles of Engineering Management U 5
A, Sp. 5 cl.
Prereq.: 3rd yr. standing and permission of instructor.
A consideration from an engineering standpoint of the fundamentals of engineering management.

614 Manufacturing Equipment and Methods U 3
A. 2 cl., 2 1-hr. lab.
Prereq.: 514. Not open to students in the College of Engineering.
A survey including lectures, laboratory demonstrations and field trips, to acquaint the student with industrial production methods and equipment.

530 Junior Inspection Trip U 2
Sp. One week at end of W. Qtr.
Prereq.: Motor standing in Ind. E.
A group visit to various industrial plants. Students must register for the course and pay the laboratory fee at the beginning of the Spring Quarter.

633 Motion and Time Study U 3
A, W, Sp. 3 cl., 1 2-hr. lab.
Prereq.: Bus. Org. 676, 677, and Econ. 542.
Not open to students in the College of Engineering.
The objectives, scope, and techniques of time study and methods analysis are considered from the standpoint of the factory and office supervisor.

639 Practical Experience in an Industrial Organization U 6
A. Ten weeks during the summer between the 4th and 5th years.
The student shall present a satisfactory report upon the work done.

663 Methods Analysis and Time Study U 5
A, W, 3 cl., 4 lab. hrs.
Prereq.: 663 and Math. 547.
Principles, applications, and purposes of methods analysis, work measurement, process and operation analysis.

664 Work Measurement and Standards U 5
A, Sp. 3 cl., 4 lab. hrs.
Prereq.: 663.
Principles, applications, and purposes of work measurement and standards. Characteristics and limitations of techniques are discussed in detail, including link analysis and ratio delay.

667 Tool Engineering U 3
A. 2 cl., 4 lab. hrs.
Prereq.: 519.
The design of tools, jigs, and fixtures. The basic elements of fixture design, such as form, locating points, clamping devices, and the use of standardized parts.
* See footnote concluding second column, preceding page.

706 Industrial Quality Control U 3
W, Sp. 3 cl.
Prereq.: 502, Math. 547.
The application of probability theory, statistics, and control theory to problems in product inspection and process control. Economic evaluation of quality control techniques. Root.

708 Design of Production Systems U 5
A, Sp. 3 cl., 4 lab. hrs.
Prereq.: 663, 664 concur.
Integration of the methods and analytical techniques of industrial engineering into the design of a complete production system.

709 Production Engineering U 5
W, Sp. 3 cl., 6 lab. hrs.
Prereq.: 521, 663.
Not open for graduates credit for majors.
Fundamentals of production tooling and correlating with design and specifications of the product. Kibby.

714 Time and Motion Study U 3
Sp.
Prereq.: 3rd yr. standing.
Not open to majors in Ind. E.
Not open to students with credit for 663, 664.
Principles, aims, methods, and applications of time and motion study including job analysis, job standardization, formula construction, job evaluation and wage evaluation. Baker.

715 Principles of Industrial Engineering U 4
A, W. 4 cl.
Prereq.: Prof. Dies. 3rd yr. standing, Math. 546.
Not open to majors in Ind. E.
A survey of the industrial engineering phase of manufacturing with emphasis on principles and problem solving methods. Root.

761 Engineering Economy U 3
W, Sp. 3 cl.
Prereq.: Acc. 624 or 502, and Math. 547.
Not open for graduate credit to majors in Ind. E.

764 Production Programming U 3
A, Sp. 3 cl.
Prereq.: 761.
Mathematical formulation and solution of problems of scheduling, inventory control, logistics, etc. The course covers various linear models. Bishop.

771 Safety Engineering U 3
A, W. 3 cl.
Prereq.: 519 and 6 additional cr. hrs. in other laboratory courses including mechanical equipment.
The nature, cause, and costs of industrial accidents and occupational diseases. Methods of accident prevention, physical, supervision, and educational. Ohio laws, regulations, and aids.

Prereq.: 5th yr. standing and permission of instructor.
Repeatable to a maximum of 24 cr. hrs.
The student must register for specific classes in areas as indicated below, and may register for more than one at a time.

A-131
798A  Job Evaluation
798B  Organized Labor and Industrial Methodology
798C  Industrial Applications for Statistics
798D  Quality Control
798E  Engineering Economy
798F  Production Planning and Control
798G  Contemporary Problems in Plant Layout and Design
798H  Materials Handling
798I  Time Standards and Estimates
798J  Human Factors in System Design
798K  Organization of Industrial Engineering Functions
798L  Production Engineering
798M  Industrial Safety Problems
799  Special Problems in Industrial Engineering U G 1-6

This course is intended to give the advanced student an opportunity to pursue special studies not offered in fixed curricula.

A, W, Sp, Su.
Prereq.: 5th yr. standing and permission of instructor.

801  Seminar in Industrial Engineering G 2
A.

802  Seminar in Industrial Engineering G 2
W.

803  Seminar in Industrial Engineering G 2
Sp.

811  Methods Engineering G 3-12
A, W, Sp, Su.
Prereq.: 863 and 864.

Advanced work in one or more special phases of time study, motion study, job evaluation, wage analysis and payment systems, speed and effort rating. The viewpoint of unions and problems arising from labor-management relationships. Baker.

812  Advanced Systems Design G 3
W.
Prereq.: 788l.
Advanced work in the analysis and design of man-machine systems. Houland.

821  Problems in Production Engineering G 3-12
Prereq.: 709.

Advanced work in one or more phases of Production Engineering involving problems in production design, equipment planning, tool design, quantity and quality control. Kibby.

828  Advanced Studies in Plant Design and Materials Handling G 3-12
A, W, Sp, Su.
Prereq.: 708.
Advanced work in one or more special phases of plant design and materials handling. Miller.

840  Operations Research G 3
Prereq.: 706 and 781, or equiv.
Advanced work in the methodology and techniques of Operations Research.

842  Operations Research I G 3
A.
Prereq.: Calculus, probability theory and statistical methods, and permission of instructor.
Introduction to the nature and problems of Operations Research and the study of actual case histories in the field.

843  Operations Research II G 3
W.
Prereq.: 842.
The position of the model in Operations Research and the study of the important techniques and formal approaches to research problems.

844  Operations Research III G 3
Sp.
Prereq.: 843.
Consideration of topics in Operations Research including research methodology in the various sciences, and the conduct of actual Operations Research investigations.

851  Personnel Research in Engineering G 3-12
Industries
A, W, Sp, Su.
Prereq.: 602, 664.
Advanced work in one of the several phases of personnel management in engineering industries. Baker.

861  Research in Decision Processes G 3-12
A, W, Sp, Su.
Prereq.: 761 and 764.
Advanced work in decision theory and processes including criteria research, decision making under uncertainty and in conflict situations, and gaming techniques. Morris.

862  Decision Theory G 3
A, Sp.
Prereq.: 706, 781, and permission of instructor.
Introduction to normative decision models and their applications. Morris.

863  Control Theory G 3
Prereq.: 706, 764, 798l.
Advanced work in the theory of control of industrial operations. Bishop.

866  Programming and Control Research G 3-12
A, W, Sp, Su.
Prereq.: 706, 761, 764.
Advanced work in the several phases of programming and control theory. Consists primarily of application of mathematical methods to the formulation and solution of process programming and control problems. Bishop.

871  Safety Engineering Research G 3-12
A, W, Sp, Su.
Prereq.: 771.
Advanced work in one or more phases of safety engineering; plant design, equipment design, and other accident prevention programs. Rockwell.
International Studies

Office: 100 University Hall, 216 N. Oval Dr.
ASSOCIATE PROFESSOR JENEMZER (Chairman); PROFESSORS J. W. L. E. T. E., ROYCE, B. H., R. E. D., and R. M. S. M. H. M. T. A. M. N. M. R. E. A. M. N. M. R. E.

410 Basic Issues in World Affairs U 5
W. 3 cr.
General introduction to contemporary international problems, conducted cooperatively by members of several departments.

520 The Oriental World U 5
Sp. 5 cr.
Interdepartmental survey of contemporary Asian civilization, geographic and racial background, historical and cultural heritage, social organizations, economic and political problems, and international relations.

540 Introduction to the Soviet Union U 5
A, Sp. 5 cr.
A survey of the land, people, history, politics, social institutions, literature and arts of the Soviet Union, conducted by members of several departments. Nemzer and staff.

601 Selected Problems in International Studies U G 5
W. 2 cr.
Prereq.: Pol. Sci. 610 or equiv. Open only to Internat. S. majors or students with equiv. preparation.
Panel discussions, informal conferences, and a reading and research program arranged to meet the special needs of those enrolled. Nemzer and staff.

705 Honors Course U 3-5
A.
Prereq.: Senior standing and 40 cr. hrs. in the social sciences including 15 cr. hrs. in courses acceptable for a major in Internat. S., with a grade of A in at least half of these major courses and an average of B in the remainder.
Informal conferences to allow full scope to the initiative of the student. A special topic is assigned to each student. The results are tested by conferences and special reports. Minimum grade of B required for special honors credit.

706 Honors Course U 3-5
W.
See prereq. for 705.

707 Honors Course U 3-5
Sp.
See prereq. for 705.

Interdepartmental Seminars

589 Interdepartmental Seminar G 1-5
(See under Interdepartmental Seminars.)

590 Research in Industrial Engineering G Arr.
Research for thesis or dissertation purposes only.

895 Interdepartmental Seminar in Radio Astronomy G 1-5

896 Interdepartmental Seminar in Polar and Alpine Studies G 1-3
Sp. 1-3 hr. cr.
Permission of instructor.
Repeatable to a maximum of 9 cr. hrs.
A seminar on selected topics involving anthropology, biology, climatology, exploration, geology, glaciology, microbiology, and soils. Given cooperatively by the Institute of Polar Studies and the following departments: Agronomy, Anthropology, Botany and Plant Pathology, Civil Engineering, Geography, Microbiology, and Zoology and Entomology.

897 Interdepartmental Seminar in Natural Resources G 1
A seminar in natural resources conservation. Given cooperatively by the Natural Resources Institute and the following departments: Agronomy, Agricultural Economics and Rural Sociology, Agricultural Engineering, Botany and Plant Pathology, Geography, Horticulture and Forestry, and Zoology and Entomology.

898 Interdepartmental Seminar in Nutrition and Food Technology G 1
Sp.

899 Interdepartmental Seminars G 1-5
Two or more departments may collaborate in presenting seminars on subjects of mutual interest. Topics to be announced.
Italian

Office: 116 Derby Hall, 154 N. Oval Dr.
PROFESSORS: BABCOCK (Chairman), and GRIFFIN; ASSISTANT PROFESSORS: ANGELO and MACCINII.

401 Elementary Italian U 5
A, W. 5 cl.
Not open to students who are not eligible to take Eng. 416. May not be taken concur. with French 401-402, 402, Span. 401-402. Credit in 401 will be counted toward graduation only if followed by successful completion of 402, or if taken after successful completion of the fourth regular university course in another foreign language.

Elements of Italian grammar with oral and written exercises. Attention to ear training and oral practice. Elementary reading based on Italian geography, history and customs.

402 Elementary Italian U 5
W, Sp. 5 cl.
Prereq.: 401.
May not be taken concur. with French 401-402, Span. 401-402.
The elements of Italian grammar with abundant oral and written exercises. Development of conversational skill. Reading, vocabulary building, attention to Italian idioms. Modern Italian prose.

303 * Modern Italian Drama U 5
Sp. 5 cl.
Prereq.: 402.
Special attention given to Goldoni and Pirandello.

504 * Modern Italian Poetry U 5
Sp. 5 cl.
Prereq.: 402.
Carducci, Pascoli, D'Annunzio. MacCini and others.

505 Italian Neo-Realism U 5
W. 5 cl.
Prereq.: 402.
Italian Literature since the end of the second World War. MacCini.

510 Italian Conversation and Composition U 5
A, Sp. 5 cl.
Prereq.: 402 or equv. MacCini.

611 * Dante U G 3 or 5
W. 3 cl. in Eng.; 2 additional cl. in Ital. for 5 cr. hrs.
Prereq.: Permission of instructor.

621 * Petrarch and Boccaccio U G 3 or 5
W. 3 cl. in Eng.; 2 additional cl. in Ital. for 5 cr. hrs.
Prereq.: Permission of instructor.
Historical and aesthetic analysis of Petrarch's poetry. Petrarchism as a European phenomenon. Literary background of Boccaccio's prose and verse. Readings from the Decameron, MacCini.

631 * Modern Italian Fiction U G 3 or 5
Sp. 3 cl. in Eng.; 2 additional cl. in Ital. for 5 cr. hrs.
Prereq.: Permission of instructor.
Special emphasis on the novel from Manzoni to Svevo. MacCini.

701 Minor Problems in Italian U G 1-5
Prereq.: Permission of instructor. MacCini.

Japanese

Office: 2nd Floor University Hall, 216 North Oval Dr.
ASSOCIATE PROFESSOR CHING (Chairman).

401 Elementary Japanese U 5
A. 5 cl.
Kauai.

402 Elementary Japanese U 5
W. 5 cl.
Prereq.: 401.
Kauai.

403 Intermediate Japanese U 5
Sp. 5 cl.
Prereq.: 402.
Kauai.

404 Intermediate Japanese U 5
A. 5 cl.
Prereq.: 403.
Kauai.

505 Japanese Conversation U 3
W. 3 cl.
Prereq.: 401 or permission of instructor.
Practice in conversation.
Kauai.

506 Japanese Composition U 3
Sp. 3 cl.
Prereq.: 401 or permission of instructor.
Practice in composition. Review of vocabulary and grammar.
Kauai.

517 * Study Tour of Japan U 15
56 cr. hrs. at OSU; 8 weeks in Japan.
Prereq.: 55 cr. hrs. of Japanese or permission of instructor.
Advanced work in conversation and reading in order to prepare for the tour. In Japan only Japanese will be spoken. Some formal instruction will be given daily by the tour leaders.

609 Advanced Reading, Conversation, and Composition I U C 3
A. 3 cl.
Prereq.: 505 and 506 or permission of instructor.
Reading of contemporary prose and verse, presentation of oral and written reports, drill in pronunciation, practice in translation and composition. Wright.

610 Advanced Reading, Conversation, and Composition II U G 3
W. 3 cl.
Prereq.: 609 or permission of instructor.
Continuation of 609. Wright.
Journalism

Office: 304 Journalism Bldg., 248 West 18th Avenue.

PROFESSORS HALL (Director), BAUMANN and FOLLETT (Emeritus); ASSOCIATE PROFESSORS MAGUIRE, NORTON, and SEIFERT; ASSISTANT PROFESSORS BOSTWICK, DRENTEN, GAUMER, HUDSON, LAUER, McGUIFF, and TITCHENER.

401 Introduction to Journalism
A, W, Sp, Su. 3 cl.
Prereq.: Engl. 410.
An introduction to newspapers, magazines, radio-television, and public relations. Laufer, Lemmon, McGuiFF.

402 News Writing
A, W, Sp. 2 cl., 1 lab. hr.
Prereq.: 401.
Writing news and feature articles. Hudson, Laufer, Lemmon.

501 Editing
A, W, Sp, Su. 2 cl., 2 lab. hrs.
Prereq.: 402.
Editing of copy, headline writing, re-writing, and general copy desk work. Introduction to photo editing and make-up. Lemmon, McGuiFF.

505 Reporting Public Affairs
A, W, Sp. 3 cl.
Prereq.: 501, Pol. Sci. 401, 410, or 507.
Reporting of court and governmental news. Students attend court trials, legislative and council sessions, visit governmental agencies as reporters and write news stories. Gaumer, Bostwick.

508 Technical Writing
A, W, Sp, Su. 3 cl.
Prereq.: 3rd or 4th yr. standing.
Not open to students majoring in Jour.
Writing for special, trade and professional publications. Designed for non-journalism students in Agriculture, Engineering, Business, Education, Dentistry, Law, Medicine, Home Economics. Maguire, Seifert.

509 Journalism Laboratory
A, W, Sp, Su. 1 3-hr. lab.
Prereq.: 402 or permission of instructor.
Repeatability to a maximum of 5 cr. hrs.
Laboratory in one or more of the following: reporting, news writing, feature writing, broadcast news, editing, makeup, critical writing, photojournalism, cartooning. Drenten, Mullins.

510 Photojournalism
A, W, Su. 2 cl., 1 2-hr. lab.
Prereq.: 501.
Reporting the news with a camera. How to recognize, develop, and create picture stories. Experience in coordinating words and news pictures. Picture editing. Layout. Drenten.

517 History of U.S. Journalism
Sp. 3 cl.

519 Typography and Printing
A, W, Sp, Su. 2 cl., 2-hr. lab.
Typographic and printing processes and their relation to graphic arts in the mass media. Gaumer.

555 Factual Writing
A, W, Sp, Su. 5 cl.
Prereq.: Engl. 418 or equiv.
Not open to students with credit for 401.
Instruction and practice in gathering and presenting factual material. Observation, research, interviewing, critical analysis, and rewriting are stressed. Barton, Hudson, McGuiFF.

602 Magazine Writing I
A, W, Sp, Su. 3 cl.
Prereq.: Major standing in Jour. or permission of instructor.
Non-fiction writing for publication in general, professional, trade or Sunday magazines. Norton.

603 The Writing of Reviews and Criticisms
A, Sp, Su.
Prereq.: Major standing in Jour. or permission of instructor.
Study of the work of the dramatic and literary critic, especially on newspapers and magazines. Practice in writing reviews and criticisms. Barton, Titchener.

605 News in Broadcasting I
A, Sp, Su. 2 cl., 2-hr. lab.
Prereq.: Major standing in Jour.; others by permission of instructor.

606 News in Broadcasting II
A, W. Sp. 1 cl., lab. arr.
Prereq.: 605 or equiv.
Practice in writing and editing news for broadcasting at various broadcasting stations, and voice of newscasts at WOSU and WOSU-TV. Drenten.

607 Special Radio and Television News Programs
W. 2 2-hr. lab-labs.
Prereq.: 605 or permission of instructor.
Planning and production of special news programs; such as the sportscast, the interview, special events, and documentaries. Drenten.
COURSING OF INSTRUCTION
JOURNALISM

608 The Press and Basic Issues of Our Times U G 3
A, W, Sp. 1 cr., 1 2 hr. seminar.
Prereq.: Senior or graduate standing, or permission of instructor.
Distinguished faculty members and nationally known off-campus specialists in economics, history, journalism, law, political science, sociology, the sciences, will analyze issues in the news. Boston, Maguire.

612 Magazine Writing II U G 3
W, Sp, Su. 3 cl.
Prereq.: 602.
Continuation of 602 with emphasis on the full-length magazine article. Norton.

613 Journalism Laboratory U G 1
A, W, Sp, Su. 1 3-hr. lab.
Prereq.: Senior or graduate standing.
Repeatable to a maximum of 3 cr. hrs.
Laboratory work in one of the following: reporting, news writing, feature writing, editing, makeup, reviews, photojournalism, or news broadcasting. Drennen, Mulhins.

615 Journalism Laboratory U G 2-5
A, W, Sp, Su.
Prereq.: 5 cr. hrs. Journ. lab. or permission of Director of the School of Journalism.
Repeatable to a maximum of 10 cr. hrs.
Provides credit for those holding responsible positions or the Ohio State Lantern or in approved broadcasting stations. Drennen, Mulhins, Harkey.

617 Public Relations I U G 3
A, Sp, Su. 3 cl.
Prereq.: 3rd yr. standing.
Survey of public relations—history, social, economic, and political implications; applications in business, industry, government, trade and professional associations and education, labor, social agencies and politics. Seltzer.

618 Public Relations II U G 3
W. 3 cl.
Prereq.: 617.
Study of research methods in public relations and mass media. Review of contemporary research in public opinion and attitude measurement. Seltzer.

619 Public Relations III U G 3
Sp. 3 cl.
Prereq.: 617 or permission of instructor.
Industrial editing. The history, development, and scope of institutional publications; practice in the planning and preparation of publications. Seltzer.

621 The Editorial Page U G 3
A, W, Sp. 1 3-hr. cl.
Prereq.: 4th yr. standing.
Study of the purpose, form, style, and spirit of the editorial. Consideration of current events, practice in news interpretation, and other editorial writing. Harkey.

624† Mass Media Research U G 3
A, W, Sp, Su. 3 cl.
Prereq.: 4th yr. or graduate standing.
Types and methods of qualitative and quantitative research in the news media. Analysis of methods and findings of typical studies.

625 Journalism Internship U 2-5
A, W, Sp, Su.
Prereq.: 501 or permission of Director of the School of Journalism.
Employment in newspaper, magazine, broadcasting, or public relations work off-campus. Barton, Drennen.

626† Newspaper Management, Circulation, and Advertising U 5
A, W, Sp. 4 cr., 3 1-hr. lab.
Prereq.: 4th yr. standing.
Consideration of the tasks and problems of newspaper management with emphasis on circulation policies and methods and those affecting advertising.

627 Public Relations IV U G 3
A. 1 3-hr. cl.
Prereq.: 617 or permission of instructor.
Public relations methods and techniques; publicity and the mass media; preparation and production of special media. Arter.

The Supervision of Journalism in Secondary Schools
(See Education 674).

629 Senior Reporting U G 3
A, W, Sp. 1 3-hr. cl., conf. arr.
Prereq.: Journ. 4th yr. standing or permission of instructor.
Intensive reporting and writing. Mullins.

700 Honors Course U 3-5
A.
Prereq.: Senior standing, a grade of A in half of the major courses and a B in the remainder, permission of Director of School of Journalism.
A reading program for students who are candidates for a degree with distinction in Journalism. Barton.

701 Honors Course U 3-5
W.
Prereq.: Senior standing, a grade of at least A in half of the major courses and a B in the remainder, permission of Director of School of Journalism.
A continuation of 700. Barton.

702 Honors Course U 3-5
Sp.
Prereq.: Senior standing, a record of at least A in half his major courses and a B in the remainder, permission of Director of School of Journalism.
A continuation of 701. Barton.

711 Special Problems in Journalism U G 2-10
A, W, Sp, Su.
Prereq.: Graduate standing or permission of Director of the School of Journalism.
Repeatable to a maximum of 15 cr. hrs.
This course is designed to permit students to make extensive and significant studies in the field of Journalism.

714† Law of the Press, Radio, and Television U G 3
Sp. 3 cl.
Prereq.: 505 or permission of instructor.
History, principles, and provisions of the law of libel, slander, copyright and other statutes affecting newspapers, other publications and broadcasting.

802 Seminar in Journalism G 3-5
A, Su.
Integrated reading and research in the fields of Journalism.

803 Seminar in Journalism G 3-5
W, Su.
Integrated reading and research in the fields of Journalism.
LANDSCAPE ARCHITECTURE

School of Arch. and Land. Arch.
Office: 111 Brown Hall, 190 West 17th Avenue.
ASSOCIATE PROFESSOR TOBEY; INSTRUCTORS, and LECTurers.

507 History of Landscape Architecture U 3
A. 3 cl.
A critical and historical analysis of the organization of outdoor space to meet varying needs of man from ancient times to the Renaissance. Tobey.

550 Design of Gardens and Small Properties U 5
Sp. 2 cl., 9 lab. hrs.
Landscape design for non-professional student emphasizing the design, construction, and planting of residential properties. Tobey.

587 Landscape Construction U 3
A. 1 cl., 6 lab. hrs.
Prereq.: Land. Arch. 3rd yr. standing.
Interpretation of topography. Problems in the development of ground forms, in road alignment, and construction. Tobey.

588 Landscape Construction U 3
W. 1 cl., 6 lab. hrs.
Prereq.: 587.
Continuation of 587. Tobey.

617 Intermediate Landscape Design U 6
A. 1 cl., 15 lab. hrs.
Prereq.: Land. Arch. 4th yr. standing. Arch. 519.
An intermediate course in design with original problems involving outdoor space such as residential properties, land subdivisions, parks and other public areas. Thornberry.

618 Intermediate Landscape Design U 6
W. 1 cl., 15 lab. hrs.
Prereq.: 617.
Continuation of 617. Thornberry.

619 Intermediate Landscape Design U 6
Sp. 1 cl., 15 lab. hrs.
Prereq.: 618.
Continuation of 618. Thornberry.

627 Planting Design U 3
A. 1 cl., 6 lab. hrs.
Not open to students with credit for 727.
A study of the use of plant material in landscape design with particular emphasis on composition and ecology. Thornberry.

629 Planting Design U 3
Sp. 1 cl., 6 lab. hrs.
Prereq.: 627.
Not open to students with credit for 729.
Continuation of 627. Thornberry.

687 Landscape Construction U 4
A. 1 cl., 9 lab. hrs.
Prereq.: 586.

688 Landscape Construction U 4
W. 1 cl., 9 lab. hrs.
Prereq.: 687.
Continuation of 687. Thornberry.

689 Landscape Construction U 4
Sp. 1 cl., 9 lab. hrs.
Prereq.: 688.
Continuation of 688. Thornberry.

701 Special Studies in Landscape Architecture U C 2-10
A.
Prereq.: Land. Arch. 4th or 5th yr. standing and permission of the department.
For students in the Graduate School and those who wish to pursue special studies in landscape architecture. Staff.

702 Special Studies in Landscape Architecture U C 2-10
W.
Continuation of 701. Staff.

703 Special Studies in Landscape Architecture U C 2-10
Sp.
Continuation of 702. Staff.
COURSES OF INSTRUCTION

LANDSCAPE ARCHITECTURE

717 Advanced Landscape Design
A. 1 cl., 15 lab. hrs.
Prereq.: Land. Arch. 5th yr. standing. 619.
The integration of landscape construction and planting design in the development of problems in advanced landscape design. Individual research and criticism. Packard.

718 Advanced Landscape Design
W. 1 cl., 15 lab. hrs.
Prereq.: 717.
Continuation of 717. Packard.

719 Advanced Landscape Design
Sp. 1 cl., 15 lab. hrs.
Prereq.: 718.
Continuation of 718. Packard.

759 Professional Practice
A. 3 cl.
Prereq.: Land. Arch. 5th yr. standing. 889.
A study of professional practice including ethics, office organization and the preparation of contracts and specifications. Tobey.

787 Advanced Landscape Construction
A. 1 cl., 9 lab. hrs.
Prereq.: 689.
Theory and methods, codes and specifications pertaining to advanced landscape construction, and preparation of working drawings. Packard.

788 Advanced Landscape Construction
W. 1 cl., 9 lab. hrs.
Prereq.: 787.
Continuation of 787. Packard.

789 Advanced Landscape Construction
Sp. 1 cl., 9 lab. hrs.
Prereq.: 788.
Continuation of 788. Packard.

401 Elementary Latin
A. 3 cl.
Not for students who have studied Latin. Credit in 401 will be counted toward graduation only if followed by successful completion of 402, or if taken after successful completion of the fourth regular University course in another foreign language.
Grammar and practice in translation of the Latin idiom.

402 Elementary Latin and Caesar
W. 5 cl.
Prereq.: 401.
Continuation of grammar and selected readings.

404 Cicero
A, W, Sp. 5 cl.
Prereq.: 403, 413, or 2 yrs. of high school Latin.
Readings from Cicero with review of syntax.

405 Vergil
W, Sp. 5 cl.
Prereq.: 404 or equiv. in high school Latin.
Readings from the Aeneid.

406 Horace
A. 5 cl.
Prereq.: 405 or 4 yrs. of high school Latin.
The odes of Horace through the first book with selected poems from the later books.

407 Livy
W. 5 cl.
Prereq.: 403 or 4 yrs. of high school Latin.
The first book of Livy describing the founding of the Roman state.

408 Latin Comedy
Sp. 5 cl.
Prereq.: 405 or 4 yrs. of high school Latin.
Selected plays of Plautus and Terence.

412 Latin Review
A. 5 cl.
Prereq.: Placement test.
This course is intended for those students whose elementary Latin will begin with a review and continue as a preparation for Latin 404.

415 Intensive Introduction to Latin
U 5, 10, 15
Su. 10 cl. and 10 or more hrs. of supervised study.
Prereq.: Permission of chairman.
Students with no prior credit in Latin must register for 15 cr. hrs. Full time of student required. Students with credit for 401-403 may register for 5 or 10 cr. hrs., although the course must be completed. Not open to students with credit for 404.

401 Latin

501 Tacitus, Martial
W. 3 cl.
Prereq.: 407 or 408.
Brunner.

502 Letters of Pliny and Cicero, Catullus
U 3
A. 3 cl.
Prereq.: 407 or 408.

503 Ovid, Sallust on Jugurtha, or Petronius
Sp. 3 cl.
Prereq.: 407 or 408.

Latin
Office: 217 Derby Hall, 154 North Oval Drive.
PROFESSORS TITCHENER (Chairman), ABBOTT, FORBES, and W. R. JONES; ASSOCIATE PROFESSORS LEJNIEK, and LENARDON; ASSISTANT PROFESSORS BERKOWITZ, BRUNNER, HOLSINGER, and MORTON.

See also Classical Languages and Literatures.

Students with two years of high school Latin should enroll in Latin 404; with three years of high school Latin, including Cicero, in Latin 406; with three years of high school Latin, including Vergil, in 404 or 406. 406 is advised for Latin majors. All students except those taking 401 are required to take a Placement Test, which will indicate the University course for which each is best prepared. A Placement Test will be given at the beginning of each quarter.

A-138
505  Grammatical Review  U  3
   A.  3 cl.
   Prereq.: 407 or 408.
Barnman.

540*  Essays of Cicero  U  5
   Su.  5 cl.
   Prereq.: 406, 407, 408 or equiv.
   Not open to students with credit for 520.

541*  Vergil: Eclogues, Georgics and Epic  U  5
   Su.  5 cl.
   Prereq.: 406, 407, 408 or equiv.
   Not open to students with credit for 521.

542†  Summer Lecture Series  U  2
   Su.  2 cl.
   Prereq.: 406, 407, 408 or equiv.
   Not open to students with credit for 522.
   a. The archaeology of Rome.
   b. Roman private life.
   c. Literary forms, writing, materials, books and libraries.
   d. History of Medieval Literature.
   e. Roman stoicism.

543†  Sallust on Catiline; Livy on Hannibal  U  5
   Su.  3 cl.
   Prereq.: 406, 407, 408 or equiv.

544†  Ovid, Metamorphoses  U  5
   Su.  3 cl.
   Prereq.: 406, 407, 408 or equiv.

603  Advanced Reading  U  G  3
   Su.  3 cl.
   Prereq.: 16 cr. hrs. of Latin more advanced than 405.

612  Latin Prose Composition  U  G  3
   W.  3 cl.
   Prereq.: 16 cr. hrs. of Latin more advanced than 405.
   Exercises and lectures on Latin idiom and style. Barnmann.

615  Proseminar I  U  G  3
   W.  3 cl.
   Prereq.: 16 cr. hrs. of Latin more advanced than 405.
   Lectures on the life and period of Cicero. Readings from
   the letters and essays. Latin 615 is designed especially for
   students preparing to teach Latin. Barnmann.

616  Proseminar II  U  G  3
   Sp, Su.
   Prereq.: 16 cr. hrs. of Latin more advanced than 405.
   Lectures on the life and works of Vergil, and his influence
   on modern literature; readings from the Eclogues and Georgics.

617  Proseminar III  U  G  3
   A.  3 cl.
   Prereq.: 16 cr. hrs. of Latin more advanced than 405.
   Lectures on topics suggested by the study of Caesar's Gallic
   and Civil Wars; special consideration of literary style, political
   and military campaigns. Titchener.

625  Introduction to Medieval Latin  U  G  3
   Sp.  3 cl.
   Prereq.: For majors in Class. Leng., 16 hrs. of Latin
   more advanced than 405; for others, two yrs. of high
   school Latin and a reading knowledge of a modern
   Romance language or German.
   Extensive reading in texts illustrating the history of Latin
   language and literature from the fourth through the thirteenth century.
   Forbes.

627  Vulgar Latin  U  G  3
   W.  3 cl.
   Prereq.: 16 hrs. of Latin more advanced than 405, or
   French 501 or equiv. Linguistic basis.
   Lectures and the study of texts and inscriptions illustrating the
   development of the popular speech. Abbott.

631  Private Reading and Minor  U  G  1-6
   Problems
   A, W, Sp, Su.
   Prereq.: One reading course more advanced than 408.
   Passages for private reading and topics for investigation will be
   suggested to meet the needs of individual students. Abbott, Babcock,
   Morford.

650  History of Roman Literature  U  G  3
   A.  3 cl.
   Prereq.: Three reading courses more advanced than 408.
   Repeatable for graduate credit.
   Lectures and assigned reading in literary histories on the development
   of Roman literature; required and suggested passages for translation
   in each author studied; weekly reports. Titchener.

651  History of Roman Literature  U  G  3
   W, Su.  3 cl.
   Prereq.: Three reading courses more advanced than 408.
   Continuation of 650. Abbott.

652  History of Roman Literature  U  G  3
   Sp, Su.  3 cl.
   Prereq.: Three reading courses more advanced than 408.
   Continuation of 651. Babcock.

701  Special Problems  U  G  1-4
   A, Su.
   Prereq.: 10 cr. hrs of 600 level work in Class. Leng., for
   class, lang., majors, or permission of instructor.
   Assigned reading and individual research. Registration for this
   course should be followed by a letter designating the field of
   study.
   a. Epigraphy.
   b. Paleography.
   c. Topography of Rome.
   d. Greek Art and Archaeology.
   e. History of the Latin Language.
   f. History of the Greek Language.
   g. Democracy in Fifth Century Athens.
   Latin e, d, e, f are not open to students who have had Latin 755,
   756, 721, and 725, respectively.

702*  Plautus and Terence  U  G  3
   A.  3 cl.
   Prereq.: 20 cr. hrs. of Latin more advanced than 405.
   Aim and accomplishment in Rome's earliest successful literary
   effort. Abbott.

703*  Horace  U  G  3
   W.  3 cl.
   Prereq.: 20 cr. hrs. of Latin more advanced than 405.
   The practice of literary theory in the poetic essay and the lyric
   of human philosophy. Titchener.

704*  Tacitus  U  G  3
   Sp.  3 cl.
   Prereq.: 20 cr. hrs. of Latin more advanced than 405.
   The last great literary exponent of the Greco-Roman theory of the
   method and value of historical writing. Forbes.

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7051* Seneca
A. 3 cl.
Prereq.: 20 cr. hrs. of Latin more advanced than 405.
The moral essay and philosophic drama of the Silver Latin period. Abbott.

7061* Livy and Republican History
W. 3 cl.
Prereq.: 20 cr. hrs. of Latin more advanced than 405.
Early attempts at historical writing down to the culmination in the Augustan Period. Titchener.

707† Prose Fiction: Petronius and Apuleius
Sp. 3 cl.
Prereq.: 20 cr. hrs. of Latin more advanced than 405.

720 Introduction to Historical Greek and Latin Grammar
A. 3 cl.
Prereq.: 10 cr. hrs. of 600 level work in the Classics.

800 Seminar
W, Sp.
Textual criticism and research problems. The author to be studied will be assigned by the instructor. Titchener.

950 Research in Classical Languages
G Arr.
A. W, Sp, Su.
Research for thesis or dissertation purposes only.

092 Appellate Practice I
W, Sp.
Procedural and substantive aspects of appellate practice. The student prepares a brief and presents an oral argument on the basis of assigned research materials. See Appellate Practice II and III. Herman and Most Court Governing Board.

093 Appellate Practice II
W, Sp.
Preparation of a brief and presenting an oral argument to a panel comprising members of law faculty, bench, and bar. (Appellate Practice II is required of all students not participating on the Law Journal. See Appellate Practice I and III.) Herman and Most Governing Board.

094 Appellate Practice III
A, Sp.
Evaluation of briefs and oral arguments presented in Appellate Practice I. (Appellate Practice III is required of all third-year students not participating on the Law Journal. See Appellate Practice I and II.) Herman and Most Court Governing Board.

500 Contracts
A. 3 cr., W. 3 cr., Sp. 3 cr. Credit given only on completion of all 9 cr. hrs.
Remedies for breach; offer and acceptance; consideration; third party beneficiaries; assignment of rights and delegation of duties; conditions; impossibility and frustration; statute of frauds. Bernstein, Nordstrom.

505 Torts
A. 3 cr., W. 3 cr., Sp. 3 cr. Credit given only on completion of all 9 cr. hrs.
Trespass to person and property; conversion; privileges; negligence; strict liability; nuisance; owners and occupiers of land; tort and contract, misrepresentation, defamation; right of privacy. Miller, Carpenter.

510 Property I
A. 3 cr., W. 3 cr. Credit given only on completion of all 6 cr. hrs.
Instruments of ownership as applied to both real and personal property; possessory interests; concurrent interests; marital interests; future interests; contractual modification of these interests. Callahan, Lynn.

511 Property II
Sp. 3 cl.
Acquisition and transfer of ownership; adverse possession; conveyances (deeds, mortgages, and leases); intestacy; wills; the recording systems; title registration. Callahan, Lynn.

515 Civil Procedure I
A. 3 cr., W. 3 cr. Credit given only on completion of all 6 cr. hrs.
Civil procedure in state and federal courts; abolition of common law forms of action; res judicata; jurisdiction of subject matter, person, and personal status; venue. Wills, Fink.

516 Civil Procedure II
Sp. 3 cl.
Origin and development of equity. Merger of "law" and "equity." Framing, interpretation, modification, enforcement, and vacating of decrees. Jurisdiction of the person and subject matter. Wills, Fink.

520 Criminal Law
A. 4 cl.
Criminal laws as means of attaining socially desirable ends, stressing criminal behavior and handling of those who engage in that behavior. Herman, Sklar.

530 Administrative Practice
W.
Introduction to administrative process; reconciliation of the primary features of this process, with traditional politico-legal theories of separation of governmental powers. Kelman.
543 Legal Process

A.
Comparative evaluation of law-making by private parties, courts, legislatures, and administrative agencies; retroactivity; adherence to precedent; purposes of legislation; statutory interpretation. Pollack.

550 Constitutional Law

W. 3 cr., Sp. 3 cr. Two qtr. sequence; credit given only on completion of all 6 cr. hrs.

Functional study of the major substantive, methodological, and federalistic limitations upon governmental power obtaining under practice of judicial review. Schuerman, Kelman.

553 Evidence

W. 3 cr., Sp. 3 cr. Two qtr. sequence; credit given only on completion of all 6 cr. hrs.

Survey of rules of evidence; particularly demonstrative, testimonial, and constitutional; scope, qualification and examination of witnesses; privileges; relevancy; documents; hearsay rule and its exceptions. Slagle, Messerman.

560 Restitution

A.
Restitutionary remedies available for tort, misrepresentation, breach of contract, and for benefits conferred voluntarily, under duress or mistake, or in partial performance of contract. Nordstrom.

565 Pleading

A.
Pleading under codes and Federal Rules of Civil Procedure. Requirements of pleading; variance and amendments; defenses; denials and new matter; counterclaims; reply; demurrer; motions; interrogatories; joinder. Wills.

570 Legal Research

Use of law books, both English and American; problems in the use of reports, statutes, selected annotated cases, texts, encyclopedias, digests, dictionaries, periodicals, and citation books.

575 Negotiable Instruments Law

A.
Types of commercial or negotiable paper; transfer; purchase and payment in due course, discount and security. Clovis.

580 Income Taxation

W.
Study of the federal income tax; the concept of taxable gross income; deductions; methods for reporting income; capital gains and losses; treatment of corporations and shareholders, partnerships and trusts. Whitehead.

585 Business Associations

Prereq.: First Year Curriculum.

Business corporation as a device for the forrehanrece of trade and manufacturing. Clovis, Clever.

600 Legal Clinic

Three consecutive quarters for regular students Sp, A, W; for students accelerating and graduating in December, Sp, Sa. A.

Practical experience in handling actual cases for legal aid clients in conjunction with Legal Aid Society and under supervision of Director of Legal Clinic. Messerman, Carpenter, Backer.

605 Trial Practice

A.
Prereq.: 555, 565.

State and federal procedures in civil or criminal cases; individual student practice in the trial to a jury of a civil or criminal case. Slagle.

610 Labor Law

A.
Collective bargaining processes and duty to bargain; grievance arbitration; legal limitation on economic pressures, including interference with bargaining, strikes, picketing, and boycotts. Rutledge.

615 Trusts

W.
The nature, creation, and elements of trusts; charitable, resulting, and constructive trusts, rights and liabilities of parties. Lynn.

625 Conflict of Laws

Sp.
Private law pertaining to jural relations containing one or more foreign elements: jurisdiction; foreign judgments; domicil, choice of law; torts; workmen's compensation acts; contracts; property; family law; decedents' estates. Miller.

630 Sales

W.

650 Administration of Criminal Justice

Sp.
Processes of criminal justice from arrest to parole and probation; impact upon traditional practices and procedures resulting from major decisions of the Supreme Court of the United States. Herman.

651 Administration of Decedents' Estates

Sp.
Probate and contests of wills; jurisdiction; effect and necessity of administration; inventory and assets; contracts; sales and investments by personal representatives; claims; accounting and distribution. Wolf.

652 Admiralty Law

Admiralty; jurisdiction; injuries to seamen and maritime workers, bills of lading; charter parties; salvage; general average; limitation of liability.

653 Advanced Legal Research

Research techniques providing basic experience in analyzing legal questions, using appropriate publications, and in reaching competent solutions to legal problems.

654 Arbitration Law and Practice

W.
Commercial and labor arbitration under Ohio and federal arbitration statutes; drafting arbitration clauses; conduct of proceedings; arbitrable issues; court enforcement or impeachment of awards. Bernstein.

655 Bankruptcy

Prereq.: 585.
Methods used for the liquidation of debtors' estates, emphasizing first seven chapters of the Bankruptcy Act. Clovis.

658A Comparative Law—Western Europe

Substantive and procedural aspects of foreign legal systems in comparison with American law.

658B Comparative Law—Latin America


659 Corporate Organization and Finance

Sp.
Prereq.: 585.
Practices used to finance corporations in the process of formation and those used, under varying conditions, after the corporation has had a business experience. Clovis.

660 Domestic Relations

A.
Marriage, annulment, divorce, alimony, custody, intra-family relationships and relations of family members with others; integration data from other disciplines dealing with problems of family. Messerman.

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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>661</td>
<td>Estate-Gift Taxation</td>
<td>P 3</td>
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<td>662</td>
<td>Federal Courts</td>
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<td>663</td>
<td>Future Interests</td>
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<td>664</td>
<td>Insurance</td>
<td>P 3</td>
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<td>665</td>
<td>International Law</td>
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<td>666</td>
<td>Jurisprudence</td>
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<td>667</td>
<td>Local Government Law</td>
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<td>668</td>
<td>Appellate Practice IV</td>
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<td>W</td>
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<td>669</td>
<td>Receivership and Reorganization</td>
<td>P 2</td>
<td>Sp,</td>
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<td>670</td>
<td>Real Property Mortgages</td>
<td>P 3</td>
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<td>671</td>
<td>Mortgages and their use as a security device in real property transactions; common mortgage provisions; methods of enforcement of rights; &quot;equitable&quot; mortgages.</td>
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<td>672</td>
<td>Federal Antitrust Law</td>
<td>P 3</td>
<td>A</td>
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<td>673</td>
<td>Business Regulation</td>
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<td>Prereq.: 678</td>
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<tr>
<td>674</td>
<td>Advanced Federal Income Taxation</td>
<td>P 3</td>
<td>W,</td>
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<tr>
<td>675</td>
<td>Legal Problems of Foreign Trade and Investment</td>
<td>P 3</td>
<td>Sp,</td>
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<td>676</td>
<td>Taxation of Foreign Income</td>
<td>P 3</td>
<td>A</td>
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<td>677</td>
<td>Oil and Gas Law</td>
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<td>678</td>
<td>Copyright Law</td>
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<td>W</td>
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<td>679</td>
<td>Individual Studies</td>
<td>P 1-6</td>
<td>A, W, Sp, 3 ct</td>
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<tr>
<td>680</td>
<td>Seminars in Legal Planning</td>
<td>P 3</td>
<td>A, W, Sp, 3 ct</td>
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<tr>
<td>681</td>
<td>Protection of Literary, musical, artistic, and commercial property under common law; the federal copyright statute and related legislation.</td>
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<td>682</td>
<td>Small-group training in the non-litigious functions of the practicing lawyer. Legal planning involves the resolving of fact situations and policy questions of means and ends, together with the effectuation of determinations made in connection therewith. Effectuation of policy decisions often involves the skills of negotiation and draftsmanship, as well as the technique of counseling and litigation. (Training in these latter two techniques is provided by Legal Clinic and Trial Practice, respectively.) Following is a list from which Seminars in Legal Planning are drawn each year:</td>
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<td>683</td>
<td>Business Planning</td>
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<td>684</td>
<td>Estate Planning</td>
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<td>685</td>
<td>Federal Tax Planning</td>
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<td>686</td>
<td>General Legal Planning</td>
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A-142
693E Planning Through Negotiation
Planning negotiations; weighting legal, economic and social factors and use of techniques for attainment of objectives.

693F Legislative Planning
Role of lawyer in advocating or opposing state and federal legislation; problems selected from past and current proposals before legislatures.

693G Planning Seminar in Law
*Repeatable to a maximum of 6 cr. hrs.*
Topics will change as specially scheduled in any quarter.

696 Seminars in Legal Research P 3
A., W., Sp. 3 cr.
Individual training in original research, together with practice in expository legal writing. Subject matter is chosen for their capacity to provide training in the effective integration, with legal factors, of relevant social, economic, and other non-legal materials.

Following is a list from which Seminars in Legal Research are drawn each year:

696A Antitrust Law and Economics
*Prereq.: 478.*
Evaluation of domestic antitrust law on the basis of current economic theories. (Inter-departmental seminar of the Department of Economics and the College of Law.)

696B Antitrust Law and International Cartelization
*Prereq.: 478.*
Application of domestic antitrust policy to foreign operations of American corporations.

696C Constitutional Problems
Advanced constitutional questions, involved in evolution of judicial review, intergovernmental relationships, protection of civil liberties, special problems under Ohio Constitution.

696D Social Legislation
*Prereq.: First Year Curriculum.*
Federal wage and hour legislation, including: nature of employment relation; Fair Labor Standards Act; exemptions; compensable time; overtime on fluctuating workweek; child labor.

696E Legal Problems of Foreign Trade and Investment
Problems encountered by American business enterprises engaged in foreign trade or investment.

696F Legal Regulation of Business Practice
*Prereq.: 479.*
Regulation of competitive practices through legislative, administrative, and judicial action; equality of opportunity for small business; the Robinson-Patman Act.

696G Legal Regulation of Devolution of Property
Socio-legal problems raised by devolution of wealth through such arrangements as public welfare programs, union welfare funds, insurance, foundations, charitable trusts, and pension trusts.

696H Problems in the Law of Evidence
*Prereq.: 555.*
Advanced evidentiary questions involved in preparation for and trial of cases.

696I Legal and Economic Problems in State and Local Taxation
*Prereq.: 673.*
State taxation and intergovernmental tax relations in terms of law and fiscal economics. (Offered in cooperation with the Department of Economics.)

696M Medical-Legal Problems
Conflict in concept between disciplines of law and medicine in matters of causation, injury, disability, prognosis, aggravation and re-injury related to their use in proof of such elements in litigation.

696N The Individual and His Government
Governmental powers in democratic and totalitarian countries; relation of power to will of people; justice and fair hearing personal freedoms surviving legislative and executive encroachments.

696O Comparative Labor Law
*Prereq.: 410.*
Problems in American labor law viewed from the standpoint of both American and foreign law, collective bargaining, the use of economic force; internal and inter-union affairs.

696P Right of Privacy
Individual’s interests in freedom from publicity and in physical seclusion; particularly legal response to social and technological changes which threaten these interests.

696Q Regulated Industries
Principal regulatory agencies, both federal and state, with respect to licensing, rate-making, mergers, and general supervision of business practices.

696R International Law of Shareable and Strategic Resources
Processes of interaction, claim, and decision with respect to resources largely open to use by all states, including the ocean, “outer” space, air space, international rivers, canals, and polar areas.

696S Selected Problems in Criminal Law and Procedure
*Prereq.: 483.*
Purposes and effects of punishment; wiretapping; Uniform Arrest Act; right to counsel; habeas corpus and other postconviction remedies; treatment of criminal cases by mass communications.

696T Research Seminar in Law
*Repeatable to a maximum of 6 cr. hrs.*
Topics will change as specially scheduled in any quarter.

696U Legal Controls of the Economy
Study of State and Federal legislation affecting economic activity, including employment acts, anti-poverty legislation, tariffs, financing laws, and legal basis of the Federal Reserve System.
Linguistics

Office: 411 University Hall, 216 North Oval Drive.
PROFESSOR JEHOLSTE (Chairman); ASSOCIATE PROFESSOR TILLMORE; ASSISTANT PROFESSORS CALLAGHAN and LANGENDEN.

See also the course listings in English, the foreign languages, Romance Linguistics and Linguistics and Literature.

522 Introduction to Language U 5 A, W, Sp. 5 cl.
Not open to students with credit for Engl. 522.
A general survey of language and languages and the ways available to study them, with English as the focal language.

Introduction to the nature of selected writing systems, both at the present time and in all periods since the beginning of the use of writing.

601 Introduction to Linguistics U G 5 A, Su. 5 cl.
A broad introduction to the categories and techniques of general linguistics: phonemic, morphemic, and syntactic analysis; applied historical and comparative linguistics.

602 Syntactic Structures U G 5 W. 5 cl.
Prereq.: 601.
The grammatical construction of a number of natural languages will be examined. Syntax, morphemics and their relation to linguistic meaning. Langendoen.

603 Phonological Structures U G 5 Sp. 5 cl.
Prereq.: 601.
The phonological construction of natural languages will be examined. Phonemic theory and its role in the description of diverse languages.

650 Field Methods in Linguistics U G 5 Sp. 4 cl.
Prereq.: 601.
Techniques for describing languages by use of native informants. Callagahn.

671 Linguistics and Language Acquisition U G 5 W. 4 cl.
Prereq.: 601.
The contribution of linguistic theory to the study of the acquisition of grammatical, semantic, and phonological skills. Fillmore.

672 Languages of the World U G 3-5 A, W, Sp. 3-5 cl.
Prereq.: 601.
Repeatable.
Under direction of the linguistics staff, informant and laboratory technique will be employed to teach a selected language not otherwise offered at the University.

679 The Classification of Linguistic Structures U G 5 A. 5 cl.
Prereq.: 601.
An examination of the schemes for classifying linguistics structures, phonotopic (typological) and genotopic (genetic or genealogical), and some of the content of each type. Callagahn.


720 Seminar in Linguistics U G 3-5 A, W, Sp. 3-5 cl.
Prereq.: 602 and 603 or permission of instructor.
Topics include the history of linguistics, grammatical theory, mathematical models in linguistics, history or structure of individual languages.

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761 Historical Linguistics I G 5 W. 5 cl.
Prereq.: 601.
An introduction to the methods, conventions, and literature of comparative-historical linguistics with primary attention to the comparisons and reconstructions of phonological systems. Callaghan.

762 Historical Linguistics II G 5 Sp. 5 cl.
Prereq.: 761.
Advanced work in the comparison and reconstruction of morphological, phonological, and syntactic systems. Detailed examinations of some of the results of past and current scholarship. Callaghan.

771 Transformational Analysis G 5 Sp. 5 cl.
Prereq.: 602 and 603 or permission of instructor.
The theory of grammatical transformation: its formal properties, justifications, its adequacy as a device for explicating grammatical notions in natural languages. Fillmore.

Prereq.: 720 or permission of instructor. Repeatable.
Advanced topics in syntactic analysis. Fillmore.

821 Seminar in Phonology G 5 W.
Prereq.: 720 or permission of instructor. Repeatable.
Advanced topics in phonological analysis. Leibate.

822 Seminar in Historical Linguistics G 5 A.
Prereq.: 762 and permission of instructor. Repeatable.
Advanced topics in methods and principles of diachronic analysis. Leibate.

950 Research in Linguistics G Arr.
A, W, Sp, Su.
Research for thesis purposes only.

Mathematics

Office: 150 Mathematics Building, 231 West 15th Avenue.
PROFESSOR JOSLA (Chairman), RESEARCH PROFESSOR JASSEMBA, ASSOCIATE PROFESSORS BRUCE, BACH, SCHNITZER, MILLER, REESE, REID, SMITH, LEIBSTE, LANDON, RANDLES, RICHARD, RIDE, RIZVI, SANTOS, SAD, SENGAL, SUR. SENGAL, SMITH, SHIVASTAVA, TROY, WALD, YAFFE.
### Mathematics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
</table>
Prereq.: Elem. Educ. standing and Math. 412 or satisfactory score on OSU Math. Test. |

The course develops basic ideas of arithmetic, algebra, geometry through the study of the structure of selected mathematical systems.

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
</table>
| 412         | Basic Mathematics | U 5 | A, Sp, Su 5 cl.  
Prereq.: Placement on basis of OSU Math. Test. |

Programmed instruction used to improve algebraic computation; features contain selected advanced topics.

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<tr>
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<th>Prerequisites</th>
</tr>
</thead>
</table>
| 413         | Introduction to Mathematics II | U 5 | W 5 cl.  
Prereq.: 412. |

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<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Prerequisites</th>
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</thead>
</table>
| 414         | Introduction to Mathematics III | U 5 | Sp 5 cl.  
Prereq.: 413. |

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<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
</table>
| 416         | First Year College Mathematics | U 5 | A, W, Sp, Su 5 cl.  
Pre req.: 412 or satisfactory score on OSU Math. Test.  
Not open for credit for students having credit for 439 or Math. courses having 439 as prerequisite. |

The sequence 416, 417 is designed as a terminal sequence of courses in Mathematics and to prepare students to enter a calculus sequence. 416 treats sets, functions, algebra, graphs, and vector spaces.

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</table>
| 417         | First Year College Mathematics | U 5 | A, W, Sp, Su 5 cl.  
Prereq.: 416. |

A continuation of 416. An introduction to analytic geometry, linear programming, trigonometry, matrix algebra, limits.

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<th>Course Code</th>
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<th>Prerequisites</th>
</tr>
</thead>
</table>
| 426         | Introduction to Calculus, Probability and Statistics | U 5 | Sp 5 cl.  
Pre req.: 416 and 417.  
Not open to students with credit for 418, 435, 536, 537, 538, 541, 542, or 543. |

Differentiation, integration of polynomials, maxima, minima, mean value theorem, probability spaces, density functions, introduction to estimation, testing hypotheses.

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<th>Prerequisites</th>
</tr>
</thead>
</table>
| 429H        | Mathematics of Finance | U 5 | W, Sp 5 cl.  
Pre req.: 416 or 439. |

The principles of interest and discount with applications to annuities, sinking funds, capitalization, depreciation, valuation of bonds.

<table>
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<th>Course Code</th>
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<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
</table>
| 435         | Elementary Mathematical Statistics | U 5 | Sp 5 cl.  
Pre req.: 416 or 439. |

Elementary principles of probability and introduction to the use of the binomial and normal distributions.

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<th>Course Code</th>
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<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
</table>
| 439         | Algebra and Trigonometry | U 5 | A, W, Sp, Su 5 cl.  
Pre req.: 412 or satisfactory score on OSU Math. Test.  
Not open for credit for students having credit for 416 or Math. courses with 416 as prerequisite. |

Inequalities, functions, graph, exponential and logarithmic and trigonometric functions and their graphs, complex numbers, inverse functions.

<table>
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<th>Prerequisites</th>
</tr>
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</table>
| 440         | Calculus and Analytic Geometry | U 5 | A, W, Sp, Su 5 cl.  
Pre req.: 439 or Level I Placement on OSU Math. Test.  
Not open to students with credit for 418. |

Lines, slopes, derivatives, limits differentiation, rules, mean-value theorem, applications of derivatives: curve sketching, maxima and minima, linear motion, related rates, approximations, etc.

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</tr>
</thead>
</table>
| 441         | Calculus and Analytic Geometry | U 5 | A, W, Sp, Su 5 cl.  
Pre req.: 440.  
Not open to students with credit for 536. |

Continuation of 440. Approximating areas, the integral, integration, formulas, applications of integration, inverse functions, logarithmic and exponential functions, hyperbolic functions, integration techniques.

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<th>Credits</th>
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</tr>
</thead>
</table>
Pre req.: 541 or 441.  
Not open to students with credit for 537. |

Continuation of 541. Polar coordinates, rotation of axes, vectors, velocity, acceleration, space vector and three dimensional analytic geometry, cylindrical and spherical coordinates. Linear systems, matrices, characteristic values.

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<tr>
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</tr>
</thead>
</table>
Pre req.: 542.  
Not open to students with credit for 538. |

Continuation of 542. Partial derivatives, multiple integrals, infinite series.

<table>
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<th>Course Code</th>
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<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
</table>
| 544         | Differential Equations and Their Applications | U 5 | A, W, Sp, Su 5 cl.  
Pre req.: 538 or 543.  
Not open to students with credit for 608 or 611. |

Ordinary differential equations with particular emphasis on linear differential equations, systems of differential equations, applications to electrical, mechanical, and chemical systems.

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<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
</table>
| 545         | Applications of Mathematics | U 5 | A, W, Sp 5 cl.  
Pre req.: Ed. standing and 546 or 541 or 441. |

Approximately half of the course will be devoted to a study of probability and statistics. Other topics will be chosen to illustrate applications of mathematics.

<table>
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</tr>
</thead>
</table>
Pre req.: 538 or 543. |

Combinatorial probability, fundamental concepts of probability distributions, sample statistics, estimation and testing hypotheses, roots of statistical theory.

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<th>Prerequisites</th>
</tr>
</thead>
</table>
| 547H        | Statistical Methods in Engineering | U 5 | A, W 5 cl.  
Pre req.: Indus. E. 3rd yr. standing and 546. |

Topics included are probability, frequency distributions, testing hypotheses, and estimation.

A-145
COURSES OF INSTRUCTION

MATHEMATICS

590 Introduction to Digital Computer Programming
A, W, Sp, Su. 3 cl., 2 2-hr. lab.
Prereq.: 418 or 439.
Introduction to programming language; laboratory experience with computers installed in Numerical Computation Laboratory. Scientific, statistical and business applications.

599 Special Topics in Mathematics
A, W, Sp, Su.
Prereq.: Permission of instructor.
Repeatable.
This course is intended to give the student an opportunity to pursue special studies not otherwise offered.

601 Advanced Calculus
A, Sp, Su. 5 cl.
Prereq.: 538 or 543.
A rigorous presentation of limits, derivatives, mean value theorems, definite integrals, sequences, and series.

607 Introduction to the Theory of Functions of a Complex Variable
W, Su. 5 cl.
Prereq.: 601.
Not open to students with credit for 624.
Topics discussed include power series expansions, the formula of Cauchy, residues, conformal mappings, and elementary functions in the complex domain.

609 Fourier Series and Boundary Values
Problems for Engineers
A, W. 3 cl.
Prereq.: 608 or 544 or 611.
Not open to students with credit for 626.
Fourier series, applications of Fourier series to the solution of boundary value problems involving partial differential equations, Bessel functions.

611 Differential Equations
A, W, Sp. 5 cl.
Prereq.: 538 or 543.
Not open to students with credit for 544 or 608.

621 Advanced Geometry
A, W. 5 cl.
Prereq.: 536 or 541 or 441.
Advanced topics from Euclidean Geometry.

622 Vector Analysis for Engineers
A, W. 3 cl.
Prereq.: 608 or 544 or 611.
Not open to students with credit for 661.
Vector algebra, vector operators, line integrals, vector integral theorems, curvilinear coordinates; applications.

624 Complex Variables for Engineers
W, Sp. 3 cl.
Prereq.: 622 or Elec. E. 617 or Elec. E. 617 concw.
Introduction to complex variables, analytic functions, complex integral theorems, power series, residues, conformal mapping.

626 Fourier Series and Boundary Value Problems
Sp. 5 cl.
Prereq.: 608 or 611 or 544.
Not open to students with credit for 609 or 731.
Expansion of function in Fourier series and in series of Legendre polynomials or Bessel functions; solution of boundary value problems from physics.

631 History of Mathematics
A, W, Su. 3 cl.
Prereq.: 536 or permission of instructor.
The development of mathematics from its primitive origins to its present form. Topics include: development of arithmetic, algebra, geometry, trigonometry, and calculus.

635 Fundamentals of Mathematics
A. 4 cl.
Prereq.: Permission of instructor.
Not open for graduate credit to majors in Math.
This sequence emphasizes the fundamentals of mathematics and is designed for advanced students from areas not requiring intensive mathematical training. Topics include algebra, the number system, induction, theory of equations, progressions, combinations, and permutations, probability, determinants, and matrices, inequalities, analytic geometry, differential and integral calculus.

636 Fundamentals of Mathematics
W. 4 cl.
Prereq.: 635.
A continuation of 635.

637 Fundamentals of Mathematics
Sp. 4 cl.
Prereq.: 636.
A continuation of 636.

641 Elementary Modern Algebra
A, 5 cl.
Prereq.: 537 or 542.
An introduction to abstract algebra with topics from elementary ring, field, and group theories. Special emphasis on ring of integers, congruences, polynomial domains, permutation groups.

642 Principles of Mathematics for Science and Mathematics Teachers
Su. 5 cl.
Prereq.: Permission of instructor.
(NSF students only).
Introduction to modern mathematics, sets, functions, topology.

643 Topology
Sp. 5 cl.
Prereq.: 543.
Sets and functions; metric spaces, completeness, Baire's Theorem, continuous mappings, Euclidean spaces, compactness, connectedness, topological spaces.

645 Modern Geometry for High School Teachers
Su. 5 cl.
(NSF students only).
Coordinate geometry use of vectors in geometry, matrices coordinate transformations, matrix-vector operations, characteristic values, diagonalization of quadric forms.
646 Modern Algebra for High School Teachers
Su. 5 cl.
(NSF students only).
A basic modern algebra course for teachers of algebra. Topics will include: groups, rings, integral domains, fields, an axiomatic approach to high school algebra.

647 Analysis for High School Teachers
Su. 5 cl.
Extension of the rational number concept to the real number concept, functions, limit concept, sequences, continuous functions, derivative, integral series, applications of the calculus.

651 Fundamental Ideas in Mathematics
A. W. 5 cl.
Prereq.: 536 or 541 or 441.
Basic ideas concerning: number systems, sets, fields, axioms systems, finite geometries, projective geometry.

652 Fundamental Ideas in Mathematics
W, Sp. 5 cl.
Prereq.: 651.
Continuation of 651.

661 Vector Analysis
A. W., Su. 5 cl.
Prereq.: 601.
Not open to students with credit for 632.
The algebra and calculus of vectors with applications to mechanics. Differential operators and integral theorems. Introduction to potential theory.

665 Mathematical Logic
W. 5 cl.
Prereq.: 537 or 542 or permission of instructor.
A first course in the study of formal logical systems and their applications to the foundations of mathematics. Topics include: definition of mathematical proof; number theory; set theory; and analysis formalized within the predicate calculus; theories of Godel and the Church; recursive function theory and idealized digital computers.

666 Mathematical Logic
Sp. 5 cl.
Prereq.: 665.
A continuation of 665.

670 Matrices and Determinants
W, Su. 5 cl.
Prereq.: 537 or 542.
The fundamentals of matrix theory with emphasis on determinants, systems of linear equations, vector spaces rank, characteristic polynomials, similarity and congruence transformations.

672 Mathematical Statistics
A. W. 5 cl.
Prereq.: 538 or 543.

673 Mathematical Statistics
W, Sp. 5 cl.
Prereq.: 672.

674 Theory of Probability
Sp. 5 cl.
Prereq.: 672.
Discrete probability spaces, random walk, Markov chains, stochastic processes, strong laws of probability.

680 Elementary Number Theory
Sp. 5 cl.
Prereq.: 537 or 542.
Prime numbers, congruences, Diophantine equations, the quadratic reciprocity law, and selected topics. This course utilizes concrete examples to introduce concepts of modern algebra.

692 Computer Science
A, Sp. 4 cl., 1 2-hr. lab.
Prereq.: 590 or Engr. Mech. 629, or equiv.; 544 or 611 or equiv.; or permission of instructor.
Basic techniques of numerical analysis, finite differences, interpolation, solution of equations, integration, difference and differential equations. Laboratory use of computers.

694 * Computer Science
Sp. 4 cl., 1 2-hr. lab.
Prereq.: 692 and 670 or 725, or permission of instructor.

695 Computer Science
W, Su. 4 cl., 1 2-hr. lab.
Prereq.: 590 or 692 or Engr. Mech. 659, or equiv.

698 * Numerical Solution of Differential Equations
Sp. 3 cl., 2 2-hr. lab.
Prereq.: 692 and 611 or permission of instructor.

699 Special Topics in Mathematics
A, W, Sp, Su.
Prereq.: Permission of instructor. Repeatable.
This course is intended to give the student an opportunity to pursue special studies not otherwise offered.

700 Minor Problems
A, W, Sp, Su.
Conferences, assigned readings, and reports on minor investigations.

701 Introduction to Analysis
A, Su. 5 cl.
Prereq.: 601.
The main objective is to train students to understand and apply the basic ideas and methods of analysis. Topics discussed include limits, sequences, continuity, the real continuum, Riemann integration, interchange of limits processes, sequences, series, and measure.

702 Introduction to Analysis
W. 5 cl.
Prereq.: 701.
A continuation of 701.
704 Introduction to the Theory of Approximation I
A. 5 cl.
Prereq.: 601.

705 Introduction to the Theory of Approximation II
W. 5 cl.
Prereq.: 601, 704.
A continuation of 704.

721 Mathematical Methods in Science I
W. 5 cl.
Prereq.: 607 and 611; or 609, 622 and 624.
Linear differential equations, solutions about singular points; Fourier series; Sturm-Liouville problems; Bessel functions and Legendre polynomials; boundary value problems associated with Laplace’s equation.

722 Mathematical Methods in Science II
Sp. 5 cl.
Prereq.: 670 or 723 or permission of instructor.
722 may be taken without 721.
Introduction to tensor analysis with applications to geometry. Elements of the calculus of variations with applications to physical problems.

723 Mathematical Methods in Science III
A. 5 cl.
Prereq.: 607 or Math. of 600 or 700 level or permission of instructor.
723 may be taken without 721 or 722.
Theory of determinants and matrices, real quadratic and Hermitian forms, groups and vector spaces, applications to physics and engineering.

725* Integral Equations and Their Applications
A. 5 cl.
Prereq.: 608 or 611 or 544.
Orthogonal functions, linear, integral equations of first and second kinds, relations to ordinary differential equations, Volterra’s equation, boundary value problems, practical methods of solution.

726* Eigenvalue Problems
W. 5 cl.
Prereq.: 608 or 611 or 544.
Distribution of eigenvalues, self-adjointness, definiteness, Green’s functions, minimal properties, approximation of eigenvalues, eigenfunction expansions, Ritz method, iteration methods, matrix eigenvalue problems, finite differences.

727* Applied Operational Calculus
Sp. 5 cl.
Prereq.: 608 or 611 or 544 and 634 or 607.
Laplace transformation in real domain, applications in physics and engineering; differential equations; Laplace transformation in complex domain, application to partial differential equations; Fourier transform, applications.

728* Special Functions
A. 5 cl.
Prereq.: 624 or 607 and 611.
Power series developments, asymptotic expansion, Gamma functions, cylindrical functions, spherical harmonics, orthogonal polynomials, hypergeometric functions, theta functions, elliptic functions and integrals, numerical techniques.

729* Applied Complex Analysis
W. 5 cl.
Prereq.: 604, 607 and 611.
Basic facts of complex analysis; transformed mapping properties of elementary functions, Schwarz—Christoffel formula: distortion theorems; uniformization; applications to electromagnetic fields, fluid dynamics, heat flow.

730* Non-Linear Differential Equations
Sp. 5 cl.
Prereq.: 608 or 544 or 611.
Existence and uniqueness of solutions; initial conditions; periodic solutions; Krylov-Bogoljuboff method; graphical and numerical methods; applications to vibrational problems, relaxation theory and nonlinear mechanics.

731 Probability and Statistics
A. 5 cl.
Prereq.: 601.
General probability distributions, Stultis integral, characteristics; functions, limit theorems.

733* Statistics: Design and Analysis of Experiments
W. 5 cl.
Prereq.: 734.
Analysis of variance distribution, tests of linear hypotheses, analysis of variance in an r-way classification, non-orthogonal data, Latin squares, and lattices.

734 Statistical Inference
Sp. 5 cl.
Prereq.: 731.
Point, interval estimation, maximum likelihood estimators, principles of estimation, tests of hypotheses; Neyman-Pearson theory, power function, non-parametric tests, sequential tests, decision functions.

741 Introduction to General Topology
A. Su. 5 cl.
Prereq.: 701 or permission of instructor.
This sequence is designed to give training in the areas of modern geometry, particularly in analytic topology.

742 Introduction to General Topology
W. 5 cl.
Prereq.: 741.
A continuation of 741.

743 Projective Geometry
Sp. 5 cl.
Prereq.: 762.
The combinatorial and algebraic aspects of projective geometry, including non-Desarguesian and finite projective planes, coordination, the theory of configurations, incidence, matrices, Latin squares.

750* Introduction to Functional Analysis I
A. 3 cl.
Prereq.: 607, 702 or equiv.

751* Introduction to Functional Analysis II
W. 3 cl.
Prereq.: 750.
A continuation of 750.
761 Introduction to Higher Algebra  U G 5
   A.  3 cl.
   Prereq.: Permission of instructor.
   Groups, rings, fields, ideals; selected topics from Galois theory,
   lattice theory, and the theory of rings with minimum conditions.

762 Introduction to Higher Algebra  U G 5
   W.  5 cl.
   Prereq.: 761.
   A continuation of 761.

763 Introduction to Higher Algebra  U G 5
   Sp.  5 cl.
   Prereq.: 763.
   A continuation of 762.

790 Computer Science  U G 5
   W.  5 cl.
   Prereq.: 695 or permission of instructor.
   Symbolic programming. Design of symbolic programming systems,
   and algebraic compilers. Dynamic storage assignments. Symbol
   manipulation, information retrieval, and related topics. Classroom
   exercises involve use of computers.

793 Mathematical Foundations of the  U G 3
   Design and Use of Automatic Systems
   A.
   Prereq.: Graduate standing or permission of instructor.
   Boolean operations. Reduction of systems of Boolean functions.
   Turing machines and general recursive functions. Application to
   problems relating to design and use of automatic systems.

794 Mathematical Foundations of the  U G 3
   Design and Use of Automatic Systems
   W.
   Prereq.: 793 and graduate standing or permission of instructor.
   Continuation of 793.

795 Mathematical Foundations of the  U G 3
   Design and use of Automatic Systems
   Sp.
   Prereq.: 794 and graduate standing or permission of instructor.
   Continuation of 794.

798 Advanced Studies in Mathematics  U G 2-5
   A, W, Sp, Su.
   Prereq.: Permission of instructor.
   Repeatable.
   When students' need is sufficient, the Department will offer under
   this number a course on some phase of mathematics not covered
   in its regular offerings.

801 Theory of Functions of a Complex  G 5
   Variable
   A.  5 cl.
   Prereq.: 701 or permission of instructor.
   The complex number system, analytic functions, theorems of
   Cauchy and Goursat, series, expansions, singularities, conformal
   mapping, harmonic and subharmonic functions. Picard's theorem
   and related topics.

802 Theory of Functions of a Complex  G 5
   Variable
   W.  5 cl.
   Prereq.: 801.
   Continuation of 801.

807 * Partial Differential Equations and
   Their Applications  G 3
   A.  3 cl.
   Prereq.: 702 or permission of instructor.
   First order partial differential equations, theory of characteristics.
   Second order partial differential equations. Elliptic, parabolic,
   hyperbolic equations; standard method of solution. Greens
   functions. Integral equations.

808 * Partial Differential Equations and
   Their Applications  G 3
   W.  3 cl.
   Prereq.: 807.
   Continuation of 807.

815† Dimension Theory  G 5
   Sp.  5 cl.
   Prereq.: 703, 748, and 763.
   Dimension in separable metric spaces with application to Euclidean
   spaces. Covering theorems, imbedding theorems, and approximation
   theorems. Relationships between the concepts of dimension and
   measure.

817† Potential Theory  G 3
   A.
   Prereq.: 607 and permission of the instructor.
   Newtonian Potentials, Boundary Value Problems. Logarithmic

818† Potential Theory  G 3
   W.
   Prereq.: 817.
   Continuation of 817.

819 * Theory of Rings  G 5
   Sp.  5 cl.
   Prereq.: 763 or permission of instructor.
   The modern structure theory of rings, rings with minimum condi-
   tions, simple and semi-simple rings, Jacobson radical, non-
   associative rings, applications to geometry and combinatorial
   analysis.

821 * Functional Analysis  G 3
   A.
   Prereq.: 759, 761.
   Banach Algebras, spectral theory, harmonic analysis, fixed-point
   theorems. Applications to analysis.

822 * Functional Analysis  G 3
   W.
   Prereq.: 821.
   Continuation of 821.

823 * Functional Analysis  G 3
   Sp.
   Prereq.: 822.
   Continuation of 823.

826† Measure and Integration  G 5
   A.  5 cl.
   Prereq.: 702.
   Invariant measure in general spaces. Integration in abstract spaces
   and in Euclidean spaces of arbitrary dimension. Additive set
   functions. Applications of length, area, and calculus of variations.

827† Measure and Integration  G 5
   W.  5 cl.
   Prereq.: 826.
   Continuation of 826.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Notes</th>
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<tr>
<td>828</td>
<td>Measure and Integration</td>
<td>5</td>
<td></td>
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<td></td>
<td>Sp.</td>
<td>3 cl.</td>
<td>Prereq.: 827.</td>
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<td>830</td>
<td>Transfinite Arithmetic</td>
<td>5</td>
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<td>G</td>
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<td></td>
<td>A.</td>
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<td>Prereq.: 701 and 761.</td>
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<tr>
<td>831</td>
<td>Transfinite Arithmetic</td>
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<td>W.</td>
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<td>Prereq.: 830.</td>
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<td>841</td>
<td>Differential Geometry</td>
<td>5</td>
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<td>A.</td>
<td>5 cl.</td>
<td>Prereq.: Permission of Instructor.</td>
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<td>842</td>
<td>Differential Geometry</td>
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<td></td>
<td>W.</td>
<td>5 cl.</td>
<td>Prereq.: 841.</td>
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<td>844</td>
<td>Combinatorial Topology</td>
<td>5</td>
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<td></td>
<td>A.</td>
<td>5 cl.</td>
<td>Prereq.: 702, 742, and 762.</td>
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<td>845</td>
<td>Combinatorial Topology</td>
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<td>5 cl.</td>
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<td>849</td>
<td>Advanced Topics in Mathematical Statistics</td>
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<td>A.</td>
<td>3 cl.</td>
<td>Prereq.: Permission of instructor.</td>
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<td>850</td>
<td>Advanced Topics in Mathematical Statistics</td>
<td>3</td>
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<td></td>
<td>W.</td>
<td>3 cl.</td>
<td>Prereq.: 849.</td>
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<td>855</td>
<td>Advanced Theory of Probability</td>
<td>3</td>
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<td></td>
<td>A.</td>
<td>3 cl.</td>
<td>Prereq.: 702.</td>
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<tr>
<td>856</td>
<td>Advanced Theory of Probability</td>
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<td>W.</td>
<td>8 cl.</td>
<td>Prereq.: 855.</td>
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<td>857</td>
<td>Advanced Theory of Probability</td>
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<td>Sp.</td>
<td>3 cl.</td>
<td>Prereq.: 856.</td>
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<tr>
<td>862</td>
<td>Theory of Matrices</td>
<td>5</td>
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<td>A.</td>
<td>5 cl.</td>
<td>Prereq.: 762.</td>
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<td>864</td>
<td>Combinatorial Analysis</td>
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<td>A, W, Sp.</td>
<td>5 cl.</td>
<td>Prereq.: 762 or permission of instructor.</td>
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<td>865</td>
<td>Lattice Theory</td>
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<td>Sp.</td>
<td>5 cl.</td>
<td>Prereq.: 762.</td>
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<td>871</td>
<td>Group Theory</td>
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<td></td>
<td>A.</td>
<td>5 cl.</td>
<td>Prereq.: 762.</td>
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<tr>
<td>872</td>
<td>Group Theory</td>
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<td>W.</td>
<td>5 cl.</td>
<td>Prereq.: 871.</td>
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<tr>
<td>873</td>
<td>Analytic Number Theory</td>
<td>5</td>
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<td>Sp.</td>
<td>5 cl.</td>
<td>Prereq.: Permission of instructor.</td>
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<tr>
<td>880</td>
<td>Theory of Algebraic Numbers</td>
<td>5</td>
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<td></td>
<td>A.</td>
<td>5 cl.</td>
<td>Prereq.: 762.</td>
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<tr>
<td>881</td>
<td>Theory of Algebraic Numbers</td>
<td>5</td>
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<td>W.</td>
<td>5 cl.</td>
<td>Prereq.: 880.</td>
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<tr>
<td>890</td>
<td>Mathematical Logic</td>
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<td></td>
<td>A.</td>
<td>5 cl.</td>
<td>Prereq.: 701 and 761.</td>
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<tr>
<td>950</td>
<td>Research in Mathematics</td>
<td>3-5</td>
<td>A, W, Sp, Su.</td>
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</tr>
</tbody>
</table>

A-150
Mechanical Engineering

Office: 2075 Robinson Laboratory, 206 West 18th Avenue South.
PROFESSORS: I. MARCO (Chairman), BEITLER (Emeritus),
BOLZ, BUCHER (Emeritus), HAN, HONES, MARQUIS (Emer-
itus), MOPFAT (Emeritus), NORMAN (Emeritus), STARKER,
and STINSON (Emeritus). ASSOCIATE PROFESSORS: IDDE-
BELIN, ENGELMAN, IGLOVER, IRONING, MCLEAN,
SEPSY, SMITH, and T. VELKOFF; ASSISTANT PROFESSORS
BOYD, BRIDGE, BUXTON, DAVIDSON, FOSTER, JORDAN,
and YU; VISITING ASSISTANT PROFESSOR BRANN.

601 Thermodynamics U G 5
W, Sp. 5 cl.
Prereq.: Math. 543 and Physics 432 or 532.
Not open to students majoring in Mech. E.
A study of the principles of thermodynamics as an engineering
science. Marco.

607 Thermodynamics and Fluid Dynamics U G 5
A, W. 5 cl.
Prereq.: Professional division standing.
Not for graduate credit to students majoring in Mech. E.
Not open to students with credit for 600-604-605.
A study of basic engineering thermodynamics, including an in-
tegrated treatment of fluid flow. Marco.

608 Thermodynamics and Fluid Dynamics U G 5
W, Sp. 5 cl.
Prereq.: 607, or Chem. 681 and Physics 603.
Continuation of 607.

609 Thermodynamics and Fluid Dynamics U G 3
A, Sp. 3 cl.
Prereq.: 608.
Continuation of 608. Han.

610 Heat Transfer U G 4
A, W. 4 cl.
Prereq.: 605 or 609.
Not for graduate credit to students majoring in Mech. E.
Not open to students with credit for 611.
A study of the fundamental laws of heat conduction, radiation,
and convection, including an introduction to transient conduction.
Jordon.

614 Principles of Heat Generation U G 3
W, Sp. 3 cl.
Prereq.: 510 or 611.
Not for graduate credit to students majoring in Mech E.
Not open to students with credit for 608.
A quantitative and qualitative study of heat generation including
molecular and nuclear processes. Marco.

615 Kinematics of Machines U G 5
A, Sp. 5 cl.
Prereq.: Professional division standing.
Not for graduate credit to students majoring in Mech E.
A study of displacements, velocities, and accelerations of machine
members using graphical and numerical methods of analysis.
McLarnan.

616 Dynamics of Machinery U G 4
A, W. 4 cl.
Not for graduate credit to students majoring in Mech. E.
Not open to students with credit for 620.
A study of the interrelationships among forces, motions, and
masses as related to rigid or elastic machine members, including
force analysis, vibration, impact, and balancing. Starky.

621 Heat Transfer and Fluid Flow U G 5
W, Sp. 5 cl.
Prereq: 601.
Not open to students majoring in Mech. E.
A study of the fundamental principles of heat transfer and fluid
flow in the design of heat exchange equipment with applications
to electrical machinery and apparatus. Jordan.

627 Materials of Engineering U 4
A, W. 4 cl.
Prereq.: Professional division standing.
A study of the structure of engineering materials and of their
properties as used in engineering design. Marco.

672 Hydraulic Laboratory U 1
A. 1 3-hr. lab.
Prereq.: Must be taken concurrently with Civil E. 728.
A study of incompressible fluid flow through various primary
elements and through a centrifugal pump. Buxton.

703 Internal Combustion Engines U 4
A. 3 cl.
Prereq.: 625, or 614 and 722.
A study of combustion chambers, valve mechanisms, and the
dynamic balance of internal combustion engines. Engelman.

704 Internal Combustion Engines U 4
W. 3 cl.
Prereq.: 625, or 614 and 722.
Force analysis as related to the design of engine components such
as pistons, bearings, valve springs, and crankshafts. Engelman.

710 Heating, Ventilating, and Air Conditioning U 4
A. 4 cl.
Prereq.: 610 or 611, and 733.
A study of practices, components and systems for conventional
and unique air conditioning equipment used to control the en-
vironment for human occupancy, storage and industrial processes.
Seppey.

716 Refrigeration and Air Conditioning U 4
W. 3 cl.
Prereq.: 610 or 611, and 733.
A study of fundamental, processes and equipment associated with
refrigeration systems using vapor compression, air cycle, absorption,
magnetic and thermoelectric cooling. Seppey.

721 Principles of Energy Conversion and Turbomachinery U 3
A, W. 3 cl.
Prereq.: 605 or 609.
Not for graduate credit to students majoring in Mech E.
Not open to students with credit for 720.
A study of the principles of energy conversion and transfer, per-
formance and physical characteristics of power-absorbing, power-
generating and power-transmitting turbomachinery. Jones.
722 Principles of Energy Conversion in Positive Displacement Machinery

A. Sp. 3 cl.
Prereq.: 605 or 609, and 606 or 614
Not for graduate credit to students majoring in Mech. E. Not open to students with credit for 625.
A study of the principles of energy conversion and transfer, performance and physical characteristics of power-absorbing, power-generating, and power-transmitting positive displacement machinery. Jones.

723 Principles of Environmental Control

A. Sp. 3 cl.
Prereq.: 610 or 611, and 616 or 620.
Not for graduate credit to students majoring in Mech. E. Not open to students with credit for 719.
A study of the principles of the control of environments for human occupation, occupation by other living beings, the operation of mechanical and electrical equipment, and for the storage and processing of materials. Spevak.

724 Principles of Heat Exchangers

W, Sp. 3 cl.
Prereq.: 610.
Not for graduate credit to students majoring in Mech. E.
A study of the principles of heat and mass transfer as applied to the design of heat exchangers. Marco.

725 Diesel Engines

Sp. 3 cl.
Prereq.: 625, or 614 and 722.
An advanced study of Diesel engine design, operation, and economics. Engelman.

726 Gas Turbine Power Plants

W. 3 cl.
Prereq.: 606 or 614, and 720 or 721.
A study of the principles, performance, and design of gas turbine power plants. Engelman.

736 Machine Design

W, Sp. 5 cl.
Not open to students majoring in Mech. E.
A study of the application of the general principles and empiricism of mechanics of solids to the creative design of mechanical equipment. Starkey.

745 Vapor Power Cycles

A. 3 cl.
Prereq.: 605 or 609, 610, and 614.
A descriptive and analytical study of elementary and advanced power plant cycles. Bastian.

755 Nuclear Power Plants

Sp. 3 cl.
Prereq.: 610 or 611, and 727 or 736 or 767, and Physics 602 or 615.
A study of the thermal and mechanical design aspects of nuclear power plants and processes. Jones.

756 Cryogenic Systems

Sp. 3 cl.
Prereq.: 601 or 605, or 609, and 610 or 621.
Study of low-temperature processes and equipment; physical properties at low-temperatures; practical application of low-temperature techniques and processes in engineering systems. Marco.

761 Advanced Mechanical Engineering

W. 3 cl., 1 3-hr. lab.
Prereq.: 604 or 778, or equiv.
A theoretical and experimental study of measurement instrumentation. Emphasis on both principles of operation and analysis and design techniques for measurement systems of a mechanical and electromechanical nature. Doebelin.

762 Principles of Automatic Control

W, Sp. 3 cl., 1 2-hr. lab.
Prereq.: 605 or 609, 610 or 611, 616 or 620, and 775, or permission of instructor.
Not open to students with credit for 760.
A theoretical and experimental study of the principles of operation of feedback control systems, including servomechanisms and process controls. Doebelin.

763 Control Systems Design

Sp. 3 cl., 1 2-hr. lab.
Prereq.: 760 or 762 or permission of instructor.
A study of the theoretical and experimental procedures involved in the design of feedback control systems including servomechanisms and process control. Doebelin.

767 Principles of Mechanical Design

A, W. 4 cl.
Not for graduate credit to students majoring in Mech. E. Not open to students with credit for 727-728-744-727-788-743, or 727-728-743.
A study of the application of the general principles and empiricism of mechanics of solids to the creative design of mechanical equipment. Starkey.

768 Principles of Mechanical Design

W, Sp. 4 cl.
Prereq.: 616 or 620 and 767.
Not for graduate credit to students majoring in Mech. E. Not open to students with credit for 727-728-744, 727-728-745, or 727-733-743.
Continuation of 767. Starkey.

770 Professional Aspects of Mechanical Engineering

A. 1 cl.
Prereq.: Mech. E. Professional Division 3rd yr. standing.
A study of the code of ethics, licensing law, responsibilities of professional societies and the relationship to labor and management of the professional engineer. Marco.

771 Preliminary Design

A, W. 3 3-hr. lab.
Prereq.: 720 or 721, 728, 733, 738 or 768, and 744 or 769.
Not for graduate credit to students majoring in Mech. E.
Engineering design of a selected piece of mechanical engineering equipment involving professional type problems and encompassing all the basic disciplines of mechanical engineering. Ing. Foster.

772 Preliminary Design

W, Sp. 3 3-hr. lab.
Prereq.: 771.
Continuation of 771.
773  Preliminary Design  U G 3
A. Sp.  3 2-hr. lab.
Prereq.: 771.
Continuation of 771.

778  Mechanical Engineering Measurements  U G 3
A, Sp.  1 cl., 1 4-hr. lab.
Prereq.: 605 or 609, 610 or 611, and 610 or 620.
Not for graduate credit for students majoring in Mech. E.
Not open to students with credit for 664 and 665.
A theoretical and experimental study of the principles of operation and performance characteristics of measuring instruments used in mechanical engineering. Doebelin.

779  Mechanical Engineering Laboratory  U G 3
W, Sp.  2 2-hr. lab. and 5 hrs. lab. planning and report writing.
Prereq.: 605 or 778.
Not for graduate credit for students majoring in Mech. E.
The study and application of methods of experimental analysis. Buxton.

780  Mechanical Engineering Laboratory  U G 3
A, Sp.  2 2-hr. lab. and 5 hrs. lab. planning and report writing.
Prereq.: 779.
Continuation of 779.

798  Advanced Studies in Mechanical Engineering  U G 3-5
Prereq.: Permission of instructor.
Advanced topics in the various phases of Mech. E. The particular topics, the number of credit hours, and the instructor will be announced in the quarter previous to the one in which the course is offered.

799  Special Problems in Mechanical Engineering  U G 2-10
Prereq.: Permission of instructor.
Repeatable to a maximum of 24 cr. hrs. with a maximum of 10 cr. hrs. in any one subdivision.
This course is intended to give the advanced student opportunity to pursue special studies not otherwise offered. Work undertaken will be selected from automotive and internal combustion machinery, combustion and fuels, heat transfer, heating, ventilating, and air conditioning, industrial hydraulics, machine design, refrigeration, steam power plants, and thermodynamics.

801  Advanced Applied Thermodynamics  G 3
A.  3 cl.
Prereq.: 601 or 605, and Math. 544, or equivo.
An analytical study of the thermodynamics of fluid flows. Mancini.

802  Advanced Applied Thermodynamics  G 3
W.  3 cl.
Prereq.: 601 or 605 and Math. 544 and 546, or equivo.
A study of classical thermodynamics, systems in equilibrium, and the thermodynamics of irreversible phenomena. Marco.

803  Advanced Applied Thermodynamics  G 3
Sp.  3 cl.
Prereq.: 802.
Continuation of 802.

807  Advanced Heat Transfer  G 3
W.  3 cl.
Prereq.: 610, and 801 or Math. 609, or Math. 626.
A study of the general heat transfer equations and their applications to heat transfer in solids and through fluids. The use of numerical and graphical analysis will be included. Han.

809  Advanced Heat Transfer  G 3
A.  3 cl.
Prereq.: 808 and Math. 544, or equivo.
A study of phase change and radiative heat transfer processes. Marcro.

810  Internal Combustion Power Plants  G 3
W.  3 cl.
Prereq.: 722, or equivo.
An advanced study of reciprocating internal combustion power plants. Engelman.

811  Advanced Principles of Energy Conversion in Turbomachinery  G 3
Sp.  3 cl.
Prereq.: 721 or equivo.
An advanced study of power-absorbing, generating, and transmitting turbomachinery. Jones.

812  Preliminary Design of Power Systems  G Arr.
Prereq.: Permission of instructor.
Preliminary design and evaluation of novel systems including analysis, synthesis, and possible experimental verification. Engelman, Jones.

820  Advanced Principles of Refrigeration  G 3
W.  3 cl.
Prereq.: 710 or equivo.
Advanced study of conventional and novel processes including thermoelectric, magnetic, and gas systems. Sepay.

821  Advanced Environmental Control  G 3
Sp.  3 cl.
Prereq.: 723 or equivo.
An advanced study of conventional and unique systems used to control the environment for occupancy by people, equipment, and material. Sepay.

822  Advanced Environmental Control Problems  G Arr.
Prereq.: Permission of instructor.
A study of methods of synthesis and analysis pertaining to the creative design of environmental control systems, involving conferences and theoretical and/or experimental investigations. Sepay.

830  Advanced Steam Power Cycle and Turbine Analysis  G 3
W.  3 cl.
Prereq.: 605 or 609, 610, and 721.
An advanced study of steam power cycles and design of steam turbine nozzle and blades. Buxton.

831  Advanced Combined Vapor Power Cycle Analysis  G 3
Sp.  3 cl.
Prereq.: 805 and 830, or permission of instructor.
832 Advanced Vapor Power Cycle and Component Studies  
G Arr.  
A. W. Sp. Conf.  
Prereq.: 830 or 831, or permission of instructor.  
Courses to be conducted on a conference basis with problems assigned to each student based on his needs and area of interest. Boston.

840 Advanced Mechanical Design  
G 3  
A. 3 cl.  
Prereq.: 767 and Math. 544, or equiv.  
A study of concepts, principles, and phenomenological theories related to the failure-prevention aspect of mechanical design. Starkey.

841 Dynamics of High Speed Machinery  
G 3  
W. 3 cl.  
Prereq.: 765 or 768, and Math. 544, or equiv.  
An advanced study of the interrelationships among forces, motions, and masses as related to rigid or elastic machine members. Starkey.

843 Stress Analysis of Machinery  
G 3  
Sp. 3 cl.  
Prereq.: 735, or 785 and 788, or 861 or Math. 609, or equiv.  
A study of the concepts, principles, and procedures related to the analysis of stresses and strains in machine parts. Starkey.

844 Kinematic Synthesis and Analysis  
G 3  
A. 3 cl.  
Prereq.: 613, and 736 or 769.  
A study of fundamental methods for the synthesis and analysis of motions in mechanical systems. McLaran.

852 Dynamics of Inviscid Fluids  
G 3  
W. 3 cl.  
Prereq.: 609, and 861 or Math. 609, or equiv.  
Not open to students with credit for 808 or 850.  
Three dimensional, compressible, and incompressible inviscid flows, including irrotational and rotational motions with and without flow discontinuities. Han.

854 Laminar Flow and Heat Transfer  
G 5  
Sp. 5 cl.  
Prereq.: 610 and 853.  
Not open to students with credit for 608 or 850.  
Laminar boundary layers and fluid flow with and without heat transfer, fully established entrance flows, free convection, extensions to compressible flows. Han.

855 Turbulent Flow and Heat Transfer  
G 5  
A. 5 cl.  
Prereq.: 854.  
Not open to students with credit for 808 or 850.  
Turbulent boundary layers and flows with and without heat transfer for internal and external flows including laminar instability, Reynolds stresses, and mixing length theory. Marcz.

860 Lumped Parameter System Analysis  
G 3  
A. 3 cl.  
Prereq.: Math. 544 or equiv. or permission of instructor.  

861 Distributed Parameter Systems  
G 3  
A. 3 cl.  
Prereq.: 610 and Math. 544, or equiv.  
Not open to students with credit for 807, 808, or 850.  
Numerical and analytical methods for obtaining solutions to engineering problems in heat transfer, fluid mechanics, and other fields. Bridge.

890 Mechanical Engineering Seminar  
G 2  
A. Sp. 4 cl.  
Prereq.: Mec. E. grad. standing.  
A group study of the frontiers of knowledge in Mech E, by assignment of reading in technical literature, student presentations, and related group discussions.

950 Research in Mechanical Engineering  
G Arr.  
A, W, Sp, St.  
Research for thesis or dissertation purposes only.

**Medicine**

Office: N-1013 University Hospital, 410 West 10th Avenue

PROFESSORS 1WARREN (Chairman), 1ALLEN, 1BEMAN, 1BROWNING, 2DELOF, 1FANCHER, 1FORMAN, 1HAMM, 1HEISEL, 1KEEJ, 1KENT, 1MITCHEL, 1W. MITCHELL, 1MYERS, 1PALMER, 1PRIOR, 1ROTHERMICH, 1RYAN, 1SALAV, 1SCHIEVE, 1SCHOENE, 1SHILLITO, 1SWALL, and 1WILSON. ASSOCIATE PROFESSORS 1ATWELL, 1AYRES, 1BOUROS, 1BRADLEY, 1DIOVITZ, 1EVANS, 1FULTON, 1GREEN, 1HATIE, 1HUSTON, 1J. JOHNSON, 1KIBIEE, 1McCoy, 1MENGEL, 1SILBERSTEIN, 1STOW, 1TAGUCHI, and 1WEISS. ASSISTANT PROFESSORS 1BARTHOLOMEW, 1BOWERS, 1CARL, 1CLARK, 1CASSER, 1CLODFELTER, 1CONN, 1DONNERBERG, 1GOWN, 1GOLDBERG, 1GOODMAN, 1GOLDENBERG, 1GRAME, 1GRUBER, 1GUTHRIE, 1HAYTON, 1HATCHER, 1HATFIELD, 1HUMMEL, 1HUMPHREY, 1JACQUES, 1J. JOHNSON, 1KELLER, 1KINS, 1KREIG, 1LAMEY, 1LEFKE, 1LEIGHTON, 1LITTLE, 1LONG, 1LOVE, 1MATON, 1MATES, 1MCKINNIE, 1MENDOZ, 1MERS, 1METZGER, 1MORRICE, 1MURPHY, 1OBETZ, 1PARKER, 1PERKINS, 1PHELPS, 1PHILIPS, 1PINE, 1POL, 1PRAVER, 1Pritchett, 1READ, 1ROSENOW, 1ROBSON, 1SCHOENFELD, 1SEYLER, 1SHARKEY, 1SHEPP, 1SMITH, 1SOTOS, 1STEVENSON, 1TIBER, 1STOMACHERFS, 1TROSTEIN, 1VINCENT, 1WINEG, 1WIERDIN, 1WILLIAM, 1WILLIAMS, and 1WOOLEY.

601 The Comprehensive Evaluation of the Patient  
P 6  
W. 99 cl. and conf. hrs.  
Prereq.: Med. 2nd yr. standing.  
Complete evaluation of the whole patient including bedside examination, demonstrations, and lectures.

602 The Comprehensive Evaluation of the Patient  
P 15  
Sp. 220 cl. and conf. hrs.  
Prereq.: Med. 2nd yr. standing, and 601.  
Continuation of 601.

661 Principles of Medicine  
P 2  
Sp. 2 cl.  
Prereq.: Dent. 3rd yr. standing.  
A survey course in medicine for dental students considering the infectious, deficiency, and systemic diseases. Representative cases are selected for detailed consideration and demonstration if material is available.
675 The Art and Science of Medicine  P 0
W. 1 cl.
Prereq.: Med. 1st yr. standing.
The development of modern methods of diagnosis and treatment.
The consideration of the art as well as the science of medicine.

714 Ward Clinics in Infectious Diseases  P 6
1 month, offered all months except June.
Prereq.: Med. 3rd or 4th yr. standing.
Clerkship and seminars on common and unusual infectious diseases. Formal instruction between 8 a.m. and 6 p.m. but student is on call throughout 24 hours. Salaried.

715 Clinical Medicine  P 24
4 months, offered July, Nov., Mar.
Prereq.: Med. 3rd yr. standing.
Student will spend four months in medicine, one-third of the time in each of these areas: General Medical Wards, Out-Patient Department, and Subspecialty Ward Services, seeing general and special medical problems. Formal instruction is between 8 a.m. and 6 p.m., but student is on call throughout 24 hours. Subspecialties included are:
   a. Allergy
   b. Cardiology
   c. Dermatology
   d. Endocrinology
   e. Gastroenterology
   f. Hematology
   g. Neurology
   h. Pulmonary Diseases
   i. Renal Diseases
   j. Rheumatology

716 Ward Clinics in Pulmonary Diseases  P 6
1 month, offered all months except June.
Prereq.: Med. 3rd yr. standing.
Clerkship and seminars at Ohio Tuberculosis Hospital with emphasis on pulmonary medical problems. Formal instruction between 8 a.m. and 6 p.m., but student is on call throughout 24 hours.

733 Medical Law  P 1
Sp. Su. 1 cl.
Prereq.: Med. 4th yr. standing.
The civil and criminal aspects of legal medicine as they relate to the responsibilities, privileges, and rights of the practicing physician are considered.

736 Dispensary Clinics in Medicine  P 13
Prereq.: Med. 4th yr. standing.

740 Dispensary Clinics in Medicine  P 6
1 month, offered all months except June.
The diagnosis and treatment of ambulatory patients with general and special medical problems.

749 Medical Specialties  P 4
Prereq.: Med. 4th yr. standing.

751 Medical Specialties  P 6
1 month, offered all months except June.
Prereq.: 715 and permission of instructor.
Ward clerkship in the following subspecialties of medicine, with bedside, didactic and seminar instruction. Formal instruction is between 8 a.m. and 6 p.m., but student is on call throughout 24 hours.

MEDICINE

a. Allergy and Dermatology
b. Cardiology
c. Endocrinology
d. Gastroenterology
e. Genetics
f. Hematology
g. Neurology
h. Pulmonary Diseases
i. Renal Diseases
j. Rheumatology

770 Basic Science Review  P 2
1 month, May.
Prereq.: Med. 4th yr. standing; Concur.: Pharmacol. 770.
Didactic review of new basic science developments; practice in electrocardiographic and phonocardiographic interpretation. McCoy.

771 Medical Civics and Economics  P 1
1 month, May.
Prereq.: Med. 4th yr. standing; Concur.: Pharmacol. 770.
Elements of office practice and community relations. McCoy.

793 Individual Studies in Medicine  G 1-5
2, 3 or 4 months, offered all months except June.
Prereq.: Med. 4th yr. standing, and permission of division chief.
Research on a minor problem under faculty supervision in the following specialties of medicine:
   a. Allergy and Dermatology
   b. Cardiology
   c. Endocrinology
   d. Gastroenterology
   e. Genetics
   f. Hematology
   g. Infectious Diseases
   h. Neurology
   i. Pulmonary Diseases
   j. Renal Diseases
   k. Rheumatology

795 Seminar in Medicine  G 1-3
Prereq.: Permission of instructor.
Discussion of pertinent literature and research projects in various subspecialty areas with emphasis on basic science concepts. Warren and Staff.

798 Internship in Medicine  P 18
12 months, full time, beginning July 1.
Prereq.: Appointment as Intern, University Hospital.
Repeatable to a maximum of 216 cr. hrs.
Rotation through medical ward services and hospital emergency room; primary responsibility for patient care; attending and work rounds; staff conferences.

799 Residency in Medicine  P 18
12 months full time, beginning July 1.
Prereq.: Appointment as Resident, University Hospital.
Repeatable to a maximum of 216 cr. hrs.
Rotation through medical subspeciality, clinical and out-patient services; consultative activities, supervisory and teaching responsibilities in patient-care team; rounds; conferences.

950 Research in Medicine  G. Arr.
Research for thesis or dissertation purposes only.

A-155
Medical Microbiology

Office: Sterling Living Hall, 320 West 10th Avenue.
PROFESSOR CRAMBLETT (Chairman); ASSISTANT PROFESSORS BOWMAN and OTTOLENGHI.

624 Medical Microbiology P G 8
A. 3 hr. cl., 2 2-hr. labs.
Prereq.: Med. 2nd yr. standing.
Morphologic, physiologic and serologic characteristics of pathogenic microorganisms; the epidemiology and pathogenesis of infectious diseases, methods of diagnosis, prevention and treatment. Cramblett and Staff.

625 Medical Microbiology P G 2
W. 3 hr. cl., 2 2-hr. lab.
Prereq.: 624.
Continuation of 624. Cramblett and Staff.

Metallurgical Engineering

Office: 141A Metallurgical Building, 118 West 10th Avenue.
PROFESSORS SPONTANA (Chairman), BECK, BIRTH, MUELLER (Emeritus), NOLD (Emeritus), POWELL, SPEISER, SPIRENTAK, and IST. PIERRE; VISITING PROFESSOR LOTE; ASSOCIATE PROFESSORS IMOAZED and WILLIAMS; ASSISTANT PROFESSORS RAPP and ISTAEBLE.

420 Industrial Experience U 5
A. 5 cr. hrs. for each semester's work.
Repeatable to a maximum of 10 cr. hrs.
Register for course and submit report on experience during the Autumn Quarter following the summer in which industrial experience was obtained. Two summers or 20 weeks of approved work in metallurgical industries. Williams.

501 Foundry Technology U 4
A. 3 cl., 1 2-hr. lab.
Prereq.: 560.
Survey of mold making, fundamentals of refining metals, their properties, production of machine components by casting techniques. Williams.

560 Phase Diagrams of Metals and Alloys U 3
A. 3 cl.
The phase rule, relationship of microstructure to phase diagrams and to properties of metals and alloys. Moazed.

611 Elements of Materials Science U 4
W. Sp. 4 cl.
Metals and alloys, plastics, ceramics, and corrosion. Powell, Rapp.

630 Physical Metallurgy I U G 3
W. 3 cl.
Prereq.: 560.
Not for graduate credit to students majoring in Met. E.
States, crystal structure, and properties of single crystals of pure metals. Powell.

631 Physical Metallurgy II U G 3
Sp. 3 cl.
Prereq.: 560.
Not for graduate credit to students majoring in Met. E.

632 Physical Metallurgy III U G 3
A. 3 cl.

645 Inspection Trip U 2

661 Principles of Metallurgical Processes I U G 4
A. 4 cl.
Prereq.: Chem. 681 or concur.
Not for graduate credit to students majoring in Met. E.
Introduction to the quantitative description of metallurgical processes including mineral beneficiation. Particular emphasis on stoichiometry and thermodynamics. Rapp, St. Pierre.

662 Principles of Metallurgical Processes II U G 4
W. 4 cl.
Prereq.: 661, concur. Chem. 682.
Not for graduate credit to students majoring in Met. E.

663 Principles of Metallurgical Processes III U G 3
Sp. 3 cl.
Prereq.: 662.
Not for graduate credit to students majoring in Met. E.
Mass and heat transfer problems associated with metallurgical processes. Rapp, Staebble.

671 Metallography I U G 2
A. 1 4-hr. lab.
Concur.: 631.
Not for graduate credit to students majoring in Met. E.
Principles and practice of metallography. Powell.

672 Metallography II U G 2
W. 1 4-hr. lab.
Prereq.: 671.
Not for graduate credit to students majoring in Met. E.
Continuation of 671. Moazed.

673 Metallography III U G 2
Sp. 1 4-hr. lab.
Prereq.: 672.
Not for graduate credit to students majoring in Met. E.
Continuation of 672. Moazed.

703 Heat Treatment of Steels U G 3
W. 3 cl.
Prereq.: 632.
Not for graduate credit to students majoring in Met. E.
Decomposition of austenite and the hardenability of steels. Moazed.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>704</td>
<td>Physical Metallurgy IV</td>
<td>U G 4</td>
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<td></td>
<td>Sp. 3 cl., 1 3-hr. lab.</td>
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<td></td>
<td>Prereq.: 703.</td>
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<tr>
<td>710</td>
<td>Metallurgical Investigations</td>
<td>U G 1-6</td>
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<td></td>
<td>A, W, Sp., Su. 1 cl., 2 to 4 3-hr. lab.</td>
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<td>Prereq.: Permission of department.</td>
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<td></td>
<td>Repeatable to a maximum of 9 cr. hrs.</td>
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<td></td>
<td>The class is divided into groups for investigation along the lines of their special interests as follows:</td>
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<td></td>
<td>a. The properties of metals and alloys.</td>
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<td></td>
<td>b. Production and refining of metals.</td>
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<td></td>
<td>c. Mineral and coal beneficidation.</td>
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<td>d. Fuels.</td>
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<td></td>
<td>e. Metallurgical equilibria.</td>
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<td>f. Corrosion engineering.</td>
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<td></td>
<td>g. Foundry.</td>
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<td></td>
<td>h. Power metallurgy.</td>
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<td></td>
<td>All investigations are under the close direction of instructors. Comprehensive report required.</td>
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<td>712</td>
<td>Metallurgical Thermodynamics</td>
<td>U G 3</td>
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<td></td>
<td>A. 3 cl.</td>
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<td>Prereq.: Chem. 693.</td>
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<td></td>
<td>The application of thermodynamics to the study of metallurgical systems. Rapp, St. Pierre.</td>
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<td>716</td>
<td>Materials of Nuclear Technology</td>
<td>U G 3</td>
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<td>A. 3 cl.</td>
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<td></td>
<td>Prereq.: 611 or equiv.</td>
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<td></td>
<td>The physical metallurgy of reactor materials; the effects of reactor environment on the structure, the physical and mechanical properties of these materials. Fossell.</td>
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<td>721</td>
<td>Foundry Molding Materials</td>
<td>U G 3</td>
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<td>A. 3 cl.</td>
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<td></td>
<td>Prereq.: 501, Mineral 506.</td>
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<td></td>
<td>A study of materials used in compounding of sand mixtures and the effect of thermal shock upon the properties of molded masses. Williams.</td>
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<tr>
<td>722</td>
<td>Foundry Molding Methods, Gating,</td>
<td>U G 3</td>
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<tr>
<td></td>
<td>and Risering</td>
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<td></td>
<td>W. 3 cl.</td>
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<td>Prereq.: 501, 663.</td>
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<tr>
<td></td>
<td>The manufacture of sand molds by various methods. Gating and risering—a study of fluid flow and solidification to produce sound castings. Williams.</td>
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<tr>
<td>724</td>
<td>Casting Control</td>
<td>U G 3</td>
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<td>Sp. 3 cl.</td>
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<td>Prereq.: 721 or 722.</td>
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<td></td>
<td>A study of the factors involved in the elimination of defective products. Williams.</td>
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<td>730</td>
<td>Corrosion</td>
<td>U G 3</td>
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<td></td>
<td>A, Sp. 2 cl., 1 3-hr. lab.</td>
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<td></td>
<td>Prereq.: Engr. 4th yr. standing.</td>
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<tr>
<td></td>
<td>Fontana.</td>
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<td>731</td>
<td>Advanced Corrosion</td>
<td>U G 3</td>
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<td>W. 3 cl.</td>
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<td>Prereq.: 730.</td>
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<td></td>
<td>Theories and mechanisms of corrosion. Fontana, Stoebbe.</td>
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<td>735</td>
<td>Mechanical Metallurgy</td>
<td>U G 3</td>
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<tr>
<td></td>
<td>A. 3 cl.</td>
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<td></td>
<td>Behavior of metals under simple and combined stress systems. Elements of elastic theory, plastic deformation, dislocation theory, strength theories, and fracture. Spethman.</td>
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<tr>
<td>740</td>
<td>Advanced Physical Metallurgy I</td>
<td>U G 3</td>
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<td></td>
<td>W. 3 cl.</td>
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<td></td>
<td>Prereq.: 704.</td>
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<td></td>
<td>Detailed discussion of nucleation theory, preparation of single crystals, metallic crystals and grains; interpretation of microstructure in terms of interfacial tensions, grain growth, alloying. Moazed.</td>
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<td>741</td>
<td>Advanced Physical Metallurgy II</td>
<td>U G 3</td>
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<td></td>
<td>A. 3 cl.</td>
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<td></td>
<td>Prereq.: 704.</td>
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<td></td>
<td>Diffusion in metals. Fossell.</td>
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<td>742</td>
<td>Advanced Physical Metallurgy III</td>
<td>U G 3</td>
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<td></td>
<td>Sp. 3 cl.</td>
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<td>Prereq.: 740 and 741.</td>
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<td></td>
<td>Classification of phase transformations, precipitation from solid solution, martensitic transformations, decomposition of austenite, order-disorder. Spethman.</td>
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<td>743</td>
<td>Advanced Physical Metallurgy IV</td>
<td>U G 3</td>
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<td></td>
<td>A. 3 cl.</td>
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<td></td>
<td>Prereq.: 742.</td>
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<td></td>
<td>Relation of properties to microstructure. Moazed.</td>
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<tr>
<td>745</td>
<td>Shaping and Forming of Metals</td>
<td>U G 3</td>
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<td></td>
<td>W. 3 cl.</td>
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<td></td>
<td>Prereq.: 735.</td>
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<td></td>
<td>Fundamental aspects of deformation of metals by forging, rolling, wire drawing, tube drawing, extrusion, piercing, and deep drawing. Spethman.</td>
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<tr>
<td>759</td>
<td>Engineering Metallurgy I</td>
<td>U G 3</td>
<td></td>
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<tr>
<td></td>
<td>A. 3 cl.</td>
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<td></td>
<td>Prereq.: 703.</td>
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<td></td>
<td>Basic properties of metals and alloys, cost structure, design factors, specifications, statistical methods. Selection of metals and alloys, service failures. Spethman.</td>
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<tr>
<td>760</td>
<td>Engineering Metallurgy II</td>
<td>U G 3</td>
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<td></td>
<td>W. 3 cl.</td>
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<td>Prereq.: 759.</td>
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<td></td>
<td>Continuation of 759. Spethman, Stoebbe.</td>
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<tr>
<td>761</td>
<td>Principles of Extractive Metallurgy I</td>
<td>U G 3</td>
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<td></td>
<td>W. 3 cl.</td>
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<td></td>
<td>Prereq.: 663, 712, or permission of instructor.</td>
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<td></td>
<td>Unit processes in metal extraction and refining. Rapp, St. Pierre.</td>
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<tr>
<td>762</td>
<td>Principles of Extractive Metallurgy II</td>
<td>U G 4</td>
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<td></td>
<td>Sp. 3 cl., 1 3-hr. lab.</td>
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<td>Prereq.: 761.</td>
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<td></td>
<td>High-temperature reactions between pyrometallurgical phases. Rapp, St. Pierre.</td>
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<tr>
<td>763</td>
<td>Process Metallurgy</td>
<td>U G 3</td>
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<td></td>
<td>W. 3 cl.</td>
<td></td>
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<td></td>
<td>Prereq.: 762.</td>
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</table>
770  Theory and Properties of Metals U G 3
     Sp.  3 cl.
     Prereq.: 704, Chem. 683, and Math. 544, or permission of instructor.
Dependence of physical properties on structure; regularities in the structure of alloy systems; stability of alloy systems; transport phenomena in metals and alloys; magnetic phenomena. Speiser.

771  Theory and Properties of Metals U G 3
     A.  3 cl.
     Prereq.: 770.
Continuation of 770. Speiser.

772  Theory and Properties of Metals U G 3
     W.  3 cl.
     Prereq.: 771.
Continuation of 771. Speiser.

774† Advanced Properties of Materials U G 3
     Sp.  3 cl.
     Prereq.: Math. 544, Physics 614, and graduate standing or permission of instructor.

776  Advanced Structure of Materials U G 3
     W.  3 cl.
     Prereq.: 611 or equiv.
     Not open to students majoring in Met. E.

780  Structures of Metals and Alloys U G 3
     W.  3 cl.
     Prereq.: 632 and 704, Math. 544, Chem. 683, or permission of instructor.

790 * Energetics and Kinetics of Surfaces U G 3
     Sp.  3 cl.
     Prereq.: 712 or equiv.
Discussion of properties of interfaces and their role in rate processes. Moazed.

801  Graduate Seminar G 1
     Prereq.: Met. E. grad. standing.
     Repeatable to a maximum of 6 cr. hrs.
Discussion of current thesis problems and outstanding current literature in metallurgical engineering. Round table discussion of selected metallurgical topics.

815  Physical Chemistry of Process Metallurgy G 3
     Sp.  3 cl.
     Prereq.: 763 or permission of instructor.
Detailed discussion of current literature related to the refining of metals. St. Pierre.

820  Quantitative Dislocation Theory U G 3
     W.  3 cl.
     Prereq.: Math. 544 and permission of instructor.

830* Point Defects in Crystalline Materials G 3
     Sp.  3 cl.
     Prereq.: 712 and 730 or equiv., or permission of instructor.
A thermodynamic and electrochemical treatment of the formation, concentrations, mobilities, and interactions of ionic and electronic point defects in ionic compounds at high temperatures. Rapp.

835  Advanced Mechanical Metallurgy G 3
     Sp.  3 cl.
     Prereq.: 735.

843  Metallurgical Kinetics G 3
     Sp.  3 cl.
     Prereq.: 845.
Application of rate theory to transport phenomena in metals and alloys, and to metallurgical reactions. Speiser.

844  Advanced Metallurgical Thermodynamics G 3
     A.  3 cl.
     Prereq.: 712.

845  Metallurgical Thermodynamics G 3
     W.  3 cl.
     Prereq.: 844.
Continuation of 844 with major emphasis on practical applications. Numerous problems. Speiser.

850  Theoretical Metallurgy G 3
     A.  3 cl.
     Prereq.: Met. E. graduate standing or permission of instructor.
     Repeatable to a maximum of 9 cr. hrs.
Current topics in the field of specialization of the Visiting Battelle Professor of Metallurgy.

851  Theoretical Metallurgy G 3
     W.  3 cl.
     Prereq.: 850.
Continuation of 850.

852  Theoretical Metallurgy G 3
     Sp.  3 cl.
     Prereq.: 851.
Continuation of 851.

901  Advanced Topics in Metallurgical Engineering G 2
     A, W, Sp, Su  2 cl.
     Prereq.: Permission of the instructor.
     Repeatable to a maximum of 8 cr. hrs.
Pertinent topics to be announced.

950  Research in Metallurgy Arr.
     A, W, Sp, Su.
Research for thesis or dissertation purposes only.
Microbiology

PROFESSOR T. REINS (Chairman), I. STAHLER (Emeritus), I. BIRKELAND, I. BOHL, I. IOOD, I. HUDSON (Emeritus), I. MACGHERSON, I. RANDLE, I. SASLOW, I. WEISS, and I. WOLFF (Emeritus); ASSOCIATE PROFESSORS I. REIN and I. SUJUE; ASSISTANT PROFESSORS I. BIGLEY, I. SCHOPENHAEUER, I. DUGAN, I. FREA, I. KINSEY, I. KREISCH, I. ROEBUCK, and I. WOLFF.

For related course, see Biology.

409 Microbiology for Dental Hygienists U 4
W. 2 cl., 2 1-hr. lab.
Prereq.: Admission to Dental Hygiene program.
A survey of the principles of microbiology with reference to sterilization, asepsis, and disease prevention. More and assistants.

509 Microbiology in Relation to Man U 5
A, W, S, Su. 3 cl., 2 1-hr. labs.
Prereq.: 10 hrs. of natural science.
Not open to students with credit for 600 level courses in Microbiol.
Not to be taken concur. with Microbiol. 607.
Not for students who intend to take other courses in Microbiol.
Designed to give the student an understanding of microorganisms which have a bearing on the physical and economic well-being of man. Birkeland, Heuer, More and assistants.

510 Microbiology for Nurses U 5
W, Su. 3 cl., 2 1-hr. lab.
Prereq.: Nursing 1st yr. standing.
A survey of the principles and techniques of microbiology and immunology with special emphasis on their applications to nursing. Wolff.

511 General Microbiology U 5
A. 3 cl., 6 hr. hrs.
Prereq.: Superior performance in biol., chem., and math. in high school and permission of instructor.

512 General Microbiology U 5
W. 3 cl., 6 hr. hrs.
Prereq.: Superior performance in biol., chem., and math. in high school and permission of instructor.
A special course for first year college students. Genetics and ecology of microorganisms. Frea, Dugan, and Randles.

GENERAL PREREQUISITES FOR COURSES NUMBERED 600 AND 600

Unless otherwise indicated the prerequisites for 600 and 700 courses are fifteen hours of chemistry and ten hours of biological science.

602 Veterinary Microbiology P G 5
W. 3 cl., 3 2-hr. lab.
A study of the mechanisms of infection and resistance to disease, followed by discussion and laboratory exercises on characteristics of bacteria pathogenic for animals. Kreis and assistants.

603 Veterinary Microbiology P G 5
Sp. 3 cl., 3 2-hr. lab.
Continuation of Microbiol. 602. Lectures and laboratory exercises deal with the characteristics of bacteria, fungi, rickettsiae, and viruses that are pathogenic for animals. Kreis and assistants.

605 Basic Microbiology for Science U G 5
Teachers
W, Su. 3 cl., 3 2-hr. labs.
Prereq.: Biological science majors in the College of Education, or students in the Academic Year Institute, or graduate teachers of biological sciences.
Biology and physiology of bacteria. Their applications to foods, soil, fertility, sanitation, and disease. Laboratory exercises include those designed for limited equipment in high schools. Dugan.

607 General Microbiology U G 5
A, W, Sp, Su. 3 cl., 2 3-hr. lab.
May not be taken concur. with 509.
Not open to students with credit for 550.
The characteristics of microorganisms and their applications in everyday processes; experience in isolating and identifying bacteria. Randles, Frea, and Pfister.

609 General Microbiology U G 5
Continuation of 607. Dugan, Frea and Randles.

610 Dairy Microbiology U G 3
W. 3 cl.
Prereq.: 550 or 607.
Microorganisms involved in desirable and undesirable fermentations and methods of control. Emphasis is placed upon milk-borne diseases in relation to the public health. Kinsey and Weiser.

611 Dairy Microbiology: Laboratory U G 3
W. 3 2-hr. lab.
Prereq. or concur.: 610.
A study of standard methods used to control microorganisms discussed in Microbiol. 610. Normal and abnormal fermentation are studied in detail. Kinsey and Weiser.

620 Pathogenic Protozoology U G 3
W. 3 cl.
Prereq.: 623 and 625 or permission of instructor.
Various pathogenic protozoa of animals; host-parasite relationships; pathogenesis of protozoa diseases; structural characteristics of parasites. Kreisler.

622 Principles of Infection and Resistance U G 5
A, W, Sp, Su. 3 cl., 2 2-hr. labs.
Prereq.: 607 or equiv.
A study of host-parasite relationships, with emphasis on pathogenicity and immunity. Dood, Cherpolensky.

623 Serology U G 5
A, W. 3 cl., 3 2-hr. lab.
Prereq.: 622.
Theories, principles and techniques of the immunological phenomena such as acquired immunity, hypersensitivity, blood groups, etc., and the fundamental properties of antigens, antibodies, and their reactions. Cherpolensky.

625 Pathogenesis and Immunology of Infectious Diseases U G 5
A, W. 3 cl., 2 2-hr. labs.
Prereq.: 622.
A consideration of the microbiological and immunological aspects of representative types of infectious diseases. Bigley and Reine.

635 Physiology of Bacteria U G 3
W. 3 cl.
Prereq.: 633 and Chem. 551, 552 or 647, 648 or equiv.
Nutritional requirements of bacteria, mechanisms of anaerobic dissimulation of carbon compounds, and industrial fermentation. Randles, Dugan and Frea.

A-159
COURSES OF INSTRUCTION

MICROBIOLOGY

636 Food Microbiology U G 3
A, S, Sp. 3 cl.
Prereq.: 607.
The role of microorganisms in normal and abnormal fermentation in foods and related sanitation and public health problems are discussed. Weiser, Kinsley.

637 Food Microbiology Laboratory U G 3
A. 3 2-hr. lab.
Prereq.: 607, 636 or concurs. 608, or 654 or 659 or equiv. recommended or concurs.
Laboratory work on organisms discussed in Microbiol. 636. Weiser, Kinsley and Assistant.

638 Physiology of Bacteria U G 3
Sp. 3 cl.
Prereq.: 635 and Chem. 551, 552 or 647, 648 or equiv.
Bacterial enzymes, mechanisms, and energy relationships in respiration, nitrogen metabolism, and bacterial synthesis. Randel, Dugan, and Freis.

6391* Aquatic Microbiology U G 4
Sp. 1st term 3 all-day classes per week.
Prereq.: 20 cr. hrs. of biol. sci., including Microbiol. 607 or equiv., and Chem. 551 or equiv. Given only at the Frans Theodore Stone Laboratory.
The nature and activities of bacteria in the aquatic environment, with emphasis on the different physiological types found in the Lake Erie region. Randel.

652 General and Pathogenic Microbiology for Dental Students P G 6
W. 4 cl., 3 3-hr. lab.
Prereq.: Dent. 2nd yr. standing.
A survey of the techniques and principles of microbiology and immunology with special reference to the microbiology of the oral cavity. Dodd, Rossen and assistants.

Medical Microbiology
(See Medical Microbiology 634 and 635)

Soil Microbiology
(See Agronomy 605)

701 Minor Investigations U G 1-5
A, W, Sp, Su.
Prereq.: Microbiol. 4th yr. major or grad. standing and permission of instructor.
Repeatable.
Outlined by instructor to meet individual student's needs.

7101 History of Microbiology and Allied Fields U G 3
Sp. (Lectures, confs., and library work.)
Prereq.: Microbiol. advanced graduate standing or permission of instructor.
The historical development of bacteriology, immunology, and allied fields. Hudson.

720 Viruses: Laboratory C 3
Sp. 2 3-hr. labs.
Prereq.: 633, 654, 659, 648, and permission of instructor.
Laboratory study of viruses and some of the virus diseases of animals and man. Methods of isolation, propagation, identification, diagnosis, and control are considered. Wolf and assistants.

723 Immunology and Immunochemistry G 5
Sp. 3 cl., 2 3-hr. labs.
Prereq.: 625 and permission of instructor.
A thorough treatment of the basic phenomena involving antigens, antibodies, their nature and interactions. Dodd.

725 Bacterial Pathogens U G 5
Sp. 3 cl., 2 2-hr. labs.
Prereq.: 635.
Emphasis on the nature of representative bacterial disease agents. Rhines and Rigley.

734 Water Microbiology U G 3
Sp.
Prereq.: 609 or 633.
A basic study of the relationships and influence of aquatic environments on microorganisms and the effect of microbial metabolic processes on the quality of water.

735 Bacterial Physiology Laboratory U G 5
A. 3 cl., 2 3-hr. labs.
Prereq.: 638 and permission of instructor.
Laboratory study of bacterial physiology by a variety of techniques. Dugan, Freis and Randel.

7361* Advanced Food Microbiology U G 5
Sp. 2 cl., 2 3-hr labs.
Prereq.: 638, concurs. 622, or 635.
Advanced studies in the metabolism of microorganisms involved in preservation and food processing using radioisotopes, chromatography, and electrophoresis. Kinsley.

749 Basic Virology U G 5
W. 3 cl., 2 3-hr. labs.
Prereq.: 625 and Bio. Chem. or Physical Chem.
The basic physical, chemical and biological properties of animal and bacterial viruses including intracellular replication and subcellular responses to virus infection.

770 Microbial Cytology U G 5
Sp. 3 cl., 2 3-hr. labs.
Prereq.: 609 or 633 and permission of instructor.
A thorough study of morphology, fine structure and composition of microorganisms and the relation of these to cell function. Fister.

822 Advanced Immunology G 3
Sp.
Prereq.: 723.
Advanced studies of immunological phenomena, with emphasis on the physical and chemical aspects of antigens and antibodies. Dodd.

880 Seminar in Microbiology G 3
Repeatable. Permission of instructor only.

896 Interdepartmental Seminar in Polar and Alpine Studies Sp.
(See under Interdepartmental Seminars.)

(See under Interdepartmental Seminars.)

898 Interdepartmental Seminar in Nutrition G 1
and Food Technology Sp.
(See under Interdepartmental Seminars)

950 Research in Microbiology G Art.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.
MINERALOGY

701  Military Operations  
A. W.  2 2-hr. cl., 1 drill hr.  
Prereq.: 601, 602, 603, or permission of professor of Military Science.  
Study of Division Brigade, Battalion and Company organization and operations to include estimation of orders of infantry units in the attack, defense, and withdrawal with emphasis on mountain intelligence, and tactics. Leadership, command, and conduct of military drill.

702  Logistics and Administration  
W, Su.  2 2-hr. cl., 1 drill hr.  
Prereq.: 701 or permission of professor of Military Science.  
Study of logistics, medical service, evacuation, troop movements, motor transportation, and Army administration. Leadership, command, and conduct of military drill.

703  Military Justice and The United States in World Affairs  
Sp.  2 2-hr. cl., 1 drill hr.  
Prereq.: 702 or permission of professor of Military Science.  
Study of Military Justice. Review of Map Reading and student presentations on the role of the United States in world affairs considering world economic, political, geographic, and resource factors. Leadership, command, and conduct of military drill.

Mineralogy

Office: 291 Watts Hall, 10th West 19th Avenue.  
PROFESSORS I. FOSTER (Chairman), T. EHLERS, J. McCONNELL, J. McTACHAN, and J. WENDEN; ASSOCIATE PROFESSOR J. TETTENHORST.

506  Principles of Mineralogy  
A, W, Sp.  3 cl., 2 2-hr. lab.  
Prereq.: Chem. 412 or 405, Math. 430 or 417.  
Not open to students with credit for 511 or 512.  
An introductory course, emphasizing principles and illustrating the internal structure of solids and relationship of structure and chemical composition to properties, applications, and external features.  
Ehlers, Tettenhorst.

511  Crystallography and Descriptive Mineralogy  
A.  3 cl., 2 2-hr. lab.  
Prereq.: Chem. 412 or 405.  
Not open to students with credit for 506.  
Principles of crystallography, using models, crystals, and cleavage fragments. Physical and chemical properties, origin, association, occurrence, and site identification of about 160 of the most important minerals. Emphasis on crystallochemical principles.  
Wenden.

512  Crystallography and Descriptive Mineralogy  
W.  3 cl., 2 2-hr. lab.  
Prereq.: 511.  
Continuation of 511.
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>Advanced Crystallography</td>
<td>UG 5</td>
<td>A. 3 cl., 3 2-hr. lab. Prereq.: 506, 511, or equiv.</td>
</tr>
<tr>
<td>thermochemical mineralogy</td>
<td>UG 5</td>
<td>A. 5 cr. hrs. Prereq.: Chem. 653 or equiv., or permission of instructor.</td>
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<tr>
<td>Thermal properties of minerals. Application of high temperature equilibrium to problems of petrology and technology, using phase diagrams. Foster.</td>
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<tr>
<td>microscopy of opaque minerals</td>
<td>UG 3</td>
<td>Sp. 3 2-hr. lab. Prereq.: 506 or 512, 631.</td>
</tr>
<tr>
<td>Application of the petrographic microscope to the study of opaque minerals and ores, their identification, textures, and paragenesis. Polished section preparation, etch tests, and microchemical tests. Wenden.</td>
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<tr>
<td>microscopic mineralogy</td>
<td>UG 5</td>
<td>A., W. 2 cl., 3 2-hr. lab. Prereq.: 506 or 512, and Physics 412 or equiv. A., Geol. graduates; W., Cer. E. majors. Not open to students with credit for 625.</td>
</tr>
<tr>
<td>mineralological investigations</td>
<td>UG 3-5</td>
<td>A., W., Sp. 6-10 hr. lab. and conf. Prereq.: Satisfactory courses in field of problem, and permission of instructor. Repeatable to a maximum of 15 cr. hrs.</td>
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<tr>
<td>Special problems in petrological, thermochemical, crystallochemical, X-ray or clay mineralogy, or other advanced non-thesis research. Wenden, Ehlers, Foster, McLachlan, Tettenhorst.</td>
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<tr>
<td>advanced thermochemical mineralogy</td>
<td>UG 3</td>
<td>W. 3 cl. Prereq.: 600.</td>
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<tr>
<td>Derivation and interpretation of phase diagrams of ternary and quaternary systems of importance in petrology and technology. Foster.</td>
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<tr>
<td>microscopic petrography</td>
<td>UG 4</td>
<td>W. 2 cl., 3 2-hr. lab. Prereq.: 631.</td>
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<tr>
<td>advanced optical mineralogy</td>
<td>UG 3</td>
<td>A. 3 2-hr. lab. Prereq.: 728 or equiv.</td>
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<tr>
<td>Theory and determination of optical constants and directional features using Universal Stage. Includes determination of optic angles, feldspar compositions, double variation technique and petrofabric analysis. Ehlers.</td>
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<tr>
<td>clay mineralogy</td>
<td>UG 3</td>
<td>Sp. 3 cl., conf. Prereq.: 506 and 754, or permission of instructor.</td>
</tr>
<tr>
<td>Relationship of structure and chemical composition of clay minerals to properties, origin, occurrence, and applications. Evaluation of X-ray, differential thermal, infrared, and electron microscope data. Tettenhorst.</td>
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</tbody>
</table>

**Music**

Office: 105 Hughes Hall, 1899 North College Road.

PROFESSORS: BRIGSRY (Director), WEIGEL (Emeritus), WILSON (Emeritus), DICERMS, HEPPerson, IVEYANS, IGLI-LAND, HALDAD, HADDE, HELD, HOPPEN, KNEBERGS, LIVINGSTON, MCBRIDE, MGIRNS, MPELPS, SCHNEIDER, and STAIGER; ASSOCIATE PROFESSORS ANAWALT (Emeritus), DIERKER (Emeritus), HARDY (Emeritus), LAWSON (Emeritus), THOMAS (Emeritus), BARNES, BENNER, BURKHOLDER, JONES, IMA, ICMP, IMIX, MOONEY, FOGLAND, RAMSEY, SPORN, TETLEY, KANDOS, ITTUS, VEDDER, TWALKER, and UWILSON; ASSISTANT PROFESSORS BARNES, BONNY, ICADY, COOPER, DAVIS, HUFF, MICHAEL, HEMS, XETON, SAVID, SUDDENDORF, WABER, and WHILSON; INSTRUMENTORS BAKER, BRINK, DAFT, GREEN, LEVEY, MANLEY, and MOORE.

Preceding the class sessions of Mus 401 and Mus 408 B, C, D, E, F, or G, placement tests will be given to determine the ability of students in these subjects. (See School of Music for details of time and place.) Students with less than the expected ability will be requested to change from the original registration to Mus 400X or Music 400 A, B, C, D, E, or G.

**Applied Music**

A., W., Sp. (Include letter with number on schedule card.)

The fundamentals and techniques of applied music. This course is designed for, and open only to, students who do not qualify in the placement test or who, in the first quarter, do not maintain satisfactory standards of work in Music 408 A, B, C, D, E, or G. Applied Music Staff.

<table>
<thead>
<tr>
<th>Music Course</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>400A</td>
<td>Piano</td>
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<tr>
<td>400B</td>
<td>Voice</td>
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<td>400C</td>
<td>Strings</td>
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<td>400D</td>
<td>Woodwinds</td>
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<tr>
<td>400E</td>
<td>Brass</td>
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<tr>
<td>400G</td>
<td>Percussion</td>
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</tbody>
</table>
400 Introduction to Music U 1
2 cr., for 2 qtrs. (400 K, L, M) section meetings, or concert attendance each week for all freshmen. Attendance at twenty-seven concerts or recitals for 3 cr. (400 N, P, R) on a cumulative basis for all sophomores. A final grade for credit will be given at the end of the 8th qtr.
(Includes letter with number on schedule card.)
Lectures, discussions, conferences, and field trips, which will include: (a) Orientation of the student to University resources and to requirements of the School of Music. (b) Introduction to fields of music. (c) Assessment and advising of the student.
(d) Recital and Concert attendance.
A record of concert attendance will be kept in the School of Music office. Each course as follows is prerequisite to the next course. Mooney.
Orientation

<table>
<thead>
<tr>
<th>Concert Attendance</th>
<th>400K</th>
<th>(0)</th>
<th>400N</th>
<th>(0)</th>
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<tbody>
<tr>
<td>A. W. Sp.</td>
<td>A. W. Sp.</td>
<td>(0)</td>
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<tr>
<td>400L</td>
<td>(0)</td>
<td>400P</td>
<td>(0)</td>
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<tr>
<td>W. A. W. Sp.</td>
<td>A. W. Sp.</td>
<td>(1)</td>
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<tr>
<td>400M</td>
<td>(0)</td>
<td>400R</td>
<td>(1)</td>
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Concerts and recitals approved for attendance credit include all Messiah Auditorium and Hughes Hall events.

400X† Review of the Fundamentals of Music U 0
Theory
A. 6 lab. hrs.
This course is designed for students who do not qualify in placement tests for Music 401. Tolkien.

401 Music Theory U 3
A. 6 lab. hrs.
Prereq.: Passing of Placement Tests or 400X.
The elements of music. Development of aural and notational skills. Theory Staff.

402 Music Theory U 3
W. 6 lab. hrs.
Prereq.: 401.
Interval studies, rhythmic drill, sight-singing, dictation, keyboard practice, detailed study of primary harmonies and the dominant-seventh chord. Theory Staff.

403 Music Theory U 3
Sp. 6 lab. hrs.
Prereq.: 402.
Complex interval studies, rhythmic drill, sight-singing, dictation, keyboard practice, non-choral tones, the introduction of secondary triads. Theory Staff.

404 Introduction to Music U 3
A, W, Sp, Sp. 3 cr.
Prereq.: Not for credit to Mus. majors. A musical background is not required.
A consideration of the materials of music and important styles, forms, and composers from the Baroque to the present. Main Staff.

408 Applied Music U 1-2
(Includes letter with number on schedule card.)
Prereq.: Passing of Placement Test or 400 A, B, C, D, E, or G. Concur: 400 K, L, or M. Required of students in all Music Curricula to a minimum of 6 cr. hrs.
Instruction in Applied Music for the purpose of developing musicianship, performance, and a wide reading knowledge of music literature. A brief survey of the history of the instrument and the literature will be made.
Instruction is given in individual lessons for two one-half hour periods each week. In addition, students are required to attend the Studio Classes and Honors Recitals on Tuesday and Thursday at 1:00 p.m. during the 3rd, 5th, 7th and 10th week of each quarter. Open to other qualified students within the limits of instructional facilities by permission of the Director of the School of Music.

408A Piano
A, W, Sp. (2 cr. hrs.), Su. (either term) (1 cr. hr.) Haddad, Jones, Mooney, Whallon, Tetreau-Kardon.

408B Voice
A, W, Sp. (2 cr. hrs.), Su. (either term) (1 cr. hr.) Gilliland, Staiger, Muschick, Dietz, Cooper, Reims.

408C Strings

408D Woodwinds

408E Brass
A, W, Sp. (2 cr. hrs.), Su. (1st term) (1 cr. hr.) Evans, Suddendorf, Ewing, Nesbit.

408F Organ
A, W, Sp. (2 cr. hrs.) Hold.

408G Percussion

408H Harpsichord
A, W, Sp. (2 cr. hrs.) Staff.

408I Harp
A, W, Sp. (2 cr. hrs.) Staff.

451 Introduction to the History of Western U 3
Music I
A, W, Sp. 3 cr.
Prereq.: 404.
An historical survey of music from classical antiquity to about 1750. Staff.

452 Introduction to the History of Western U 3
Music II
A, W, Sp, Su. 3 cr.
Prereq.: 404.
Not for credit to Mus. majors.
An historical survey of music from 1750 to the present. Staff.

508 Applied Music U 1-2
(Includes letter with number on schedule card.)
Prereq.: 408, A, B, C, D, E, or G. Concur: 400 N, P or R.
Instruction in Applied Music for the purpose of developing musicianship, performance, and a wide reading knowledge of music literature.
Instruction is given in individual lessons of two one-half hour periods each week. In addition, students are required to attend the Studio Classes and Honors Recitals on Tuesday and Thursday at 1:00 p.m. during the 3rd, 5th, 7th and 10th week of each quarter. Open to other qualified students within the limits of instructional facilities by permission of the Director of the School of Music.

508A Piano
Su. (either term) (1 cr. hr.), A, W, Sp. (2 cr. hrs.) Haddad, Jones, Mooney, Whallon, Tetreau-Kardon.

508B Voice
Su. (either term) (1 cr. hr.), A, W, Sp. (2 cr. hrs.) Gilliland, Staiger, Muschick, Dietz, Cooper, Reims.

A-163
508C Strings

508D Woodwinds

508E Brass
A, W, Sp. (2 cr. hrs.), Su. (1st term) (1 cr. hr.) Evans, Suddendorf, Dort, Neubit.

508F Organ
A, W, Sp. (3 cr. hrs.) Held.

508G Percussion

508H Harpsichord
A, W, Sp. (2 cr. hrs.) Staff.

508I Harp
A, W, Sp. (2 cr. hrs.) Staff.

509 Applied Music (U 2-4
(Include letter with number on schedule card.)
Prepr.: 408 A, B, C, D, E, F, or G. Performance in applied music at the professional level. Instruction in Applied Music for the purpose of developing musicianship, performance, and a wide reading knowledge of music literature.

Instruction is given in individual lessons of one-half hour periods each week. In addition, students are required to attend the Studio Classes and Honors Recitals on Tuesday and Thursday at 1:00 p.m. during the 3rd, 5th, 7th, and 10th week of each quarter. Open to other qualified students within the limits of instructional facilities by permission of the Director of the School of Music.

509A Piano

509B Voice
A, W, Sp. (4 cr. hrs.), Su. (either term) (2 cr. hrs.) Gilliland, Steiger, Maschke, Diercks, Cooper, Reins.

509C Strings

509D Woodwinds

509E Brass

509F Organ

509G Percussion

509H Harpsichord
A, W, Sp. (4 cr. hrs.) Staff.

509I Harp
A, W, Sp. (4 cr. hrs.) Staff.

510 Graduating Recital (U 1-2
(Include letter with number on schedule card.)
Prepr.: 508.

Special preparation for the presentation of the applied music graduating recital for the B. Mus. degree. Applied Music Staff.

511 Applied Music Methods and Materials (U 1-2
(Include letter with number on schedule card.)
Prepr.: 511.

511A Piano

511B Voice

511C Strings
A, (2 cr. hrs.) A. Gilliland, Manley.

511D Woodwinds
Sp. (2 cr. hrs.), Su. (1st term) (1 cr. hr.) Wilson.

511E Brass
W. (2 cr. hrs.), 4 cl. Evans, Dort.

511G Percussion
Sp. (2 cr. hrs.), 4 cl. Spohn.

512 Applied Music, Methods and Materials (U 2
(Include letter with number on schedule card.)
Prepr.: 511.

512C Strings

512D Woodwinds
A (2 cr. hrs.), 4 cl. Wilson.

512E Brass
Sp. (2 cr. hrs.), 4 cl. Evans, Dort.

514 Music for Group Recreation (U 2
Sp. 3 cr.
Preparation and participation in folk singing and dancing. Experience in group leadership designed for recreation and camp leaders, social workers, teachers of music and classroom teachers. Sexton.

515 Opera Performance
A, W. 4 lab. hrs.
Prepr.: 363. Repeatable to a maximum of 4 cr. hrs.

Instruction in preparation for opera performance, including study of operatic literature and coaching of operatic roles. Reims.

517 Ear-Training I (U 2
A. 4 lab. hrs.
Prepr.: 403.

Sight-singing, dictation, and keyboard harmony. Theory Staff.

518 Ear-Training II (U 2
W. 4 lab. hrs.
Prepr.: 517 and 527.

Intermediate sight-singing, dictation and keyboard harmony. Theory Staff.

519 Ear-Training III (U 2
Sp. 4 lab. hrs.
Prepr.: 518 and 528.

Advanced sight-singing, dictation, and keyboard harmony. Theory Staff.

522 Elementary School Music (U 4 cl.
Prepr.: M.S. 3rd yr. standing. Not open to students with credit for 622.

The function of music in the elementary school and the introduction to music material and teaching procedures for this level. Ramsay, Sexton.

523 Music for children (U 3 cl.
Prepr.: 522.
Not open to students with credit for 693.

Singing and listening materials suitable for the elementary classroom and for school and public performances. Wilson, Bonney.
524 Vocal Music for Junior and Senior High Schools
Sp. 4 cr.
Prereq.: 522.
Not open to students with credit for 524.
The function of vocal music in the junior and senior high school and the introduction to music material and teaching procedures for this level. Simons, Ramsey.

527 Harmony I
A. 3 cr.
Prereq.: 403.
Seventh chords, common-chord modulation, borrowed tones and borrowed chord. Theory Staff.

528 Harmony II
W. 3 cr.
Prereq.: 527.
Secondary dominants, modulation to remote keys and elementary instrumentiation. Theory Staff.

529 Harmony III
Sp. 3 cr.
Prereq.: 528.
Chromatic chord forms, chromatic modulation, composition. Theory Staff.

530 Form and Analysis
A, Su. 0 cr.
Prereq.: 529.

532 Instrumentation
W, Sp. 3 cr.
Prereq.: 529.
An elementary course in scoring for the instruments of the orchestra and the band. McClure, Barnes.

540 Beginning Conducting
A, W. 3 cr.
Prereq.: 527.
The basic technique of the baton. A syllabus of selected literature and reading assignments will be used as a basis of study. Gilliland, McGinnis.

541 Instrumental Music for the Junior and Senior High School
W. 4 cr.
Prereq.: 522.
The function of instrumental music in the junior and senior high school and the introduction to music material and teaching procedures for this level. Brenner, Wilson.

546 Survey and Appreciation of Music Literature
A, W, Sp, Su. 4 cr.
Prereq.: Elem. Ed. standing.
Lectures, illustrations and analyses of elements involved in active, intelligent listening, understanding and appreciation of representative works of the great masters of music. Sexton and others.

547 Fundamentals of Music
A, W, Sp, Su. 5 cr.
Prereq.: Elem. Ed. standing.
Ear-training, music reading, creative writing, voice production, and some instrumental experience. School song materials are used for this work. Sexton and others.

548 Music Education
A, W, Sp, Su. 5 cr.
Prereq.: Elem. Ed. standing and 547.
Music literature and teaching aids for children, including singing, rhythmic, creative, and listening experiences, and their presentation. Sexton, Boreman.

551 Music History
A. 3 cr., 2 lab. hrs.
Prereq.: 403.
The development of music from the earliest times through the sixteenth century. Staff.

552 Music History
W. 3 cr., 2 lab. hrs.
Prereq.: 551.
The development of music in the seventeenth and eighteenth centuries. Staff.

553 Music History
Sp. 3 cr., 2 lab. hrs.
Prereq.: 552.
The development of music in the nineteenth and twentieth centuries. Staff.

562 Counterpoint
A. 3 cr.
Prereq.: 550.
A fundamental course in counterpoint including species counterpoint, double counterpoint, imitation, and two-voice canon. Barnes, Walker.

576 Field Experience in Church Music
Prereq.: 540 and 571, or concurs. 571.
Repeatable to a maximum of 6 cr. hrs.
Supervised experience in the actual church situation. Held.

581 Composition
W, Sp. 3 cr.
Prereq.: 559.
Creative writing in the small forms. Vedder, Huff.

601 The Romanticists
W. 3 cr.
Prereq.: 530 or 550 and 553.
The music of the romantic period in Germany and France. Davis.

602 The Opera
Sp. 3 cr.
Prereq.: 530 or 550 and 553.
A survey of the antecedents of opera and a study of representative works from each of the major periods in the history of opera. Reina.

603 Modern Music
Sp. 3 cr.
Prereq.: 530 or 550 and 553.
Major trends in the development of music since 1900. Hoppin.

604 Organ Literature
Sp. 3 cr.
Prereq.: 550 or 562 and 553.
A comprehensive survey from the earliest compositions to the works of present-day composers. Held.

607 The Classic Period
W. 3 cr.
Prereq.: 530 or 562 and 553.
Vocal and instrumental music of the middle and late eighteenth century. Davis.

609 Medieval Modes
A. 3 cr.
A study of the historical background and characteristics of plain-song, including the technical aspects of notation, modes, rhythm, and diatonomy. Kuechlehaus.

MUSIC
610 * Piano Literature

Sp, Su (1st term). 3 cl.
Prereq.: 530 or 562 and 553.
A study of the piano sonata and other characteristic forms from the pre-piano period to the present time. Haddad, Ritting-Kardos.

611 The Baroque Era

Sp. 3 cl.
Prereq.: 530 or 562 and 553.
The development of musical styles from Monteverdi through Bach. Mitter.

612 Music in the Renaissance

W. 3 cl.
Prereq.: 530 or 562 and 553.
The development of musical styles from Dufay through Palestrina and Lassus. Werner.

613 Music in the Middle Ages

A. 3 cl.
Prereq.: 530 or 562 and 553.
The development of western music through the fourteenth century. Libby.

614 Choral Literature

A. 3 cl.
Prereq.: 530 or 562 and 553.
A survey of choral music from the Renaissance to the present. Werner.

615 The Literature of Chamber Music

W, Su. 3 cl.
Prereq.: 530 or 562 and 553.

616 Symphonic Literature

Sp. 3 cl.
Prereq.: 530 or 562 and 553.
A survey of orchestral music from the classic period to the present. Mitter.

617† Individual Composers: Their Lives and Works

Sp. 3 cl.
Prereq.: 530 or 562 and 553.
A comprehensive study of the works of an individual composer, topic varies from year to year.

620 Introduction to Bibliographic Method

A, Su. 3 cl.
Prereq.: 530 or 562 and 553.
The collection, examination and documentation of information about music. Including general as well as music library materials. Mitter.

621 Basic Concepts in Music Education

A, Su (1st term). 3 cl.
Prereq.: Ed. 590 or 598.
The principles of music education and of the educational and cultural objectives derived from related disciplines which give direction and purpose to the music education program. Schneider.

622 Music Education in the Elementary School I

Su. (1st term) 5 cl.
The role of the general vocal music program in elementary schools including the relationship of music to the total learning program. Ramsey.

623† Music Education in the Elementary School II

Sp. 3 cl.
A critical study of folk and art music of various cultures and historic periods for the general vocal and listening activities of the integrated curriculum. Ramsey.

624† Vocal Music Education in the Secondary School

Sp, Su (2nd term). 5 cl.
The organization, direction and purpose of the vocal music program in the secondary schools. Simonsen.

625 The Study and Use of Literature for Vocal Music Education

Sp, Su (1st term). 5 cl.
A study of vocal literature for choral groups in the secondary school music program. Simonsen.

626† General Music I

Sp. 3 cl.
Prereq.: Graduate standing or permission of instructor.
Designed to prepare teachers of general music courses in junior and senior high schools. Ramsey.

627 General Music II

A, Su. (2nd term). 5 cl.
Prereq.: Graduate standing or permission of instructor and 553, Fine Arts 494 or 497.
Designed to prepare teachers for teaching courses in which the appreciation and understanding of music are taught with reference to other art forms. Ramsey.

630 * Analysis: The Classic Period

Su. 3 cl.
Prereq.: 530 and 553.
An analytical study of representative works from Classic literature.

632 * Orchestration

A. 3 cl.
Prereq.: 532.
Scoring for the concert band. Barnes.

633 * Orchestration

Su. 3 cl.
Prereq.: 533.
Scoring for the orchestra. Barnes, Walker.

635 * Analysis: The Romantic Period

W. 3 cl.
Prereq.: 530 and 553.
An analytical study of representative works from Romantic literature, Barnes, Vedder.

641† Principles and Practices in Instrumental Music Education

W. 5 cl.

642 The Study and Use of Literature for Instrumental Music Education

W, Su (1st term). 5 cl.
Relationship of teaching materials and performance repertory to education objectives; selection of literature, interpretation, rehearsal procedures, conducting problems, attainment of musical understanding through literature. Wilson, Bennet.

643 Advanced Conducting (Instrumental) U G 3

Sp. 3 cl., Su (1st term), 5 cl.
Prereq.: 530 and 569.
This course aims to develop the power to interpret the larger forms of instrumental literature and to read from full score. McGinnis.
646 Advanced Conducting (Vocal)  U G 3
W. 3 cl., Su (1st term), 5 cl.
Prereq.: 530 and 540.
This course aims to develop the power to interpret the larger forms
of choral literature and to read from full score. Gilliland.

650 Minor Problems  U G 1-5
A, W, Sp, Su.
Prereq.: Permission of instructor.
Investigation of minor problems in the field of music. Graduate Staff.

650X Research Techniques  U G 2
A, Su (1st term). 3 cl.
Bennett.

650Z Collegium Musicum  U G 2
A, W, Sp, Su.
Study and performance of music from the Medieval, Renaissance,
and Baroque periods. Practical study of early musical instruments.
Main.

656 Principles of Music Learning  U G 3
W, Su (2nd term). 3 cl.
An analysis of the factors in learning to appreciate and perform
music in early childhood and through adult life. Schneider.

659 Modal Counterpoint I  U G 3
W. 3 cl.
Prereq.: 530 and 553.
Not open to students with credit for 761.
Counterpoint based on the vocal polyphonic style of the sixteenth

662 Counterpoint  U G 3
W. 3 cl.
Prereq.: 562.
Studies in imitation and invertible counterpoint, applied in the
writing of two-and three-part inventions.

664 Counterpoint  U G 3
A, Su. 3 cl.
Prereq.: 562.
Writing of chorale preludes, trio sonata movements and fugal
expositions. Walker.

667 Advanced Keyboard Harmony  U G 3
W. 3 cl.
Prereq.: 559.
Practice in harmonizing melodies, realizing figured bass, improvisa-
tion and modulation at the keyboard.

670 Liturgies  U G 3
W. 3 cl.
A study of the historic liturgies of the church as a background
for the work of the church musician. Contemporary movements in
liturgical practice. Held.

671 Techniques and Materials for  U G 3
Church Choirs
Sp. 3 cl.
A study of anthem materials, chants and proper, with considera-
tion of programming and performance. Held.

672 Hymnology  U G 3
A. 3 cl.
Prereq.: 529 or permission of instructor.
An historical survey of Christian hymnody. Consideration of
criteria for judging texts and tunes with regard to artistic quality
and liturgical suitability. Held.

MUSIC

081 Composition  U G 3
A, W, Sp, Su. 3 cl.
Prereq.: 581.
Repeatable to a maximum of 9 cr. hrs.
Creative writing. Analysis, discussion, and employment of devices
used in contemporary music. Barnes, Walker.

701 The History of Performance Practices  G 5
Sp. 3 cl.
Prereq.: Permission of instructor.
A study of primary sources pertaining to contemporary attitudes and
practices in the performance of music from the Middle Ages to the present. Leipzig.

702 Notation to 1300  G 5
A. 3 cl.
Prereq.: 613 or concur.
A study of neumes, the development of staff and square notation, primitive systems, rhythmic modes, Franco-Cana
tic notation, and the innovations of Petrus de Cruce, Mitter.

703 Notation of Fourteenth and  G 5
Fifteenth Centuries
W. 3 cl.
Prereq.: 702.
A study of Ars Nova Notation, Mannered Notation, and the
transition to white notation. Hopps.

704 Notation of the Late Fifteenth  G 5
and Sixteenth Centuries
Sp. 3 cl.
Prereq.: 703.
The study of proportions, keyboard notation, and lute tablatures.

707 Musical Sources and Historiography  G 5
Su. 3 cl.
Prereq.: 620.
A study of music historiography, supplemented by the examination of
musical documents from each of the periods of music history.
Mitter.

709 Applied Music  G 2-4
(Included letter with number on schedule card.)
Prereq.: Placement examination.
A specialized and intense study of applied music literature and
the techniques of performance.
Open to other qualified students within the limits of instructional
facilities by permission of the Director of the School of Music.
Instruction is given in individual lessons of two one-half-hour
periods each week or the equivalent.

709A Piano
A, W, Sp (2 or 4 cr. hrs.), Su (either term)
(1-2 cr. hrs.) Hedin, Jones, Mooney, Tetley-Kardos.

709B Voice
A, W, Sp (2 or 4 cr. hrs.), Su (either term)
(1-2 cr. hrs.) Gilliland, Diercks, Steiger, Reims, Munchick.

709C Strings
A, W, Sp. (2 or 4 cr. hrs.), Herbstey,
McClure, Superson.

709D Woodwinds
A, W, Sp. (2 or 4 cr. hrs.), McGinnis,
Wilson, Titus.

709E Brass
A, W, Sp (2 or 4 cr. hrs.), Su (1st term) (1-2
cr. hrs.) Evans.

A-167
709F Organ
   A, W, Sp. (2 or 4 cr. hrs.), Held.

709G Percussion
   A, W, Sp. (2 or 4 cr. hrs.), Spohn.

709H Harpsichord
   A, W, Sp. (2 or 4 cr. hrs.) Staff.

709I Harp
   A, W, Sp. (2 or 4 cr. hrs.) Staff.

712 Supervision of Music in the Elementary Schools
   U G 3
   Su. (1st term) 5 cl.
   Prereq.: Mus. 4th yr. or grad. standing.
   A study of the specific problems of music supervision with special
   attention given to curriculum construction in the elementary schools. Simmons.

713 Supervision of Music in Secondary Schools
   U G 3
   Su. (1st term) 5 cl.
   Prereq.: Mus. 4th yr. or grad. standing.
   Designed to study evaluation criteria and the problems of the
   music supervisor in the secondary school. Simmons.

717 Song Literature
   U G 3
   Sp. 3 cl.
   The study of Song Literature including historical and philosophical
   backgrounds selected to meet the needs of the student, artist,
   or teacher; program building. Gilliland.

719 Theory Pedagogy
   U G 3
   Su. (1st term) 5 cl.
   Prereq.: Mus. 4th yr. standing.
   The teaching of music theory in colleges and secondary schools.
   Walker.

720 Piano Pedagogy
   U G 3
   Su. (1st term) 5 cl.
   Prereq.: Mus. grad. standing and minimum of 6 cr. hrs.
   of applied study in piano.
   An analysis of the principles and practices current in the teaching
   of piano. Haddad.

721 Vocal Pedagogy
   U G 3
   Prereq.: Mus. grad. standing and minimum of 6 cr. hrs.
   of applied study in voice.
   An analysis of the principles and practices current in the teaching
   of voice. Gilliland.

722 String Instrument Pedagogy
   U G 3
   Prereq.: Mus. grad. standing and minimum of 6 cr. hrs.
   of applied study in strings.
   An analysis of the principles and practices current in the teaching
   of strings. Burkholder.

723 Woodwind Instrument Pedagogy
   U G 3
   Su. (1st term) 5 cl.
   Prereq.: Mus. grad. standing and minimum of 6 cr. hrs.
   of applied study in woodwind instruments.
   An analysis of the principles and practices current in the teaching

724 Brass Instrument Pedagogy
   U G 3
   Prereq.: Mus. grad. standing and minimum of 6 cr. hrs.
   of applied study in brass instruments.
   An analysis of the principles and practices current in the teaching
   of brass instruments. Evans.

730 Advanced Analysis: The Classic Period
   G
   A.
   Prereq.: 630 or 635.
   An analytical study of selected major works from the classic literature. Barnes.

731 Advanced Analysis: The Romantic Period
   G 3
   W, 3 cl.
   Prereq.: Two of the following courses: 630, 635, 730
   An analytical study of selected major works from the Romantic
   literature. Barnes.

732 Advanced Analysis: Post-Romantic to Modern Music
   G 3
   Sp. 3 cl.
   Prereq.: 730 or 731.
   Analysis of selected works reflecting the evolution from the
   post-romantic period to contemporary styles. Walker.

747 Problems in Vocal Music
   U G 1-5
   Education
   A, W, Sp, Su (or either term).
   Prereq.: Permission of instructor.
   Repeatable to a maximum of 10 cr. hrs.
   Study of problems encountered in the teaching and supervising
   of music. Graduate Staff.

748 Choral Problems
   U G 1-5
   A, W, Sp, Su (or either term).
   Prereq.: Permission of instructor.
   Repeatable to a maximum of 10 cr. hrs.
   Study of the problems encountered in developing choirs and
   church choirs. Graduate Staff.

749 Development of Music Theory I
   U G 1-5
   Education
   A, W, Sp, Su (or either term).
   Prereq.: Permission of instructor.
   Repeatable to a maximum of 10 cr. hrs.
   Study of problems encountered in teaching, supervising, and
   organization of the instrumental music program. Graduate Staff.

750 Development of Music Theory II
   G 5
   A, 3 cl.
   A study of the principal treatises on music theory before 1400.
   Phelps.

751 Development of Music Theory III
   G 5
   W, 3 cl.
   A study of the principal treatises on music theory from 1400 to
   1700. Phelps.

752 Development of Music Theory IV
   G 5
   Sp. 3 cl.
   Critical study of music and theory texts from 1700 to 1900.
   Phelps.

753 Contemporary Theories of Music
   G 3
   Sp. 3 cl.
   Prereq.: Mus. grad. standing.
   Fundamental concepts of theory construction and experimental
   verification of contemporary theories of music. Poland.

760 Modal Counterpoint II
   G 3
   Sp. 3 cl.
   Prereq.: 655.
   Advanced counterpoint based on the vocal polyphonic style of
   the sixteenth century. Kuchefuwa.

765 Counterpoint Techniques
   G 3
   Sp. 3 cl.
   Prereq.: 663 or 664.
   Analysis and stylistic writing of canons, invertible counterpoint,
   and variations. Walker.
766‡ Fugue
Sp. 3 cl., Su (2nd term), 5 cl.
Prereq.: 664.
Detailed study of the fugue; writing of three-voice and four-
three-voice fugues. Walker.

780 Advanced Composition G 3
A, W, Sp, Su.
Prereq.: 2 yrs. of 681, or equiv.
Creative writing in the large forms at an advanced level. Barnes,
Walker.

784‡ Studies in Medieval Music G 5
A. 3-5 cl.
Problems and research in music before 1400. Hoppin.

785‡ Studies in Renaissance Music G 5
W. 3-5 cl.
Problems and research in music between 1400 and 1600. Mixter.

786 Studies in Baroque Music G 5
Su. 3-5 cl.
Problems and research in music between 1600 and 1750. Liv-
ington.

787 Studies in Classic Music G 5
A. 3-5 cl.
Problems and research in music of the late eighteenth century.
Davis.

788 Studies in Romantic Music G 5
W. 3-5 cl.
Problems and research in music of the nineteenth century. Hoppin.

789 Studies in Modern Music G 5
Sp. 3-5 cl.
Problems and research in music of the twentieth century. Main.

850 Advanced Studies in Music G 3
(Include letter with number on schedule card.)

850C Supervision and Administration of School Music.
Sp. (3 cr. hrs.)
Prereq.: Permission of instructor.

850D‡ The Instrumental Program in the Public Schools—Elementary Grades.

850E‡ The Instrumental Program in the Public Schools—Secondary Grades.

850I Factors in Music Education.
A. W, Sp. (3 cr. hrs.)
A study of sociological and psychological factors which a-
ffect instruction in music. Schneider, Cady.

850J Music Education and the Curriculum.
A. (3 cr. hrs.)
A study of the application of music education in the school curriculum. Schneider.

850K Music in Higher Education.
W, Su. (1st term) (3 cr. hrs.)
Schneider.

850N Contrapuntal Techniques.
A. (3 cr. hrs.)
Prereq.: 630 and 653 or permission of in-
structor.
Contrapuntal techniques in the works of twentieth-
century composers. Walker.

850Q Seminar in Music: Factors in Choral Tone Production.
W. (3 cr. hrs.) 3 cl.
A study of choral blend and other vocal techniques. Dio-
ecks.

880 Seminar in Music G 3
A, W, Sp, Su. 3 cl.
Repeatable to a maximum of 15 cr. hrs.

880B Music Theory.
Barnes, Phelps, Walker.

880C Music Education.
Schneider.

881 Seminar in Music History G 5
A, W, Sp, Su.
Repeatable to a maximum of 15 cr. hrs.

890 Individual Studies in Music History G 1-5
A, W, Sp, Su.
Individual research projects not connected with the dissertation.

950 Research in Music G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

CAMPUS MUSIC ORGANIZATIONS
University Campus Music Organizations are open to all students in the University who may receive full credit according to regu-
lations of the college in which they are enrolled.

A. University Choruses

A1 University Chorus
Prereq.: Admission by audition only.
Oratorio and large choral works are studied and per-
formed. Diereks.

A3 Symphonic Choir
Prereq.: Admission by audition only. Application
should be made to the director.
Symphonic Choir is a concert organization singing a
variety of literature. Diereks.

A4 Women's Glee Club
Prereq.: Membership in this concert group is open
to all women students in the University by au-
dition. Auditions are held at stated periods, and
cancies in the club are filled with the best avail-
able voices.
Study and performance of choral literature for women's
voices. Mcshrick.

A5 Men's Glee Club
Prereq.: Membership in this concert group is open
to all men students in the University by audition
only. Auditions are held at stated periods, and
cancies in the club are filled with the best avail-
able voices.
Study and performance of choral literature for men's
voices. Steiger.
B. University Orchestras 1
   (1 cr. hr.)
   Prereq.: Admission by audition and permission of the director.
   Three or more hrs. rehearsal each week.

B1 University Symphony Orchestra
   Prereq.: Membership is open to all University students and personnel and to symphony players from in and about Columbus.

The University Symphony Orchestra is a seventy-five piece orchestra of full instrumentation devoted to the preparation of standard and modern literature. The group gives at least three concerts each year. Hardesty.

B3f University Little Orchestra
   Prereq.: Admission by audition.
   A selected group giving public and broadcast performances. Professional orchestral techniques are emphasized. Burkholder.

C. University Marching Bands 1
   (1 cr. hr.)
   Prereq.: Admission by audition and permission of the director. Open to men students.
   Three or more hrs. rehearsal each week.

C1 University Football Marching Band
   A.
   Prereq.: The University Marching Band is a selected group of 150 brass, wood and percussion players which performs at football games and rallies during the Autumn Qtr.

Spohn.

C2 ROTC Band (Air-Army)
   W, Sp.

Spohn.

D. University Bands 1
   (2 cr. hr.)
   Three or more hrs. of rehearsal each week.

D1 The University Concert Band


D2 The University Buckeye Band
   Prereq.: Permission of director.

Provides concert-band participation for students unable, for some reason, to play in the University Concert Band. Performs for University functions and gives public concerts. Fricke, Baker.

F. Small Ensembles 1
   (1 cr. hr.)
   Prereq.: Admission by audition and permission of the instructor.
   Two or more hours of rehearsal each week.

F1 Opera Chorus

F2 Vocal Ensembles

F3f Radio Ensembles
   A, Sp.

F4 String Ensembles

F5 Woodwind Ensembles
   Titus and Staff.

F6 Brass Ensembles
   Suddendorf and Staff.

F7 Miscellaneous Ensembles

J. Choral Music
   Sp. 3 cr.

A choral music laboratory designed to provide experiences in teaching music through practical in the selection and presentation of literature and the critique of teaching performance. Simmons.

K. Instrumental Music
   W, Sp. 2 cr.

An instrumental music laboratory designed to provide experiences in teaching music through practical in the selection and presentation of literature and the critique of teaching performance. Bennet, Burkholder.

National Security Policy Studies

Office: 214 Law Building, 1659 N. High Street.

PROFESSOR: FURNISS.

701 Individual Studies in National Security Policy
   U G 3
   Prereq.: Permission of instructor.
   A special national security topic is assigned to each student for reading and a report. Furriss and Staff.

702 Introduction to National Security
   U G 3-5
   A. 1 cr.
   Prereq.: Permission of instructor.
   Examination of approaches taken by various social science disciplines to field of national security; survey of literature in field; identification of major problem areas. Furriss and Staff.

703 Research Principles and Techniques in National Security
   W. 1 cr.
   Prereq.: 702 or permission of instructor.
   Repeatable with permission of instructor to a maximum of 10 cr. hrs.
   Examination of particular policy problems and the application thereof to social science analytical techniques. Barber.
Naval Science

CAPTAIN WEHMEYER and STAFF.

The sequence of courses is the same for all officer candidate students for the first two years. At the end of the second year, students may apply to specialize in Supply or the Marine Corps, in which case there is a variation in course presentation. Naval science courses are open to a limited number of civilian students with permission of the Professor of Naval Science.

Normal sequence of courses is as follows: (Naval Science unless otherwise indicated.)

First Year:
- All candidates—441, 442, 443.
- Second Year:
  - All candidates—541, Psychol. 403, 543.
- Third Year:
  - Line candidates—641, 642, 643.
  - Marine candidates—651, 652, 653.
  - Supply candidates—661, 662, 663.
- Fourth Year:
  - Line candidates—741, 742, 743.
  - Marine candidates—751, 752, 753.
  - Supply candidates—761, 762, 763.

441 Naval Orientation U 3
A. 3 cr., 1 1-3 hr. lab.
The basic study of naval lore, covering organization, customs, discipline, vessels of the U.S. Navy, introduction to seamanship, leadership, and tactics.

442 Naval History, Part I U 3
W. 3 cr., 1 2-3 hr. lab.
Prereq.: 441.
The study of Naval History from earliest recorded history up to World War I, with particular emphasis on the principles of war and influence of sea power upon history.

443 Naval History, Part II U 3
Sp. 3 cr., 1 2-3 hr. lab.
Prereq.: 442.
The continued study of Naval History from the beginning of World War I to the present time.

541 Naval Weapons, Part I U 3
A. 3 cr., 1 2-3 hr. lab.
Prereq.: 443 or permission of Department Chairman.
A broad basic study of naval gunnery, including the fire control problem. An introduction to anti-submarine warfare.

543 Naval Weapons, Part II U 3
Sp. 3 cr., 1 2-3 hr. lab.
Prereq.: 541.
More advanced study of Naval Weapons and their employment, including guided missiles and nuclear weapons, and a basic study of the technology of space.

NAVAL SCIENCE

641 Naval Operations U 3
A. 3 cr., 1 2-3 hr. lab.
Prereq.: 543 or completion of summer camp.
A study of fleet operations, including tactics, tactical communications, meteorology, Rules of the Nautical Road, and the principles of relative motion.

642 Naval Operations and Introduction to Navigation U 3
W. 3 cr., 1 2-3 hr. lab.
Prereq.: 641.
A study of the Naval Communications system, shipboard organization, administration and the electronic and dead reckoning methods of marine navigation.

643 Celestial Navigation U 3
Sp. 3 cr., 1 2-3 hr. lab.
Prereq.: 642.
The determination of position by celestial methods of navigation.

651 Evolution of the Art of War, Part I U 3
A. 3 cr., 1 2-3 hr. lab.
Prereq.: 543 or completion of summer camp.
A study of the evolution of weapons and tactics, illustrating the principles and variables of war used in certain battles from Alexander through the Mexican War.

652 Evolution of the Art of War, Part II U 3
W. 3 cr., 1 2-3 hr. lab.
Prereq.: 651.
A continuation of the study of the Evolution of the Art of War from the beginning of the Civil War to the end of World War II.

653 Modern Basic Military Strategy and Tactics U 3
Sp. 3 cr., 1 2-3 hr. lab.
Prereq.: 652.
A survey of modern logistical and tactical principles, and current military developments.

661 The Navy Supply System and Supply Management Afloat, Part I U 3
A. 3 cr., 1 2-3 hr. lab.
Prereq.: 543 or completion of summer camp.
A study of the system of procurement, control and distribution of materials required by the Navy; introduction to Supply Management procedures afloat.

662 Supply Management Afloat, Part II U 3
W. 3 cr., 1 2-3 hr. lab.
Prereq.: 661.
A continuation of supply management afloat, including the procedures for receipt and storage of stock and the naval accounting system afloat.

663 Supply Management Afloat, Part III U 3
Sp. 3 cr., 1 2-3 hr. lab.
Prereq.: 662.
A continuation of the study of supply management afloat, including the expenditure and control of material and financial management afloat.

741 Naval Engineering U 3
A. 3 cr., 1 2-3 hr. lab.
Prereq.: 643.
Principles of ship stability and buoyancy in the practice of damage control. Theory of construction, installation and operation of a modern naval steam engineering plant.

A-171
COURSES OF INSTRUCTION
NAVAL SCIENCE

742 Naval Engineering and Introduction to Naval Administration
W. 3 cl., 1 2-hr. lab.
Prereq.: 741.
A study of civil engineering, naval auxiliary systems and shipboard organization and administration.

743 Naval Administration
Sp. 3 cl., 1 2-hr. lab.
Uniform Code of Military Justice. The psychology of human relations and the techniques of leadership; career planning.

751 Amphibious Warfare, Part I
A. 3 cl., 1 2-hr. lab.
The history of amphibious warfare and its development from Gallipoli through Korea.

752 Amphibious Warfare, Part II
W. 3 cl., 1 2-hr. lab.
a familiarization with the doctrinal techniques and present concepts of amphibious warfare including the planning phase.

753 Leadership and the Uniform Code of Military Justice
Sp. 3 cl., 1 2-hr. lab.
Survey of the UCMJ and a study of the psychology of human relationships and techniques of leadership as applied by Marines.

761 Retail Sales
A. 3 cl., 1 2-hr. lab.
A study of the clothing and small stores retail organization, accounting procedures and related reports; introduction to ship's store afloat.

762 Advanced Retail Sales and Naval Administration
W. 3 cl., 1 2-hr. lab.
A continuation of the study of ship's store afloat, including stock control, sales procedures and related reports, the psychology of human relations and the techniques of leadership.

730 Corrosion
A, Sp. 2 cl., 1 2-hr. lab.
(See under Met. E. 730)

743 Nuclear Engineering Laboratory I
A, Sp. Su. 2 3-hr. lab.
Prereq.: Physics 514 or equiva., Math. 544.
Experimental investigations of nuclear radiation interactions with matter; a discussion and experimental verification of radiation detection and shielding principles.

744 Nuclear Engineering Laboratory II
W, Sp. 2 3-hr. lab.
Prereq.: 743 and/or concur. 783.
Experimental nuclear reactor analysis; understanding of the basic nuclear and reactor parameters and utilizing these fundamental concepts in an economical engineering design.

755 Nuclear Power Plants
Sp. 3 cl.
(See under Mech. E. 755)

765 Introduction to Nuclear Chemical Engineering
W. 3 cl.
(See under Chem. E. 765)

766 Nuclear Chemical Engineering
Sp. 3 cl., 3 hr. lab.
(See under Chem. E. 766)

770 Plasmas and Controlled Fusion
W. 3 cl.
Prereq.: Physics 615, Mech. E. 621 or Physics 702 or equiva.
The Thermodynamic plasma; approaches to a stable and sufficiently hot plasma. Nuclear reactions, plasma kinetics, diagnostic devices, and engineering problems in research, development, and power production.

783 Nuclear Reactor Analysis
A. 3 cl.
Prereq.: Physics 614, Math. 609 or equiva. Concur.: Physics 615.
Reactor theory, probability concepts and nuclear cross sections, the multiplication constant and neutron flux, neutron slowing down process, diffusion theory, Fermi age theory, homogeneous reactors, heterogeneous reactors, reactor kinetics.

820 Reactor Dynamics and Control
G 3
Sp. 3 cl.
Prereq.: 783, Elec. E. 644 or permission of instructor.
Nuclear reactor and nuclear reactor system operation; control system performance requirements and control mechanisms; automatic control system and their performance with transient and with steady state operation.

845 Advanced Laboratory Studies
G 3-6
A, W, Sp, Su.
Prereq.: 743 or 744, and permission of instructor.
Experimental treatment of advanced nuclear engineering concepts.

856 Advanced Nuclear System Design Concepts
G 4
Sp. 3 cl., 3-hr. lab.
Prereq.: 755, Concur.: 884.
Investigations of advanced-converter-reactor design concepts; design problems and basic concepts of thermal and fast breeders; reactors, design and economics study of a total reactor system.

Nuclear Engineering
Office: 1065 Robinson Laboratory, 206 West 18th Avenue.
ASSOCIATE PROFESSOR GLOWER (Chairman): PROFESSORS RYDEN, I. FONTANA, J. JONES, I. POOL, and I. FEISSLER; ASSISTANT PROFESSORS STAHLHE and SWARTZ.

710 Applied Nuclear Engineering
A, Sp. 3 cl.
Industrial and research applications of radioactive isotopes; thickness and density, food irradiation, direct energy conversion, activation analysis, radioactive tracers, topics in bioengineering.

716 Materials for Nuclear Technology
Sp. 3 cl.
(See under Met. E. 716)

A-172
NURSING

405 Advanced Anesthesia II
A, W, Sp, Su.
Prereq.: 404.
Instruction in the care of the patient undergoing cardio-pulmonary bypass and thoracic anesthesia.

406 Advanced Anesthesia II
A, W, Sp, Su.
Prereq.: 405.
Instruction in the care of the patient undergoing neurosurgery.

Nursing
Office: School of Nursing, B-201 Starling Lawing Hall, 320 West 16th Avenue.
PROFESSORS: NEWTON (Director), ISHIBSH; ASSOCIATE PROFESSORS BELLAM, BUCKERIDGE, ICHAMBER, HARVEY, ILEWIS, PEASE, PRICE, THOMAS, WITTMEYER, ASSISTANT PROFESSORS BREGE, CLARK, COLVER, CLINE, CONSTANT, CURRAY, DILLER, FAIR, GIESE, JOHNSTON, KRUMAN, KUSE, MARTIN, POLCYN, ROLLER, SCHRER, SCHWARTZ, SHAW, TULLY, WALLACE, WILLIAMS.
Open only to students registered in the School of Nursing.

539 Fundamentals of Nursing
A, 3 cr. and average of 12 hrs. clinical study per week (lectures, discussion groups, clinical practice, and human relations lab.)
Study of basic needs of hospitalized adult patients and the functions of the nurse in meeting these needs.

547 Medical Nursing I
W, Sp, 4 cr. and average of 16 hrs. clinical study per week (lectures, discussion groups, nursing lab., clinical practice, and human relations lab.)
Prereq.: 539.
Knowledge, understanding, and skill necessary to give nursing care to adult patients treated medically; focus is primarily on patients with cardiovascular or gastro-intestinal conditions; or diabetes mellitus.

548 Surgical Nursing I
W, Sp. 4 cr. and average of 16 hrs. clinical study per week (lectures, discussion groups, nursing lab., clinical practice, and human relations lab.)
Prereq.: 539.
Knowledge, understanding, and skill necessary to give nursing care to adult patients who have commonly needed surgical procedures and which will require minimal guidance in rehabilitation.

563 Introduction to Clinical Experiences for Medical Technologists
Su. 2 cr.
Prereq.: Med. Tech. 4th yr. standing.
This course acquaints the medical technology student with hospital and health center functioning and helps her develop selected patient-care skills. Price and Staff.

A-173
694 Problem Solving in Nursing U 6
A, W, Sp, Su.
The process of planning, providing, and evaluating nursing care of selected patients.

613 Maternity Nursing U 8
A, W, Sp, Su. 4 cl., and average of 16 hrs. clinical study (work conf., discussion groups, nursing lab., clinical practice, and human relations lab.)
Prereq.: 547, 548.
Knowledge, understanding, and skill necessary in providing nursing care to the mother in the antepartal, intrapartal, and postpartal periods in one quarter.

614 Pediatric Nursing U 8
A, W, Sp, Su. 4 cl., and average of 16 hrs. clinical study (work conf., discussion groups, nursing lab., clinical practice, and human relations lab.)
Prereq.: 613.
Continuation of 613. The effects of illness on the child and his family in the hospital, home, and community.

615 Coordinated Nursing Care U 8
A, W, Sp, Su. 4 conf., 20 hrs. clinical experience.
The components of effective nursing care, the functions of health personnel, and the methods of promoting good working relationships.

617 Public Health Nursing U 5
A, W, Sp, Su. 5 cl.
Prereq.: 591 or equiv., 613, 614, 647, and 648.
Not open to students with credit for 602 and 630.
A study of the development and trends of public health nursing and the basic principles underlying its practice.

619 Public Health Nursing Field Experience
A, W, Sp, Su.
Supervised experience is provided in a public health agency which offers a generalized program emphasizing family health.

620 Foundations of Nursing Education U 3
A, Sp. 3 cl.
Prereqs.: Psychol. 401 and 404, and Soc. 401.
The historical development of nursing education, surveys used to evaluate its progress, levels of nursing, and essential characteristics of a good school of nursing.

647 Medical Nursing II U 8
A, W, Sp, Su. 4 cl., and average of 16 hrs. clinical study (work conf., discussion groups, nursing lab., clinical practice, and human relations lab.)
Prereq.: 547, 548.
Continuation of 547. Study of patients with disturbed function of the endocrine, integumentary, muscle-skeletal, hematologic, and respiratory (including tuberculosis) systems.

648 Surgical Nursing II U 8
A, W, Sp, Su. 4 cl., and average of 16 hrs. clinical study (work conf., discussion groups, nursing lab., clinical practice, and human relations lab.)
Prereq.: 547, 548.
Continuation of 548. Nursing study of patients with neurosurgical, orthopedic, thoracic, gynecological, or genitourinary problems in the setting of the operating rooms, recovery room, and patient's units.

649 History of Nursing U 3
A, W, Sp. 3 cl.
Prereq.: Nurs. 3rd yr. standing.
The effect of religious, military, secular, and educational influences on the development of nursing.

663 Nursing Study of The Psychiatric Patient U 8
A, W, Sp, Su. 4 cl., and average of 16 hrs. cl. study per week.
Prereq.: 613, 614, 647, 648.
Nursing study of the psychiatric patient as an interpersonal, problem-solving process. (Conferences, discussions, clinical practice.)

676 Leadership and Management in Nursing U 8
A, W, Sp, Su. 3 cl. and 20-24 hrs. cl. study per week.
Prereq.: 613, 614, 647, 648.
Effective team members and team leader experiences; observation and selected experiences in unit management; and guided study of a nursing problem. (Conferences, discussions, clinical practice, human relations laboratory.)

677 Occupational Orientation to Nursing U 10
A, W, Sp, Su. 4 cl., and 24 hrs. cl. study per week.
Prereq.: 613, 614, 647, 648.
Guided practice of professional nursing; requirements and responsibilities in present day practice, job opportunities, and professional obligations.

701 Minor Problems in Nursing U 1-5
A, W, Sp, Su.
Prereq.: 4 or hrs. of 746 and permission of instructor.
Reading, conferences, and minor investigations by individual arrangement for qualified students who desire to study a particular nursing problem intensively.

736 Interpersonal Aspects of Nursing U 3
A. 3 cl.
Influence of modern psychiatry on nursing practice. Emphasis given to nursing as a significant interpersonal process. Independent study, conferences, and seminars.

737 Interpersonal Aspects of Nursing U 3
W. 3 cl.
Prereq.: 736.
Continuation of 736.

740 Advanced Medical-Surgical Nursing U 3
A, W. 3 cl.

741 Advanced Medical-Surgical Nursing U 3
W, Sp. 3 cl.
Prereq.: 740.
Continuation of 740. Chambers.

746 Field Instruction U 4-15
A, W, Sp. 2 cl., 4 hrs. clinical experience per cr. hr.
Prereq.: Permission of advisor.
The first qtr. of registration in this course must be for 4 cr. hrs.
Application of scientific method of study to selected nursing and teaching problems. Includes observation and participation in clinical situation, conferences, library study, field trips, and written reports. Chambers, Leslie, Posey.

750 Fundamentals of Nursing Administration
W. 5 cl.
Prereq. or conc: Grad. standing in nursing service administration curriculum, 740, 602, 741 and Bus. Org. 676, 682.
Study of the fundamentals of planning, organizing, and controlling nursing service departments. Dorosch.
OBSTETRICS AND GYNECOLOGY

731 Supervision of Nursing Services U G 5
Sp., 4 cl. and 3 hr. planned observations.
Prereq.: Grad. standing in nursing service administration curriculum, 750 and Bus. Org. 686.
Exploration of major problems of nursing administration at the supervisory level. Includes observation of clinical situations, conferences, field trips, and written reports. Dorsch.

732 Administration of Nursing Services U G 5
Su., 4 cl. and 3 hr. planned observations.
Prereq.: or concurs.: Grad. standing in nursing service administration curriculum, 731.
Exploration of major problems of nursing administration at the top administrative level. Includes observation of administrative situations, conferences, field trips, and written reports. Dorsch.

796 Methods of Teaching Nursing U G 4
Sp., Su., 4 cl.
Prereq.: or concurs.: Ed. 607, Nurs. 810 recommended.
Instructional planning for courses in clinical nursing with opportunities to develop teaching-learning units and tools to assess learning outcomes. Pease, Anderson.

802 Research Development in Nursing G 3
A., W., 3 cl.
A seminar on the status and scope of research in nursing. Written reports and comparison of various types of research studies will be required. Newton, Shirk.

810 Curriculum Development G 5
W., S., 5 cl.
Prereq.: 4 cr. hrs. of 746.
Study of theories of higher education related to education for nursing and principles of curriculum development. Students apply these principles to program planning in nursing. Pease.

950 Research in Nursing G Arr.
A., W., Sp., Su.
Research for thesis purposes only.

740 Fetus and Newborn P 6
1 month, offered Aug.-Dec., May.
Prereq.: 736, Part. 715.
Reproduction biology and human development; the fetal-maternal axis and the product of conception; supervised clinical training and service.

745 Reproduction Endocrinology and Infertility P 6
1 month, offered Sept. and Mar.
Prereq.: 736.
Selective endocrinologic aspects of the specialty; correlation of biochemical, histochemical and cytologic aspects with clinical problems.

751 Obstetric and Gynecologic Specialties P 6
1 month, offered all months.
Prereq.: 736.
Repeatable by permission of instructor.
Instruction in the newer and more advanced techniques of diagnosis and therapy which would be the most useful to the practicing obstetrician.
A. Obstetric emphasis
B. Gynecologic emphasis

793 Individual Studies in Obstetrics and Gynecology P 6
1 month, offered all months.
A., W., Sp., Su.
Prereq.: Permission of Chairman.
Clinical, laboratory, conference, and library work in Obstetrics and/or Gynecology.
A. Obstetric emphasis
B. Gynecologic emphasis

799 Residency in Obstetrics and Gynecology P 18
A., W., Sp., Su.
13 months, full time, beginning July 1.
Prereq.: Appointment as Resident, University Hospital. Repeatable to a maximum of 360 cr. hrs.
Rotation through obstetric and gynecologic sub-specialties, inpatient and out-patient services; supervisory and teaching responsibility in the patient-care team; rounds and conferences.

900 Obstetric and Gynecologic Pathology G 2-5
A., W., Sp., Su.
Prereq.: Permission of instructor.
Laboratory, conference, and library work. Study of current pathological specimens with emphasis upon special investigation. Ullyot, Metting, Hollenbeck, Holmsiefl, Williams, Boutsellis, Besch.

950 Research in Obstetrics and Gynecology G Arr.
A., W., Sp., Su.
Research for thesis purposes only.

Obstetrics and Gynecology

Office: N-624 University Hospital, 410 West 10th Avenue.
PROFESSORS: JULLERY (Chairman), HOLLENBECK and IMELING; ASSOCIATE PROFESSORS ICOPELAND, HOLZAEFFEL and WILLIAMS; ASSISTANT PROFESSORS BARBY, BESCH, BOUTSELLIS, deNEEF, DEVOE, NEIL, RIGSBY, STEEVES, TETERIS, TRELFORD, VORTS and ZARTMAN.

737 Clinical Obstetrics and Gynecology P 12
2 months, offered in July, Sept., Nov., Jan., Mar., or May.
Prereq.: Med. 3rd yr. standing.
Normal and abnormal obstetrics and diseases of the female generative tract; management and philosophy of current therapy. Supervised in-patient and out-patient experience.
Occupational Therapy

Office: 964.2970 Upham Hall, 473 W. 39th Avenue.
PROFESSOR LOCHER (Director), INSTRUCTORS GRANT and ROSS.

401 Occupational Therapy Orientation U 1
A. 2 cl.
The scope of occupational therapy is presented with its relationship to broad fields of education and medicine and to other allied health professions. Locher, Grant.

402 Occupational Therapy Orientation U 1
W. 2-hr. lab.
Prereq.: 401.
Continuation of 401.

403 Occupational Therapy Orientation U 1
Sp. 2-hr. lab.
Prereq.: 402.
Continuation of 402.

500 Survey of Occupational Therapy U 1
A, W, Su. 1 cl., 2 lab.
The development of occupational therapy and survey of its relationship, history, standards, trends, applications, personnel, opportunities, and problems. Locher.

501 Departmental Organization U 2
Sn. 2 cl.
Prereq.: Registration in Oc. Ther. curriculum.
Occupational therapy relationships within the institution and community. A study in program planning based on treatment methods including budgets, equipment, supplies, records, and staffing implications. Grant.

602 Occupational Therapy U 5
A. 5 cl.
Prereq.: Anat. 505, concur. Physiol. 506.
Medical information correlated with theory of treatment through activity for general medical and surgical conditions, including tuberculosis, cardiac, geriatric, pediatric, visual, and auditory disabilities. Locher, visiting physicians.

603 Occupational Therapy U 5
W. 5 cl.
Neurological and orthopedic medical information correlated with treatment principles and methods through activity in cases of loss of muscle power, limited joint motion, and amputation. Grant, visiting neurologist, and orthopedists.

604 Occupational Therapy U 5
Sp. 5 cl.
Prereq.: Psychol. 541.
Information, discussion, and demonstration of medical problems, and use of activities, self and groups in the total treatment program of neuropsychiatric and mentally deficient patients. Locher and psychiatrist.

605 Occupational Therapy U 2
A. 2 cl.
Prereq.: Anat. 505, Phys. Med. 503 and 606 and Physiol. 506 or concur.
Principles and methods of treatment in cases of lack of coordination, adaptation of equipment to meet activity needs of the individuals so involved. Grant.

Ophthalmology

Office: University Hospital, Room N-350, 410 West 10th Avenue.
PROFESSORS MAKLEY (Chairman), BLACKWELL, HAVENER and PERRY; ASSOCIATE PROFESSORS ANDREW, BATTLES, MOSES and ISUES; ASSISTANT PROFESSORS BITONTE, BARTON, BONTLE, BREDEMeyer, COOK, de la MOTTE, KAPETANSKY, KEATES, LETSON, LONG, MAGNUSON, SAGE and STINE.

751 Group Studies in Ophthalmology P 1
1 month, Oct. and Jan.
Prereq.: Med. 4th yr. standing.
Fundamentals of ophthalmology applicable in general practice and in other medical specialties. Makley.

793 Individual Studies in Ophthalmology G 1-5
1, 2, or 3 months, any month except Oct., Feb., and June.
Library, conference, clinic, and laboratory work. Makley.

799 Residency in Ophthalmology P 18
12 months full time, beginning July 1.
Prereq.: Appointment as Resident, University Hospital.
Repeatable to a maximum of 216 cr. hrs.
Rotation through ophthalmology clinical and outpatient services; consultative activities, supervisory and teaching responsibilities in the patient-care teams; conferences and rounds.
Optometry

Office: 111 Optometry Bldg., 338 West 10th Avenue.

PROFESSORS: BRY (Director); ASSOCIATE PROFESSORS: HEBBARD, HILL, and WILD; ASSISTANT PROFESSORS: ESKRIDGE, HINNES, MOTE, and REESE.

Also see courses in Physiological Optics.

514 Practical Optometry
A. 3 cl., 1 3-hr. lab.
Prereq.: Optom. 4th yr. standing, Physics 412, and Math. 439.
Theoretical and techniques of keratometry, skirometry, objective and subject tests of refraction, accommodation, and functions of the extra-ocular muscles. Hubbard.

515 Practical Optometry
W. 3 cl., 1 3-hr. lab.
Prereq.: 514.
Correlation and analysis of data. Systematic determination of the etiology of anomalies and sources of visual discomfort and inefficiency. Corrective procedures and prescription writing. Hubbard.

516 Practical Optometry
Sp. 3 cl., 1 3-hr. lab.
Prereq.: 515.

531 Mechanical Optics
Sp. 3 cl., 1 2-hr. lab.
Prereq.: Optom. 4th yr. standing, Physics 412 and Math. 439.
Classification of ophthalmic lenses: physical characteristics, manufacture, and testing of optical glass and lenses; system of distribution and stocking; grinding and polishing; measuring refracting power. Wild.

532 Mechanical Optics
W. 3 cl., 1 2-hr. lab.
Prereq.: 511.
Classification, description, manufacture, and distribution of frames and mountings. Laboratory practice in grinding, polishing, and mounting lenses, and repairing and reconstructing frames and mountings. Wild.

533 Mechanical Optics
Sp. 3 cl., 1 2-hr. lab.
Prereq.: 532.
History and basic theory of ophthalmic lenses, facial measurements; writing specifications for lenses and frames to be assembled. Wild.

541 Clinical Practice in Optometry
A, W, Sp. Su. 2 cl., 3 3-hr. lab.
Prereq.: 516.
Clinical practice in examining eyes and carrying out corrective procedures. The conference periods are devoted to the discussion of problems encountered during the clinic periods. Hobbard, Wild, Eskridge, Mote and Staff.

542 Clinical Practice in Optometry
A, W, Sp. Su. 2 cl., 3 3-hr. lab.
Prereq.: 541.
Continuation of 541. Hobbard, Wild, Eskridge, Mote and Staff.

543 Clinical Practice in Optometry
A, W, Sp. Su. 2 cl., 3 3-hr. lab.
Prereq.: 542.
Continuation of 542. Hobbard, Wild, Eskridge, Mote and Staff.

545 Special Clinical Practice
A, W, Sp. Su. 1 cl., 2-4 3-hr. lab.
Prereq.: 516, concur. 541 and permission of instructor.
Repeatable to a maximum of 15 cr. hrs.
Clinical experience in specialized phases of optometric practice: (a) subnormal vision, (b) asthenopia, (c) vision in schools and industry, (d) orthoptics, (e) contact lenses. Hobbard, Wild, Eskridge and Staff.

555 Applied Pathology of the Eye
Sp. 3 cl., 1 2-hr. lab.
Prereq.: 516 and Anat. 608.
Advanced ophthalmoscopy, slit lamp microscopy, tonometry, and other methods of detecting pathological conditions. Systematic study of ocular diseases; artificial eyes and other prosthetic devices. Hill.

556 Applied Pathology of the Eye
A. 3 cl., 1 2-hr. lab.
Prereq.: 555.
Motor disturbances of eyes, palsy, ataxia, peripheral fixation anomalies, nystagmus, ptosis, ptosis crutches, anomalous accommodative and pupillary responses. Eskridge.

557 Applied Pathology of the Eye
W. 3 cl., 1 2-hr. lab.
Prereq.: 556.
Visual fields: scotomata; subnormal central vision involving pathology; telescopic lenses and aids for subnormal vision; theory and practice in the use of contact lenses. Hill.

561† Optometric Economics and Jurisprudence
W. 2 cl.
Prereq.: 516.
Historical background; legal status; practice building techniques; office accounting and general practice management; representative organization in optometry; professional ethics. Hobbard.

562† Visual Problems in Schools, Industries, etc.
A. 2 cl.
Prereq.: 516.
Visual screening tests and survey methods for motorists, school children, industrial workers, etc.; vision and vocational efficiency; visual aspects of job analysis and design. Wild.
COURSES OF INSTRUCTION

OPTOMETRY

563 | Civic and National Problems in Eye Care | P 2 | 
   | sp. 2 cl. | 
   | Prereq.: 562. | 
Number, distribution, supply; interrelationships, and roles of various ophthalmic groups; prevalence of visual anomalies; problems and care of the blind and near blind. Hubbard.

601 | Advanced Clinical Practice in Optometry | P 5 | 
   | A. 2 cl., 3 3-hr. lab. | 
   | Prereq.: Optom. 4th yr. standing and 516. | 
Advanced clinical practice. The conference periods are devoted to the discussion of problems and cases encountered during the clinic periods. Wild, Esbridge and Staff.

602 | Advanced Clinical Practice in Optometry | P 5 | 
   | W. 2 cl., 3 3-hr. lab. | 
   | Prereq.: Optom. 4th yr. standing and 601. | 
Continuation of 601. Wild, Esbridge and Staff.

603 | Advanced Clinical Practice in Optometry | P 5 | 
   | Sp. 2 cl., 3 3-hr. lab. | 
   | Prereq.: Optom. 4th yr. standing and 602. | 
Continuation of 602. Wild, Esbridge and Staff.

651 | Subnormal Vision | P 4 | 
   | Sp. 3 cl., 1 2-hr. lab. | 
   | Prereq.: Optom. 3rd yr. standing and 516. | 
Etiology of subnormal vision; measurement of loss of central acuity and other visual functions; design of optical devices for the aid of the partially sighted. Esbridge.

652 | Aniseikonia | P 4 | 
   | W. 3 cl., 1 2-hr. lab. | 
   | Prereq.: Optom. 3rd yr. standing and 516. | 
Clinical methods of testing and measuring anisokonia; etiology of aniseikonia; effects associated with uncorrected anisokonia; design of lenses for anisokonia. Fugate, Albright.

653 | Contact Lenses | P 4 | 
   | A. 3 cl., 1 2-hr. lab. | 
   | Prereq.: Optom. 3rd yr. standing and 516. | 
Theory and practice in the use of contact lenses; artificial eyes; pterygium, crusts and other prosthetic devices. Bailey.

660 | Ophthalmic Pathology | P 5 | 
   | Sp. 3 cl., 6 lab hrs. | 
   | Prereq.: Optom. 4th yr. standing, 650. | 
Gross and microscopic pathology of the eye, including diseases of the conjunctiva, orbital cavity and pertinent pathology of the central nervous system. Irill.

Otolaryngology

Office: N-320 University Hospital, 410 West 10th Avenue.

PROFESSORS: W. H. SAUNDERS (Chairman); ASSISTANT PROFESSORS: M. FAPARELLA, W. M. MELNICK; INSTRUCTOR E. NILLO; RESEARCH ASSOCIATES: J. LIM, S. SUGIURA; CLINICAL ASSOCIATE PROFESSORS: MILLER, EICK; CLINICAL ASSISTANT PROFESSORS: J. LOWERY, A. DEISHLEY, G. GERSTEN, KRECH, SMITH; CLINICAL INSTRUCTORS: HILLMAN, H. LOWERY, WAGENBRENNER, WEHR.

751 | Group Studies in Otolaryngology | P 1 | 
   | 1 month. Offered Oct. and Feb. | 
   | Prereq.: Med. 4th yr. standing. | 
Clinical work in basic otolaryngology as encountered in general and other medical specialty practice.

793 | Individual Studies in Otolaryngology | P 6 | 
   | Any month. | 
   | Prereq.: Med. 4th yr. standing. | 
Practical applications of the principles of otolaryngology. Saunders, Faparella.

794 | Advanced Studies in Otolaryngology | P 18 | 
   | 3 months; offered July, Nov. and Mar. | 
   | Prereq.: Med. 3rd or 4th yr. standing. | 
Library, clinical, or laboratory problems in otolaryngology. Faparella, Saunders.

799 | Residency in Otolaryngology | P 18 | 
   | 12 months, full time, beginning July 1. | 
   | Prereq.: Appointment as Resident, University Hospital. | 
   | Repeatable to a maximum of 216 cr. hrs. | 
Rotation through clinical inpatient and outpatient services; consultative activities, supervisory and teaching responsibilities in otolaryngology; conferences and rounds.

Pathology

Office: M-112 Stolling Building, 320 West 10th Avenue.

PROFESSORS: IVY HAAM (Chairman), COLE, DAVIDSON, GAJALWA, ILISS, MACPHerson, and SCARPPELLI; ASSOCIATE PROFESSORS: KOLAS, N. M. ROBERTSON, RUBRECHT, and STEVENSON; ASSISTANT PROFESSORS: ALLEN, B. B. BERNHARD, CAMPA, CELENE, CUPPAGE, DAVIS, DIEDERICHS, FREDERICK, E. G. GIERRE, HURD, JOHNSTON, LEWIS, LOWY, M. MILLER, MURTHY, REINER, SAMUELS, SARMINA, SMITH, THORNE, and VON DER HOEVEN

603 | Clinical Pathology | P 6 | 
   | W. 2 cl., 3 3-hr. lab. | 
   | Prereq.: Med. 2nd yr. standing. | 
A study of the changes in the blood, urine, feces, sputum, spinal fluid and gastric contents brought about by disease. Macpherson, Steenerson.
PATHOLOGY

630 Medical Technology U 3
Su. 3 cl.
Prereq.: Med. Tech.: 4th yr. standing.
Hematology, urine analysis, clinical microscopy; blood bank, blood groups, blood types, and blood transfusions. Stevenson.

631 Medical Technology U 3
A. 3 cl.
Prereq.: Med. Tech.: 4th yr. standing.
Clinical microbiology, serology, parasitology, and mycology. Macpherson and Staff.

632 Medical Technology U 3
Sp. 3 cl.
Prereq.: Med. Tech.: 4th yr. standing.
Clinical blood and tissue chemistry, and modes of investigating diseases by biochemical methods. Graumer and Staff.

633 Medical Technology U 3
W. 3 cl.
Prereq.: Med. Tech.: 4th yr. standing.
Preparation of tissue for histologic examination by frozen and permanent sections; special stain techniques. Macpherson.

636 Medical Technology U 2
W. 2 cl.
Prereq.: Med. Tech.: 4th yr. standing.
The use and interpretation of laboratory tests in medicine. Macpherson and Staff.

637 Medical Technology U 2
Sp. 2 cl.
Prereq.: 636.
Continuation of 636.

640 Medical Technology Laboratory U 4
Su. 12 lab. hrs.
Prereq.: Med. Tech.: 4th yr. standing.
Laboratory demonstrations and practice in hematologic techniques and clinical microscopy. Stevenson and Staff.

641 Medical Technology Laboratory U 9
A. 27 lab. hrs.
Prereq.: Med. Tech.: 4th yr. standing.
Applied techniques and demonstrations in microbiology, immunology, mycology and parasitology. Macpherson, Sutton, Kinleton.

642 Medical Technology Laboratory U 9
Sp. 27 lab. hrs.
Prereq.: Med. Tech.: 4th yr. standing.
Demonstrations and applied techniques in the quantitative chemistry of blood and other body fluids. Graumer, Eary.

643 Medical Technology Laboratory U 9
W. 27 lab. hrs.
Prereq.: Med. Tech.: 4th yr. standing.
Tissue technique; mycology and parasitology. Macpherson, Sutton, Kinleton.

644 Medical Technology Laboratory U 5
Su. 15 lab. hrs.
Prereq.: Med. Tech.: 4th yr. standing.
Laboratory demonstrations and practice in blood bank and immuno-hematologic techniques. Stevenson and Staff.

645 Fundamentals of Disease U 3
A. 3 cl.
Prereq.: Med. Tech.: 4th yr. standing.
The nature of disease, mechanisms involved in the disease process, and use of the laboratory in defining the mechanisms of disease. Macpherson and Staff.

646 Clinical Practice in Medical Technology U 10
A, W, Sp, Su. 5 8-hr. labs.
Prereq.: Med. Tech. Senior standing and permission of instructor.
Application of medical laboratory techniques under supervision in the clinical laboratories of University Hospital.

650 Pathology U 5
A. 3 cl., 6 lab. hrs.
Prereq.: Optom. 4th yr. standing, Chem. 551-552; Physiol. 601-602; Anat. 607-608.
General pathology including the etiology of infectious diseases, disturbances of nutrition, inflammation, and neoplasia, with special reference to the influence upon ophthalmic pathology; selected chapters of Special Pathology, histologic and gross demonstrations. Buergel.

653 Clinical Pathology P G 6
W. 4 cl., 2 4-hr. labs.
Prereq.: Microbiol. 654, 659, Chem. 552 and permission of instructor.
The changes in the blood, urine, feces, sputum, spinal fluid and gastric contents brought about by disease. Macpherson, Stevenson, and Staff.

655 General Pathology P 5
Sp. 3 cl., 2 3-hr. labs.
Prereq.: Dent. 2nd yr. standing.
General pathology, including the etiology of diseases, disturbances of nutrition, inflammation, regeneration, and tumors. Buergel and Staff.

793 Individual Studies in Pathology
1, 2, 3, or 4 months.
A, W, Sp, Su.
Prereq.: Med. 3rd yr. standing; grad., permission of instructor.
A. Pathologic anatomy. 3 months, offered F G 18
C. Serum enzymes for diagnosis of disease. 3 months, offered Mar. Freola.
D. Clinical chemistry. 3 months, offered F G 18
E. Neuropathology. 3 months, offered F G 18

A-179
F. Immunohematology, 1 month, offered Sept., Mar., Apr., May, Morphyeram.  P G 6
G. Clinical microbiology, 4 months, offered Nov. Morphyeram.  P G 24
I. Surgical pathology I, 4 months, offered July, Nov. Old.  P G 24
K. Special pulmonary pathology, 2 months, offered July, Praz.  P G 12
L. Ultrastructure of cells in disease, 2 months, offered Nov. Scarpelli.  P G 12
M. Laboratory medicine—the erythrocyte, 2 months, offered Sept. Stevenson.  P G 12
N. Problems in experimental pathology, 4 months, offered Nov. von Haam, Scarpelli.  P G 24
O. Problems in pathology and clinical pathology.  G 3-5

798 Internship in Pathology  P 18
A, W, Sp, Su,
13 months full time, beginning July 1.
Prereq.: Appointment as Intern, University Hospital.
Repeatable to a maximum of 72 cr. hrs.
Rotation through the Division of Pathologic Anatomy and Surgical Pathology; primary responsibility for pathology service; work rounds and staff conferences.

799 Residency in Pathology  P 18
A, W, Sp, Su,
12 months full time, beginning July 1.
Prereq.: Appointment as Resident, University Hospital.
Repeatable to a maximum of 288 cr. hrs.
Rotation through all Pathology and Clinical Pathology subspecialties; certain teaching responsibilities, conferences and seminars.

800 Seminar in Pathology and Clinical Pathology  G 2
A, W, Sp, Su.  1-2 hr. cr.
Prereq.: Path. grad. standing.
Discussion of pertinent literature, presentation and discussion of research work, and demonstration of fresh specimens and slides.

950 Research in Pathology  G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

Pediatrics

Offices: Children’s Hospital, 561 South 17th Street.
N-118, University Hospital, 410 West Tenth Avenue.
PROFESSORS: IGRAHAM (Chairman), IAMUEL, ICRAIG-MBLETT, IHIOUSE, ISHAFFER, ASSOCIATE PROFESSORS M. AINSWORTH, ANDERSON, EDELMAN, FALKENSTEIN, ICHIBERG, HAMARIAN, HOSMION, HOWARD, KASMERSKY, McCLAVE, MISSIDINE, MUTOY, SEUMOY, SOTOS, TURNER; ASSISTANT PROFESSORS L. AINSWORTH, APLIN, BALDOCK, BASS, DONALDSON, EATON, EBERLY, FERNALD, FRAY, COVE, HALE, KONRAS, LEOV, MEYER, MCALL, MILLER, RIEPENNHOFF, ROBBINS, ROBERTSON, RUEGER, SAMUELS, SAUERS, SCHEP, SIVON, and SYLVESTER.

715 Ward Clinics in Pediatrics  P 12
2 months, offered July, Sept., Nov., Jan., Mar., or May.
Prereq.: Med. 3rd yr. standing.
Didactic and clinical instructors in Children’s Hospital is given to students in small sections; the members of which are required to write case histories and make routine clinical and laboratory examinations of cases assigned to them. All of the medical, surgical, and psychiatric aspects of diseases of children will be presented.

793 Individual Studies in Pediatrics  P G
Prereq.: Med. 4th yr. standing, 715, and permission of instructor.
A. Advanced Pediatrics  G 3-5
B. Chromosome Study, 1, 2, 3, or 4 months, offered all months.  P 6, 12, 15, 24
C. Pediatric Infectious Diseases, 2, 3, or 4 months, offered all months except June.  P 6, 12, 15, 24
D. Pediatric Practice, 1 month.  P 6

794 Group Studies in Pediatrics  P
1, 2, 3, or 4 months.
for D—Med. 3rd or 4th yr. standing.
for F—715 and permission of instructor.
A. Advanced Pediatric Problems, 1, 2, 3, or 4 months, offered all months except June. Graham.  P 6, 12, 18, 24
B. Ambulatory Pediatrics, 1, 2, 3, or 4 months, offered all months except June. Ambul. Eberly, Turner.  P 6, 12, 15, 24
C. Child Development, 2, 3, or 4 months, offered all months. Knudtson, Eberly.  P 12, 18, 24
D. Diseases of the Newborn, 1 month, offered all months. Graham, Span.  P 6
E. Inpatient Pediatrics, 1, 2, 3, or 4 months, offered all months except June. Graham.  P 6, 12, 15, 24
F. Laboratory Investigation of Metabolic Disorders of Children, 2, 3, or 4 months, offered all months. Sotos.  P 12, 18, 24
G. Pediatric Cardiology, 1 month, offered all months.  P 6
H. Pediatric Endocrinology and Metabolism, 1, 2, 3, or 4 months, offered all months. Sotos.  P 6, 12, 18, 24

A-180
798 Internship in Pediatrics
    P 18
    A, W, Sp, Su.
    12 months full time, beginning July 1.
    Prereq.: Appointment as Intern in Department of Pediatrics.
    Repeatable to a maximum of 72 cr. hrs.
    Eight months at Children's Hospital, four in medical pediatrics,
    two in pediatric surgery, two in pathology; four months at
    University Hospital, two emphasizing communicable diseases,
    two emphasizing the newborn infant.

799 Residency in Pediatrics
    P 18
    A, W, Sp, Su.
    12 months full time, beginning July 1.
    Prereq.: Appointment as Resident, Children's and
    University Hospitals.
    Repeatable to a maximum of 216 cr. hrs.
    Supervised care of hospitalized and ambulatory pediatric patients
    at Children's Hospital and University Hospital; certain teaching
    responsibilities; conferences and round.

900 Seminar in Pediatrics
    G 3-5
    A, W, Sp, Su.
    Prereq.: Permission of instructor.

950 Research in Pediatrics
    G Arr.
    A, W, Sp, Su.
    Research for thesis purposes only.

Petroleum Engineering

Office: 335 Chemical Engineering Bldg., 140 West 15th Avenue.
PROFESSOR O'ROURKE (Emeritus), ASSOCIATE PROFESSOR
SLIDER.

602 Petroleum Geophysical and Drilling
    U 3
    Methods
    W. 3 cl.
    Prereq.: Physics 553 or 413 and Math. 537 or 542 or
    equive.
    The engineering aspects of the geophysical exploration and drilling
    for gas and oil. Emphasis is placed on rotary drilling. Slider.

713 Drilling Fluids
    U 3
    W. 1 cl., 2 3-hr. lab.
    Prereq.: 602.
    The significance and control of drilling fluid qualities. Commercial
    drilling fluids are analyzed in the laboratory and the control of
    their properties is demonstrated. Slider.

723 Physical Analysis of Petroleum Reservoirs
    U 3
    W. 1 cl., 1 4-hr. lab.
    Prereq.: 602 or permission of instructor.
    A quantitative study of the physical nature of a petroleum
    reservoir. Includes laboratory analysis of porosity, permeability,
    saturation, capillary pressure, and multi-phase characteristics
    of reservoir rocks. Slider.

735 Reservoir Engineering—Hydrocarbon
    U 3
    Phase Behavior
    A. 2 cl., 1 2-hr. lab.
    Prereq.: Chem. E. 754.
    Quantitative study of the physical nature and phase behavior of
    subsurface reservoir fluids. Slider.

736 Reservoir Engineering—Fluid Flow
    U 3
    A. 2 cl., 1 2-hr. lab.
    Prereq.: 735.
    Quantitative study of reservoir fluid flow, including analysis of
    material balance, producing mechanisms, and well performance.
    Slider.

737 Oil and Gas Well Completions
    U 3
    Sp. 3 cl.
    Prereq.: 713, 736.
    Design of well completion methods emphasizing reservoir damage
    and evaluation of reservoir conditions, casing design, cementing,
    logging, acidizing, and hydraulic fracturing. Slider.

750 Petroleum Investigations
    U 3
    A, W, Sp. Library, conf., and lab. work.
    Prereq.: 736.
    750C Engineering problems of petroleum and natural
    gas exploration, production and transportation. Slider.
    750D Design or planning of petroleum field develop-
    ment.

765 Advanced Petroleum Engineering
    U 3
    Technology
    Sp. 2 cl.
    Prereq.: 736 and 723.
    Library research and seminar discussions of the most recent
    technical developments in petroleum engineering. Slider.

802 Petroleum Production and Oil Field
    U 3
    Development and Operational Problems
    Prereq.: Permission of instructor.
    Examination and testing of petroleum and petroleum bearing
    rocks; economic interpretation and application to problems of
    primary and secondary recovery.

950 Research in Petroleum Engineering
    G Arr.
    Research for thesis or dissertation purposes only.

A-181
Pharmacology

600  General Pharmacology  U G 3  
A, 2 cl., 1 3-hr. lab.  
Prereq.: Physiol. Chem. 611, Physiol. 601 or permission of instructor.  
Introduction to the general principles of pharmacology, drug classification, and the sites and mechanisms of drug action. Leveque.

601  Laboratory Methods in Pharmacology  U G 3  
A, 1 cl., 2 3-hr. labs.  
Prereq.: 600.  
Biological, chemical, electronic and mathematical techniques commonly employed in a pharmacology laboratory. Cardier.

610  Toxicology and Drug Identification  U G 3  
W, 1 cl., 2 3-hr. lab.  
Prereq.: 600.  

700  Medical and Mammalian Pharmacology  P G 4  
W, 4 cl.  
Prereq.: 600 or permission of instructor.  
General principles of pharmacology. Drugs used for diagnosis, prevention or eradication of the cause of disease, including endocrine products and chemotherapeutic agents.  

701  Medical and Mammalian Pharmacology  P G 5  
Sp, 4 cl., 2 lab. hrs.  
Prereq.: 700.  
Continuation of 700.

750  Seminar in Pharmacology  G 2  
A, W, Sp, Su, 1 cl.  
Prereq.: Permission of instructor.  
Conferences on selected topics in pharmacology.

770  Clinical Pharmacology and Therapeutics  P 3  
May.  

793  Individual Studies in Pharmacology  
I, 2, 3, months, offered all months except June.  
A, W, Sp, Su  
Prereq.: Med. 3rd yr. standing or permission of instructor.  
Cardiac arrhythmias; digitalis pharmacodynamics; neuropharmacology; endocrine pharmacology; advanced cardiovascular pharmacology; autonomic pharmacology. Marks.

820†  Autonomic Pharmacology  P G 3-15  
A, 2 cl., lab. arr.  
Prereq.: 600 or 701.  
Comprehensive review of drugs that mimic or affect the actions of autonomic neurons with emphasis on biochemical and cellular analysis of autonomic drug action. Marks.

821†  Cardiovascular Pharmacology  P G 3-15  
W, 2 cl., lab. arr.  
Prereq.: 600 or 701.  
Modern concepts of the action of drugs on the heart and circulation. Leveque.

822  Neuroendocrine Pharmacology  P G 3-15  
Sp, 2 cl. hr., lab. arr.  
Prereq.: 600 or 701.  
Levels of interaction of the nervous and endocrine systems. Goldstein.

823  Pharmacology Related to Anesthesia  G 3-15  
A, 2 cl., lab. arr.  
Prereq.: 600 or 701.  
The pharmacodynamics of anesthetic agents and of other drugs which modify the state of surgical anesthesia. Cardier.

845  Bioelectric Potentials  P G 5-15  
W, 5 cl., lab. arr.  
Prereq.: Physiol. 611, 602 or equiv. or permission of instructor.  
Methods of recording transmembrane potentials in cells; interpretation of cell potentials; effects of drugs on transmembrane potentials. Hollandar.

851†  Steroid Pharmacology  P G 3-15  
Sp, 2 cl. hr., lab. arr.  
Prereq.: 600 or 701 or permission of instructor.  
Pharmacology of steroids which affect special tissues, organs, etc. systems. Bench.

950  Research in Pharmacology  G Arr.  
A, W, Sp, Su.  
Research for thesis or dissertation purposes only.
Pharmacy

PROFESSORS: PARKS (Dean), IDEAL, IBROE, IFR, HARRIS (Emeritus), J. JOHNSON, I. MALAEPS, INELSON, I. TAY, ASSOCIATE PROFESSORS: BURKMAN, I. KIER, I. LAPI- 
DUS, I. ATOLAIOS, I. WOLF; ASSISTANT PROFESSORS: DOKOTCH, I. KANAP, I. OTABAI, I. OLSLON, PATIN, I. SOKO- 
LOSKI and C. L. WILLIAMS (Emeritus); INSTRUCTORS: BUERKII and ECKEL; CLINICAL INSTRUCTORS: SISTER 
FLORENTINE and HOLLAND.

401 Pharmaceutics I
W. 4 cl., 2 2-hr. lab.
Prereq: Chem. 551 or equiv.
The application of physical chemical principles to phar- 
aceuticals: a fundamental introduction to solid and liquid dosage forms.
Malapin, Notari, Sokolowski.

402 Pharmaceutics II
Sp. 3 cl., 2 2-hr. lab.
Prereq: 401.
The application of physical chemical principles to phar- 
aceuticals: properties of solutions of pharmaceutical and medicinal com- 
ounds, Malapin, Notari, Sokolowski.

470 Pharmacology for Nurses
Sp. 4 cl.
Prereq: Chem. 408 or 411, Physiol. 507.
Open only to students registered in School of Nursing.
A survey of the important drugs used in medicine and a con- 
sideration of their therapeutic applications. Some time is also 

503 Pharmaceutics III
A. 3 cl., 1 3-hr. lab.
Prereq: 402.
The application of physical chemical principles to phar- 
aceuticals: solubility and mixed solvents, complexation, redox systems in phar- 
macy. Sokolowski, Malapin, Notari.

504 Pharmaceutics IV
W. 3 cl., 2 2-hr. lab.
Prereq: 503.
The application of physical chemical principles to phar- 
aceuticals: heterogeneous systems, emulsions, suspensions, gels and magmas.
Sokolowski, Malapin, Notari.

505 Pharmaceutics V
Sp. 3 cl., 2 2-hr. lab.
Prereq: 504.
The formulation of compounded prescriptions and other dosage forms, with emphasis on drug availability, physiological require- 
ments, compatibility, prediction of stability and clinical effec- 
tiveness. Notari, Malapin, Sokolowski.

509 Drug Marketing
A. 3 cl.
Prereq: Econ. 506.
A study of the activities involved in the distribution of drug 
products from the producer to the consumer. Knapp.

512 Pharmacy Management
W. 2 cl., 2 2-hr. lab.
Prereq: 509.
A study of fundamental problems associated with planning, or- 
ganizing, and controlling a retail pharmacy. Emphasizing case 
problems to illustrate the practical application of management 
principles. Knapp.

513 Pharmacy Management
Sp. 3 cl., 1 2-hr. lab.
Prereq: 512.

514 History of Pharmacy
A. 2 cl.
Prereq: 513.
A course designed to give the pharmacy student a deeper appreci- 
ation of the background of pharmacy and its development through 
the years. Knapp, Buergi.

521 Pharmacognosy
A. Su. 4 cl., 1 3-hr. lab.
Prereq.: Chem. 551 or equiv.
A study of the history, source, identification, constituents, and 
medicinal preparations of some of the more important drugs of 
biological origin. Beal, Deschutes.

522 Pharmacognosy
W. 4 cl.
Prereq.: Chem. 551 or equiv.
A continuation of 521. Beal, Deschutes.

530 Inorganic Pharmaceutical Chemistry
W. 2 cl., 2 2-hr. lab.
Prereq.: Chem. 413 or equiv.
A systematic study of the elements, their compounds, and 
preparations containing those substances that have pharmaceutical 
application. Kier.

531 Inorganic Pharmaceutical Chemistry
Sp. 3 cl.
Prereq.: 530.
A continuation of 530. Kier.

550 Pharmacy Survey
A. 1 cl.
Lectures and discussions to acquaint the student with the pro- 
fession of pharmacy and the many fields of interest and speciali- 
zation within the profession. Parks.

551 Pharmacy Survey
Sp. 1 cl.
A continuation of 550. Parks.

600 The Pharmacist and Public Health
Sp. 3 cl.
Prereq.: Physiol. 507 or equiv., Microbiol. 607.
An introduction to public health stressing the pharmacist's role 
in the maintenance of the health of the community. Tye, Wolf.

601 Clandular Products
A. Su. 3 cl.
Prereq.: 709 or permission of instructor.
Preparations, properties, standardization, and uses of medicinal 
products obtained from glands and other organs of animals, and 
their related compounds. Tye, Nelson, Wolf.

602 Biological Products
W. 3 cl.
Prereq.: Microbiol. 607.
U.S.P. standards and legal requirements governing manufacture, 
standardization, storage and distribution of toxins, antidotes, 

604 Organic Pharmaceutical Chemistry
A. Su (1st term). 4 cl.
Prereq.: Chem. 553 or equiv.
A study of the chemistry of organic pharmaceutical and medicinal 
agents. LaPint, Kier.

PHARMACY

A-183
605 Organic Pharmaceutical Chemistry P G 4
W, Su (2nd term). 4 cl.
Prereq.: 604 or equiv.
A continuation of 604. LaBuday, Kier.

606 Pharmaceutics VI P 5
A. 3 cl., 1 3-hr. lab.
Prereq.: 505.
A continuation of 605 with emphasis on the physical chemical properties of drugs and dosage forms and the nature and intensity of biological action. Notari, Malpezi, Sokoloski.

607 Pharmacology P 5
A. 5 cl.
Prereq.: Physiol. 507 or equiv. or permission of instructor.
Fundamental materia medica including a discussion of the more commonly used drugs and preparations, their pharmacology and therapeutic applications. Nelson, Burkman, Tyue, Wolf.

610 Drug Assay P 4
A. 2 cl., 2 3-hr. lab.
Prereq.: 605 or equiv.
The qualitative and quantitative examination of drugs and drug formulations. Kier, Olson.

613 New and Non-Official Drugs P 3
Sp. 3 cl.
Prereq.: Senior standing.
The pharmacy of the more commonly used new and non-official medicinals. Guth.

614 Bio-Pharmacy P 5
Sp., Su. 4 cl., 1 3-hr. lab.
Prereq.: Chem. 552 or equiv.
A study of pharmaceutical agents important in biochemical processes. Bope.

615 Professional Orientation P 1
Sp. 1 cl.
Prereq.: Senior standing.
Discussions to focus attention on contemporary problems in pharmacy and to stimulate development of professional awareness and responsibilities. Parks.

619 Toxicology P 3
A. 3 cl.
Prereq.: 709 or permission of instructor.
Fundamentals of toxicology, including a discussion of the general classes of poisons, their physiological action, methods of treatment and detection with special emphasis on poisons. Nelson, Tyue, Wolf.

620 Cosmetic and Toilet Preparations P 3
A, W. 2 cl., 2 3-hr. lab.
Prereq.: 402.
A fundamental study of various types of preparations, such as creams, lotions, dentifrices, powders, perfumes, and related substances. Guth.

621 Manufacturing Pharmacy P 3
A. 1 cl., 2 3-hr. lab.
Prereq.: 402.
Courses dealing with the formulation and mechanical fabrication of a wide variety of pharmaceutical dosage forms. Guth.

622 Manufacturing Pharmacy P 3
W. 1 cl., 2 3-hr. lab.
Prereq.: 402.
A continuation of 621. Guth.

623 Manufacturing Pharmacy P 3
Sp. 1 cl., 2 3-hr. lab.
Prereq.: 402.
A continuation of 621. Guth.

632 Organic Pharmaceutical Chemistry P G 3
Sp. 3 cl.
Prereq.: 605 or equiv.
A continuation of 605. LaBuday, Kier.

640 Dispensing P 4
A. 3 cl., 2 2-hr. lab.
Prereq.: Senior standing.
A course dealing with the fundamentals of prescriptions including the techniques, physical-chemical phenomena, and incompatibilities. Notari.

641 Dispensing P 4
W. 3 cl., 2 2-hr. lab.
Prereq.: 640.

642 Dispensing P 3
Sp. 2 cl., 2 2-hr. lab.
Prereq.: 641.

643 Hospital Pharmacy P 3
A, W, Sp. 1 cl., 2 2-hr. lab.
Prereq.: 402.
Repeatable to a maximum of 9 cr. hrs.
Introduction to and clinical experience in hospital pharmacy under the supervision of a registered pharmacist in University Hospital, Mt. Carmel Hospital, or Good Samaritan. LaBuday, Ecket, Sister Florentine, Holland.

645 Pharmacy Seminar P 2
A, W, Sp. 2 cl.
Prereq.: Senior standing or permission of instructor.
Repeatable to a maximum of 6 cr. hrs.
A course dealing with the problems arising out of professional relations of the pharmacist with the physician, medical interns, nurses, laboratory technicians, and the laity.

647 The Pharmacy of Metabolic Agents P 3
Sp. 3 cl.
Prereq.: Senior standing.
A study of the pharmacy of medicinal products used in the treatment of deficiency diseases, malnutrition, and convalescence. Guth.

650 Pharmaceutical Jurisprudence P 3
Sp. 3 cl.
Prereq.: 513 or concur.
A study of the laws and regulations relating to the practice of pharmacy with emphasis on cases and court decisions illustrating the pharmacist's responsibilities. Kennep.

693 Special Problems P 1-3
Prereq.: Junior standing, cumulative point hour ratio of 2.5, and permission of instructor.
Repeatable to a maximum of 9 cr. hrs.
Laboratory and library work designed to give the qualified student an opportunity to complete an original investigation or pursue an interest in a special problem.

708 Pharmacology P G 5
W. 4 cl., 1 3-hr. lab.
Prereq.: 507 or equiv.
Fundamental Materia Medica including a discussion of the more commonly used drugs and preparations along with their pharmacological and therapeutic applications. Nelson, Tyue, Wolf, Burkman, Patil.
709 **Pharmacology**
Sp. 4 cl., 1 3-hr. lab.
Prereq.: 708 or equiv.

711 **Drug Assay**
P 3
W. 2 cl., 1 3-hr. lab.
Prereq.: 610 or equiv.
A continuation of 610. Kier, Olson.

712 **Pharmaceutical Analysis**
P 5
Sp. 3 cl., 2 3-hr. lab.
Prereq.: 711 or equiv.
The use of specialized instruments in the assay and control methods of drugs and drug preparations. Kier, Olson.

714 **Pharmacology of Newer Products**
P 3
W. 3 cl.
Prereq.: 709.
A course covering the pharmacology of the more recent drugs and preparations and their therapeutic application. Nelson, Tyse, Wolf.

7151** Sterile Products**
P 3
W. 2 cl., 1 3-hr. lab.
Prereq.: 504 or equiv.
A course dealing with the formulation, preparation, and testing of sterile products including injections, bulk solutions, and nasal and ophthalmic preparations. Latiolais, Guth.

717 **Microsopical Pharmacognosy**
P 3
W, Su. 1 cl., 2 2-hr. lab.
Prereq.: 533 or equiv.
A course embodying the principles of the microscope and the application of microchemical and specialized techniques in the detection, separation, and identification of drugs. Beal, Dosketch.

718 **Microsopical Pharmacognosy**
P 3
W, Su. 1 cl., 2 2-hr. lab.
Prereq.: 717 or equiv.
Pharmaceutical applications of specialized microscopic instruments. Beal.

725 **Hospital Pharmacy and the Hospital**
P 3
Organization
A. 3 cl.
Prereq.: Senior standing, 643 or equiv., and permission of instructor.
A course dealing with the hospital organization and the relationship of the departmental components to the pharmacy. Latiolais.

730 **Research Techniques and Instruments**
P 3
A. 1 cl., 2 3-hr. lab.
Prereq.: 605 and permission of instructor.
Study and application of selected techniques and instruments useful in research in the pharmaceutical sciences. Dosketch.

805 **Technology**
P 3
W. 1 cl., 2 3-hr. lab.
Prereq.: 606 or equiv.
Principles and practice in processing pharmaceutical dosage forms by the use of machines. Emphasis is on fundamentals of unit processes in pharmaceutical manufacture. Guth.

8061** Advanced Technology**
P 2-3
Sp. 8-9 hrs. lab.
Prereq.: 606 or equiv.
Repeatable to a maximum of 9 cr. hrs.
A laboratory course designed to permit study of a variety of problems in pharmaceutical production, with the ultimate aim of pilot plant scale production. Guth.

807 **Principles of Hospital Pharmacy**
P 3
W. 3 cl.
Prereq.: 725.
A course dealing with the administrative and professional principles and concepts of, and trends affecting, hospital pharmacy. Latiolais.

808 **Principles of Hospital Pharmacy**
P 3
Sp. 3 cl.
Prereq.: 807.
A continuation of 807. Latiolais.

809 **Product Development**
P 3
Su. 1 cl., 2 3-hr. lab.
Prereq.: 606 or equiv.
Study of problems involved in the formulation of suitable dosage forms and the relationship of physical, chemical, therapeutic, and organoleptic properties of medicaments to principles of formulation. Guth.

811 **Advanced Pharmacy**
P 3
Sp. 3 cl.
Prereq.: Chem. 682 or 670.
A study of the application of physical chemical principles to the design and development of oral pharmaceutical dosage forms. Sokolowski.

812 **Advanced Pharmacy**
P 3
Su. 3 cl.
Prereq.: Chem. 682 or 670.
A study of the methods used to predict, determine, and improve the stability characteristics of medicinal agents in dosage form. Sokolowski.

8251** Advanced Drug Marketing**
P 3
W. 3 cl.
Prereq.: 500, Bus. Org. 700 or equiv.
Theoretical aspects of drug marketing with emphasis on policies and practices of the pharmaceutical manufacturer. Knapp.

828 **Seminar in Pharmacy Administration**
P 3
A, Su. 3 cl.
Prereq.: 685, Bus. Org. 676 or equiv.
Repeatable to a maximum of 6 cr. hrs.
Investigation and analysis of selected areas of pharmacy administration for group discussion and written report. Case problems, review of current literature, and research. Knapp.

831** Plant Drug Constituents**
P 3
Su. 2 cl., 1 3-hr. lab.
Prereq.: Permission of instructor.
A study of the more important classes of constituents obtained from plants, including methods of isolation, purification, and identification. Beal, Dosketch.

835 **Advanced Pharmaceutical Chemistry**
P 3
A. 3 cl.
Prereq.: 605 or equiv.
A study of the chemistry of synthetic organic medicinal agents with emphasis on the relation of structure to biologic action. Bope, Kier.

836 **Advanced Pharmaceutical Chemistry**
P 3
W. 3 cl.
Prereq.: 605 or equiv.
A continuation of 835. Bope, Kier.

8451** Advanced Pharmaceutical Chemistry**
P 3
W. 3 cl.
Prereq.: Chem. 843.
A study of the methods used in structure determination and synthesis of alkaloids. Lapidas.

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**PHARMACY**
846  * Advanced Pharmaceutical Chemistry  G 3
   Sp.  3 cl.
   Prereq.: 845.
   Repeatable to a maximum of 6 cr. hrs.
   A continuation of 845 dealing primarily with steroid hormones, glycosides, and antibiotics. Lapidus.

850  Seminar  G 1
   Round table discussion, oral and written reports dealing with recent advances in pharmacy.

851  * Advanced Pharmacognosy  G 3
   A.  3 cl.
   Prereq.: Agr. Bio. 707 or Bot. 606 or permission of instructor.
   A study of research involving biosynthesis of plant constituents of pharmaceutical interest. Beal.

852  * Medicinal Plant Propagation and Cultivation  G 3
   Sp.  2 cl.
   Prereq.: Bot. 606 or permission of instructor.
   A study of the methods employed and problems involved in propagation, cultivation, harvesting, and evaluation of medicinal plants. Beal.

853  Medicinal Plant Laboratory  G 2-3
   Sp., Su.  6-9 hrs., lab.
   Prereq.: 852 or permission of instructor.
   Repeatable to a maximum of 12 cr. hrs.
   A laboratory course dealing with fundamental principles and special problems involved in the propagation and development of a medicinal plant garden. Beal.

870  Theories in Pharmacology  G 3
   A  3 cl.
   Prereq.: 709 or equiv.
   Orientation to graduate pharmacology. An introduction into theories of pharmacology and the research approach in pharmacology. Nelson, Tire.

871  Screening Methods in Pharmacology  G 3
   W.  1 cl., 2 3-hr. lab.
   Prereq.: 870 or equiv. and permission of instructor.
   Qualitative pharmacology covering the standard laboratory procedures and methods used in routine screening and laboratory evaluation of new drugs. Nelson, Tire, Wol.

872  * Advanced Research Methods  G 3
   Sp.  1 cl., 2 3-hr. lab.
   Prereq.: 871 and permission of instructor.
   The theory and practice of specialized pharmacological instruments. Tire, Farn.

880  * Biological Standardization  G 3
   Su.  1 cl., 2 3-hr. lab.
   Prereq.: 871 and permission of instructor.
   Quantitative pharmacology covering principles of bioassay design and interpretation. Laboratory consists of the performance of standard bioassays. Nelson, Tire.

881  * Advanced Topics in Pharmacology  G 3
   W.  3 cl.
   Prereq.: 871 and permission of instructor.

890  Special Problems  G 1-5
   A, W, Sp., Su.  cl., lab. arr.
   Repeatable to a maximum of 15 cr. hrs.
   Individual investigation of problems in one of the areas below:
   a. Pharmacy.
   b. Pharmacy Administration.
   c. Hospital Pharmacy.
   d. Pharmacoeconomic Chemistry.
   e. Pharmacognosy.
   f. Pharmacology.

950  Research in Pharmacy  G 1-15
   Research for thesis or dissertation purposes only.

Philosophy

Office: 10 University Hall, 216 North Oval Drive.
PROFESSORS: NELSON (Chairman), EVANS (Emeritus), IFOX, HUNSHAW, J.TURNBULL, and LJEITZ; ASSOCIATE PROFESSOR REITHER (Emeritus); ASSISTANT PROFESSORS JANDERSON, GARNER, HAUSMAN, KIELKOFF, IOLDENQUIST, JOLSCAMP, ROSEN, and WEVERS.

400  Types of Philosophy  U 3
   Not open to students with credit for 401.
   Essentials of the various types of philosophy: naturalism, pragmatism, dualism, idealism, mysticism.

401  Introduction to Philosophy  U 5
   Not open to students with credit for 400.
   The meaning and scope of philosophy, its typical problems and theories, its relations to the sciences, morality, and religion.

402  Introduction to Logic  U 5
   Deductive and inductive logic; conditions of clear statement and valid reasoning; contradiction, definition, argument, fallacies; the methods by which theories and laws are established.

405  Introduction to Ethics  U 5
   Examination of the ground for moral judgments; the nature of right and wrong; good and evil; adequate criteria for moral values.

406  Religious Questions  U 3
   A.
   Nature and significance of religion; examination of the individual and social bases of religious experience.

510  Introduction to Social Ethics  U 5
   Sp.
   Not open to students with credit for 656.
   Issues in ethical theory and their bearing on the problems of the nature of a good social order and of right social action.
515 Esthetics U 5
W, Sp, Su.
Prereq.: One course in Philos. or 15 cr. hrs. in Fine Arts or Mus.
Principal systems of aesthetics; interpretation of the creative activity of the artist, the work of art, and the contemplation and criticism of art objects. Weitz, Brown.

520 Philosophical Bases of Western Culture U 5
A, W, Sp, Su.
Prereq.: Sophomore standing.
Not open to students with credit for 551 or 552.
Elucidation of major philosophical themes and their humanistic and scientific roles in western thought through the writings of Plato, Lucretius, Augustine, Descartes, Kant, and Nietzsche. Weitz, Turnbull.

551 Points of View in Ancient Philosophy U 3
Prereq.: Junior standing.
Not open to majors in Philos.
A study of the central points of view of Plato and Aristotle.

552 Points of View in Modern Philosophy U 3
Prereq.: Junior standing.
Not open to majors in Philos.
A study of two major philosophers, such as Locke and Kant.

GENERAL PREREQUISITES FOR COURSES NUMBERED 600 AND 700
Not open to freshmen or sophomores. Unless otherwise indicated the prerequisites for 600 and 700 courses are either ten hours in philosophy and ten hours in natural or social sciences, or fifteen hours in natural science and fifteen hours in social science.

601 History of Ancient Philosophy U G 5
A.
Not open to students with credit for 501.
Not for graduate credit to students majoring in Philos. Special attention is given to the Pre-Socratics, Plato, Aristotle, Stoicism, Epicureanism, Neo-Platonism.

602 History of Philosophy from Augustine to Hume U G 5
W.
Not open to students with credit for 502.
Not for graduate credit to students majoring in Philos.
The medieval period is dealt with briefly. Special attention is given to Descartes, Spinoza, Leibniz, Locke, Berkeley and Hume.

603 History of Philosophy from Kant through the Nineteenth Century U G 5
through the Nineteenth Century
Not open to students with credit for 503.
Not for graduate credit to students majoring in Philos. Special attention is given to Kant, Fichte, Hegel, Schopenhauer, Nietzsche, and the Utilitarians.

604 Philosophy Since 1900 I U G 3
W, Su.
Prereq.: 10 cr. hrs. of Philos.
Special attention is given to idealism, realism, and analytic philosophy.

607r American Philosophy U G 3
Sp.
Prereq.: 401 or 602, and 5 additional cr. hrs. in Philos.

609r Medieval Philosophy U G 5
Sp, Su.
Prereq.: 10 cr. hrs. of Philos. including 601, or 638 and 639.
An examination of the main trends in the thought of the middle ages, based on a study of characteristic works of some of the most important medieval philosophers.

617 Existentialism U G 3
A.
Not open to students with credit for 645 or 665.
Introduction to the major doctrines of existentialism through writings of representative existentialists, such as Kierkegaard, Sartre, Jaspers, Heidegger. Brown.

618 Philosophy in Literature U G 5
A.
Not open to students with credit for Eng. 618.
Philosophical problems as reflected in classics of literature, such as the Greek dramatists, Shakespeare, Voltaire, T. S. Eliot, Proust and Tolsk. Brown.

631r Philosophy of Aquinas U G 3
Sp.
Prereq.: 10 hrs. of Philos. including 601.
Analysis of the treaties on the existence of God, the nature of man, and law; consideration of Aristotelian influences in medieval controversies.

633 Philosophy of Locke and Berkeley U G 3
Su.
Prereq.: 10 cr. hrs. of Philos. including 602.

634 Philosophy of Hume U G 3
A.
Prereq.: 10 cr. hrs. of Philos. including 602.

635 Philosophy of Descartes U G 3
A.
Prereq.: 10 cr. hrs. of Philos. including 602.

636r Philosophy of Spinoza U G 3
W.
Prereq.: 10 cr. hrs. of Philos. including 602.

637 Philosophy of Leibniz U G 3
W.
Prereq.: 10 cr. hrs. of Philos. including 602.
Turnbull.

638r Philosophy of Plate U G 3
A.
Prereq.: 10 cr. hrs. of Philos. including 601.
Fox.

639r Philosophy of Aristotle U G 3
W.
Prereq.: 10 cr. hrs. of Philos. including 601.
Fox.

640r Post-Kantian German Idealism U G 3
Sp.
Prereq.: 10 cr. hrs. of Philos. including 603.
German philosophy as presented in writings of such thinkers as Fichte, Schelling, Hegel, and Schopenhauer.
COURSES OF INSTRUCTION
PHILOSOPHY

642† Philosophy of James and Dewey U G 3
Su.
Prereq.: 10 cr. hrs. of Philos.

646 * Kant: Critique of Pure Reason W U G 5
Prereq.: 603.
Not open to students with credit for 702.

647 * Kant: Critique of Practical Reason and Critique of Judgment Sp.
Prereq.: 646.
Not open to students with credit for 703.
Fox.

649 Symbolic Logic I U G 3
A.
Prereq.: 402 or permission of instructor.
Development of the classical propositional calculus from both the matrix and the axiomatic points of view. Modal, multi-valued, weak, intuitionistic, propositional calculi.

650 Symbolic Logic II U G 3
W.
Prereq.: 649 or permission of instructor.
Axiomatic development of the predicate calculus of first-order through proofs of consistency and completeness. Equality, restricted quantification, and descriptions.

652 Philosophy of Science U G 3
W, Sp.
Prereq.: 5 cr. hrs of Philos. and 10 cr. hrs. of science, or 20 cr. hrs. of science.
A study of the concepts and methods of science. The role of formal systems in the construction of theories. Hinshaw.

653 Philosophy of Religion U G 5
A.
Prereq.: 5 cr. hrs of Philos.
A study of religious concepts and problems; the idea and nature of God, of man, their relation to the world and human destiny. Fox.

654† Conceptions and Methods of the Social Sciences U G 3
W.
Prereq.: Philosophy 402 and 10 cr. hrs. in social science or permission of the instructor.
Philosophic assumptions of social science: nature of explanation (methodological individualism, holism, functionalism); methods in natural and behavioral science; fact and value in social inquiry.

657 * Philosophy of Mind U G 3
W.
Classical and contemporary approaches to problems such as nature of mind, mind-body, other minds, intentionality, mental acts, reductionism. Weis.

661 Theory of Knowledge U G 3
W.
Prereq.: 10 cr. hrs. of Philos.
A study of major epistemological problems; the possibility, origin, foundation, structure, methods, limits, and validity of knowledge. Hinshaw.

663 Problems in Metaphysics U G 3
A.
Prereq.: 402 and 631, 602, or permission of instructor.
Philosophic methods and nature of metaphysics; categories, substance and process, causality and law. Nelson.

664 Problems of Metaphysics II U G 3
W.
Prereq.: 663 or permission of instructor.
Metaphysical presuppositions of knowledge; problems of universals; monism and pluralism; space and time. Nelson.

665 * Philosophy of History U G 3
A.
Prereq.: 10 cr. hrs of Philos. and 10 cr. hrs. in social sciences.
The place of history in knowledge; theories of the nature of historical process. Plato, St. Augustine, Hegel, Marx, Spengler, and Toynbee will be considered. Hinshaw.

666 Philosophy of Language U G 3
W.
Prereq.: 10 cr. hrs of Philos. including 649 or 650.
Semantics and language analysis; functions of language; modes of meaning, relation of linguistic structure to metaphysics.

671 Advanced Ethical Theory U G 3
Sp.
Prereq.: 10 cr. hrs. of Philos. including 405.
Carner.

701 Minor Problems U G 2-10
A, W, Sp, Su.
Prereq.: Permission of Chairman of Department.
Students ordinarily earn from 2 to 5 cr. hrs., but honor students may earn up to 10 cr. hrs.

720 Advanced Studies in Philosophy U G 3-5
A, W, Sp, Su.
Prereq.: Permission of instructor.
Repeatabile.
Topic for Autumn: Human Action and Causality.
Topic for Winter: Theories of universals.
Topic for Spring: Meinong's influence on the development of realism.

GENERAL PREREQUISITES FOR COURSES NUMBERED 800-AND 900

Unless otherwise indicated the prerequisites for 800 and 900 courses are acceptable foundation courses either in psychology, logic and ethics, or history of philosophy, and in some cases in all these subjects.

807 Seminar in the Philosophy of Religion G 3
W.
Fox.

821 Seminar in Logic G 3
A.

822 Seminar in Metaphysics G 3
Sp.
Nelson.

823 Seminar in Theory of Knowledge G 3
Sp.
Nelson.

824† Seminar in Ethics and Theory of Value G 3
A.

825 Seminar in the History of Philosophy G 3
Sp.
Turnbull.

A-188
PHYSICAL EDUCATION

615 Motion Picture Photography 
A, Sp. 3 cl., 2 lab. hrs.  
Prereq.: 510 or 511 or 625 or permission of instructor.  
Motion picture production in the 16 mm. field. Principles of motion picture cameras, photography, processing, scripting, editing, sound recording, and production planning. Staples.

625 Scientific Photography 
A, W, Su. 3 cl., 2 2-hr. lab.  
Prereq.: Chem. 404, 405, 406 or equiv., 20 cr. hrs. in science major.  
Not open to students with credit for 511.  
For students in physical and biological science who need a knowledge of photography as an aid to their scientific work. Applications of photography to science. Binau, Davis, Drake.

650 Advanced Photography 
W. 2 cl., 2-2-hr. lab.  
Prereq.: 511 or 625.  
Continuation of Photog. 511 or 625. Binau.

699 Minor Problems in Photography 
A, W, Sp. 4 to 8 lab. hrs.  
Prereq.: Graduate standing. 6 cr. hrs. in Photog., and permission of instructor.  
Repeatable to a maximum of 15 cr. hrs.  
Use of departmental facilities for adding to the student's knowledge of a specially selected photographic problem pertaining to his major field. Staff.

Photography

Office: 12 Brown Hall, 190 West 17th Avenue.  
PROFESSORS DAVIS (Chairman) and WAGNER; ASSOCIATE PROFESSORS BINNAU and DRAKE; ASSISTANT PROFESSORS BALL, PIATT, and STAPLES; and INSTRUCTOR.

511 Photography 
A, Sp. 2 cl., 2-2-hr. lab.  
Fundamentals of photography, including cameras, emulsion characteristics, processing, filters, chemistry, and optics. Binau, Wilhelm.

003 Photography in Education and Communication 
W, Su. 2-2-hr. cl.  
Prereq.: Graduate or 4th yr. standing and permission of instructor.  
Photographic media in education and communication. Role of the photographic image in relation to educational theory. Development of photographic systems in educational and informational programs. Staples, Wagner.

005 Theory of Photography and the Moving Image 
A, Sp. 2-2-hr. cl.  
Prereq.: Graduate or 4th yr. standing and permission of instructor.  
A study of the development of the art and science of photography and its relation to related arts and sciences. The photographic origins of the still and motion picture. Staples.

010 Application of Photographic Processes to Television 
W, Su. 2 cl., 2 lab. hrs.  
Motion picture production for use in television. Film production planning, continuity, and photographic processes. Special problems in telecasting and relationship of film units to other station activities. Staples.

Physical Education

Office: Men's: 124 Physical Education Bldg., 337 West 17th Avenue.  
PROFESSORS LARKINS, THESS, TASHIBBOO, BENNETT, CUSHMAN, HAYES, HIXSON, MATHEWS, ROBERTERF, FEFFE (Emeritus); ASSOCIATE PROFESSORS BIGGS, HENDRIX, HEWLETT, KAROW, MANDE, MONTANARO, STbral, WIRTHWEIN; ASSISTANT PROFESSORS KARTELTS, BEKMAN, CLARK, ERING, FREDERICKS, HARTMAN, KLEINMAN, TAYLOR; INSTRUCTORS BERTHAM, BOHNE, BOWERS, BRENNER, BURKHOLDER, CARROLL, CRASE, COATES, DUNCLAP, EPSKAMP, HARPER, MALMSTOR, MELICK, O'BRIEN, OLSO, RICETTS, SARKINEN, SIMONIAN, SONNAG, STANLEY, STROBEL, SWANSON, WEBB, and ASSISTANTS.

Women's: 201 Pomerene Hall, 1760 Neil Avenue.  
PROFESSORS MORDY, JALKINS, JULLINGER, BEYER, GILMAN (Emeritus), ILPUP, ISON, STEIN (Emeritus), WATSON (Emeritus), YOST; ASSOCIATE PROFESSORS BAILEY, CRITTS, ISELIN, FOGGE, LOGSDON, SCHROEDER, SOLEDER, ASSISTANT PROFESSORS BLAINE, FELDZEN, GAZETTE, HAYS, HULL, LILLY, NOLTE, WHEELER, INSTRUCTORS BOWERS, COOLEY, FOX, HERROLD, HOUSE, HURKELL, OLSO, OWEN, PATTY, RICHARDSON, TANDY, WOODS, WYNN, and ASSISTANTS.

401 Physical Education 
Instruction in the techniques of play, rules, strategies, and the social behavior involved in sports and dance activities.
402 Physical Education (Men)  U 1
A, W, Sp, Su.  2 cl.
Continuation of 401.

403 Physical Education (Men)  U 1
A, W, Sp, Su.  2 cl.
Continuation of 402.

411 Physical Education Activities  U 2
A.  5 2-hr. lab.
Prereq.: By permission of chairman.
Reqd. of majors in Phys. Ed. Open to others in place of Phys. Ed. 401, 402, or 403 for men, or Phys. Ed. 421, 422, or 423 for women. Dance majors should schedule D sections.
Repeatable without credit.
These courses aim to develop knowledge, understandings, and skills in the basic activities appropriate to the teacher of physical education and dance education.

412 Physical Education Activities  U 2
W.  5 2-hr. lab.
See requirements for 411.
Continuation of 411.

413 Physical Education Activities  U 2
Sp.  5 2-hr. lab.
See requirements for 411.
Continuation of 412.

414 Physical Education Activities  U G 2
A.  5 2-hr. lab.
Reqd. of majors in Phys. Ed. Open to women in place of 425, 426, or 427 by permission of chairman. Dance Majors should schedule D Sections.
Repeatable without credit.
Continuation of 413.

415 Physical Education Activities  U 2
W.  5 2-hr. lab.
See requirements for 414.
Continuation of 414.

416 Physical Education Activities  U 2
Sp.  5 2-hr. lab.
See requirements for 414.
Continuation of 415.

421 Physical Education (Women)  U 1
A, Su.  2 cl.
Not open to majors in Phys. Ed.
Instruction in the techniques, rules, strategy, and social behaviors of a sport or dance activity selected by the student from a wide range of offerings.

422 Physical Education (Women)  U 1
W, Su.  2 cl.
Continuation of 421.

423 Physical Education (Women)  U 1
Sp, Su.  2 cl.
Continuation of 422.

424 The University Dance Group  U 1
Prereq.: Admission by audition only.
Repeatable to a maximum of 12 cr. hrs.
The University Dance Group is a concert organization, dedicated to the study and performance of experimental and repertory dance works; three or more performances a year. Alkire, Bliette.

425 Physical Education  U 1
A, W, Sp, Su.  2 lab. hrs.
Not open to Phys. Ed. majors.
Not repeatable.
A continuation of 421-422-423 for women; and 401-402-403 for men.

426 Physical Education  U 1
A, W, Sp, Su.  2 lab. hrs.
Continuation of 425.

427 Physical Education  U 1
A, W, Sp, Su.  2 lab. hrs.
Continuation of 425.

452 Supervision of Playground and Community Recreation Activities  U 2
Sp.  2 2-hr. lab.
Programming of recreational activities relative to community conditions. Overview of activities desirable for a broad, comprehensive program.

514 The Science of Development Through Activity  U 5
W.  4 cl., 1 2-hr. lab.
Prereq.: Physiol. 410, Anat. 504.
A systematic study of factors in human movement which affect the physiological development of the organism.

519 The Teaching of Basketball  U 3
A, Sp.  3 cl., 2 1-hr. lab.
Prereq.: Men. 412 or satisfactory evidence of skill in playing basketball.
Not open to students with credit for 449.
Study in the theory, strategy, and mechanics of directing basketball. Taylor.

520 Sports Officiating-Football  U 2
A.  2 cl., 2-lab. hrs.
Prereq.: Men. 416 or satisfactory evidence of playing experience in football. Students completing this course are eligible for certification to officiate football in the schools of Ohio.
This course will include lectures, readings, class discussions, and field experience in the officiating of school and college football games. Husxon.

521 Sports Officiating-Basketball  U 2
A. (Men), W.  2 cl., 3-lab. hrs.
Prereq.: 412 or satisfactory evidence of playing experience in basketball.
Lectures, readings, class discussions, and field experience in the officiating of school and college basketball games. Beekman, Crafts.

538 Dance Notation I  U 2
A.  2 cl., 2 1-hr. lab.
Prereq.: 411D or permission of instructor.
Fundamentals and principles of Labanotation. Staff.

539 Dance Notation II  U 2
W.  2 cl., 2 1-hr. lab.
Prereq.: 538 or permission of instructor.
Continuation of 538 with emphasis on reading and writing scores. Staff.

541 Theory and Practice of Elementary School Physical Education  U 3
A.  2 2-hr. lab., 1 3-hr. school observation.
Contribution of rhythmic, individual and group activities to the development of children. Stimulation of the creative process and adaptation of methods and materials. Logsdon.
542 Physical Education for The Elementary School Child
W. 4 hr. lab., 1 3-hr. lab.
Prereq.: 541 for Women, Psychol. 307 for all students.
Study of characteristics of the elementary school child with implications for physical education experience. The selection, adaptation and teaching of appropriate activities are emphasized. For Men, Ashbrook, Breiner. For women, Legendre.

543 The Theory and Practice of Physical Education for Junior High School Youth (Women)
Sp. 5 lab. hrs.
A study of the developmental needs of nearly adolescent youth. Emphasis is placed upon the adaptation of physical activities to meet these needs. Scott.

544 The Teaching of Track and Field
W. 2 hr. cl.
Prereq.: Men. 412 or satisfactory evidence of skill in track and field events.
Not open to students with credit for 443.
Study in the theory, methods and mechanics of coaching track and field. Snyder.

546 The Teaching of Football
W. 2 hr. cl., 3-lab. hrs.
Prereq.: Men. 416 or satisfactory evidence of skill in playing football.
Not open to students with credit for 446.
Study in the theory, methods, and mechanics of coaching football including fundamentals of play, offensive and defensive formations, organizations, practice periods, and educational values. Hayes.

547 The Teaching of Baseball
W. 2 hr. cl.
Prereq.: 412 or satisfactory evidence of playing experience in baseball.
Not open to students with credit for 447.
Study in the theory, strategy, and mechanics of coaching baseball, including batting, baserunning and the playing of all positions. Karwoski.

548 Theory and Practice of Dance Education
A, Sp. 1 hr., 3 lab. hrs.
Prereq.: 2 hrs. of Modern Dance or equiv.
Foundations for teaching and organizing dance in high school programs of physical education. Laboratory problems, lectures, and reading. Bannan.

549 The Teaching of Swimming
W. (Women), Sp. (Men). 2 hr., 2-lab. hours.
Prereq.: Satisfactory evidence of skill in swimming.
Organization of water sport activities in schools, camps and recreation centers. Methods of teaching swimming, life saving, and canoeing. Bartels, Lilly.

550 Theory and Practice of Dance Education
A, Sp. 1 hr., 4 lab. hrs.
Prereq.: 542 or equiv.
A continuation of 548 with emphasis on folk and ballroom forms of dances. Laboratory problems, lectures and readings. Ellis.

551 Directed Teaching Experience in Physical Education
A, W, Sp, Su. 4 hr. lab.
Prereq.: Permission of departmental adviser.
Opportunity is provided for assisting in the teaching of sport and dance activity classes.

560 Camp Counseling
A. 2 hr., 7-day September workshop, Sp. 2 hr. cl.
Prereq.: Phys. Ed. major and minor students shall have completed the September workshop immediately preceding the qtr. of enrollment. Spring Qtr. section open to all University students.
Investigation of the responsibilities and duties of the counselor in various types of camps. Practical experience in basic craft skills. Bailey and Mand.

576 Creative Physical Education for Elementary Teachers
A, W, Sp, Su. 2 hr. lab.
Men and Women.
Not open to students with credit for 471, 541, 542.
Theory of physical activities as a medium for creative, self-expression. Exploration of rhythmic, individual and group activities and their relation to development of children. Allenbaugh.

601 Principles of Football Coaching and Management
Su. 3 cl.
Prereq.: Grad. standing and coaching experience.
A course for advanced students of football considering the principles of various types of strategy. The designing of plays, methods of teaching and controlling players and special problems of management. Hayes.

615 Problems in Intramural Sports
Sp, Su. 1 hr.
A critical analysis of intramural sports programs. Problems of policy and administration of programs on the elementary, secondary and college levels will be studied. Beckmann.

616 The Administration of Interschool Athletics
A, Su. 2 cl.
Not open to students with credit for 540.
An introductory course in athletic administration, including scheduling contests, records, eligibility, contest management, facilities and equipment, budgets and finance, public relations, and awards. Haxton.

621 Principles of Physical Education
A, Sp, Su. 5 cl.
Prereq.: Major or minor in Phys. Ed. or permission of instructor.
Origins and nature of modern physical education as developmental experience and medium of education. Contributions to organic growth, personal resources, and growth in social relationships. Obertaffer.

625 Evaluation in Physical Education
W, Su. 2 cl., 1 2-hr. lab.
A critical study of methods in evaluating biological, social, and psychological outcomes for physical education. Mathews.

630 Adapted Physical Education
Prereq.: 691 or equiv.
Organization and administration of individual physical education for typical or atypical students. Laboratory experience in sports, swimming or exercise therapy for prevalent types of disabilities. Women—Wheeler, Men—Ashbrook.

631 Theory and Practice of Modern Dance
Sp. 2 cl., 3 lab. hrs.
Prereq.: Permission of instructor.
Foundations for teaching and organizing instructional and extra curricular programs of modern dance in schools and colleges. Laboratory problems, lectures, readings, and discussions. Staff.
COURSES OF INSTRUCTION

PHYSICAL EDUCATION

632 Dance Composition  U G 3
A. 2 1-hr. cl., 4 lab. hrs. Prereq.: Permission of instructor.
A study of composition based on elements of modern dance backgrounds and immediate sources of modern art. Laboratory problems with criticism, readings, films, and slides. Akkine.

633 Dance Production  U 5
W. 2 1-hr. cl., 10 lab. hrs. Prereq.: Permission of instructor.
A study of the production problems in staging dance for the theater. Lectures, readings, and discussions. Akkine.

640 History of Physical and Health Education  U G 3
W, Su. 3 cl.
Not open to students with credit for Ed. 642.
An historical survey of physical and health education beginning with ancient Greece and with special emphasis on recent and contemporary developments in Europe and America. Bennett.

647 Physical Education for Secondary School Youth  U G 3
A, Sp. 2 2-hr. cl., Women 3 2-hr. cl. Prereq.: Satisfactory proficiency in 411-416 inclusive or equiv.
Emphasis on the study of needs, interests and abilities of secondary school youth and methods and materials for the conduct of appropriate sports activities. Crafts, Hendrix.

648 Physical Education for Senior High School Youth  U G 3
Sp, Su. 3 2-hr. cl. Prereq.: 411-416 inclusive or equiv.
Continuation of 647 with emphasis on the characteristics of the middle adolescent as they affect the selection and conduct of physical education activities. Crafts.

649 Outdoor Education and Camp Administration  U G 3
Sp. 3 cl. Prereq.: 560 or permission of instructor.
Introduction to the principles, status and administration of outdoor education and camping. Mand.

650 Advanced Dance Composition  U G 4
A, Sp. 2 2-hr. cl., 1 2-hr. lab. Prereq.: 539, 632 or equiv.
Choreographic problems of groups: duets, trios, quartets, quintets. Analysis of dance works of recognized artists through films and dance scores written in Labanotation. Blaine.

655 Public Recreation: Its Organization and Administration  U G 3
W. 3 cl. Prereq.: Soc. 645 or equiv.
Not open to students with credit for Soc. Work 655.
Consideration of common patterns of organization of community recreation found in American cities, large and small, under municipal school and other auspices. Mand.

657 History of Dance I  U G 3
A. 3 cl. Prereq.: Antithetical -501 or 503 or equiv.
Dance motivation from sympathetic magic in tribal societies; in mythic ritual and dance drama. Staff.

658 History of Dance II  U G 3
W. 3 cl.
Survey of dance from the early Christian church through the Baroque period. Staff.

659 History of Dance III  U G 3
Sp. 3 cl.
Dance development in the nineteenth and twentieth centuries with emphasis on ballet and modern dance. Staff.

682 Organization and Administration of Physical Education  W. 5 cl.
Prereq.: 621 or equiv.
Study of policies and procedures in the organization and administration of the physical education program. Mordy, Hess.

685 First Aid and Care of Injuries  U G 4
A, Sp. 5 cl. Prereq.: 10 qtr. hrs. of Anat. and Physiol.
Students completing this course are eligible for Red Cross standard or advanced certification in first aid.

691 Kinesiology  U G 3
A, W, Sp. 4 cl. Prereq.: Anat. 504 or equiv.
The science of bodily movement. Wooten, Mand, Bartels.

701 Minor Problems in Physical Education and Dance Education  U G 1-4
A, W, Sp. Su. Prereq.: Grad. or senior standing and permission of advisor.
Not open to students with credit for 651.
a. Physical Education.
b. Dance Education.
Investigation of selected professional problems.

799 Physical Education Workshop  U G 4
Su. 3 week workshop. Prereq.: Teaching experience or senior standing in Phys. Ed. and permission of instructor.
A team approach to activity teaching in Physical Education with emphasis on instruction, methods, materials, resources, evaluation, inter-relationships, and others. Hixson and Crafts.

802 Seminar in Physical Education  G 2
W, Su. 2 cl.

803 Seminar in Recreation  G 2
Sp, Su. 2 cl. Mand.

805 Physical Education in School and College  G 3
A, Su. 3 cl. Obsessorger.

810 Survey of Research in Physical Education  G 3
W, Su. 3 cl. Prereq.: 825 or equiv.
Mathews.

814 Seminar in the Role of Sports in Society  G 3
Sp, Su. 3 cl. Prereq.: Soc. 645 or equiv.
Study of the significance of sports in society; and examination of the extent to which sports contribute to human welfare. Mordy.
810 Problems in Intercollegiate and Interfraternity Athletics
   W. 3 cr.
The relation of athletics to education; problems of athletic organization; eligibility; finance, current trends, and developments in management and purpose; public relations. Huson.

820 Problems in Physical Education G 3
   A, W, Sp, Su.
Advanced problems in physical education, individual or group participation.

820A Recreation A

820B Adapted Physical Education W
820C Curriculum in Physical Education
   Sp, Su.

820D Physical Education in Higher Education A, Su.

820E Physical Education in Secondary Education
   Sp.

820F Physical Education in Elementary Education W.

820G Dance Education

820H School Evaluation W.

820I Administration W.

823 Organic Science as Applied to Physical Education and Health Education
   Sp.
   Prereq.: 10 hrs. of Physiol., 10 hrs. of Chem. and 10 hrs. of Biol. or equiv.
A systematic study of the integration of chemistry, biology, anatomy, physiology to the fields of physical education and health education. Ashbrook.

825 Methods of Research in Health Education and Physical Education A, Su. 3 cr.
To develop some competency in professional writing and in the use of various research methods applied to health education and physical education. Mathews.

826 Supervision of Physical and School Health Education A. 3 cr.
A study of the responsibilities and functions of the supervisor in city, county, and state school systems. Scott.

846 Professional Preparation of Teachers in Physical and Health Education
   Sp, Su. 3 cr.
Not open to students with credit for 846.
Principles underlying professional preparation of teachers in physical and health education; curriculum construction; selection of candidates; supervised teaching; staff personnel; problems pertaining to professional students. Hess.

950 Research in Physical Education G Arr.
   A, W, Sp, Su.
Research for thesis or dissertation purposes only.

Physical Medicine

Office: Dodd Hall, 473 West 8th Avenue.
PROFESSORS JOHNSON (Chairman); ASSOCIATE PROFESSORS HAMILTON, IStOW, and NAGI; ASSISTANT PROFESSORS GUYTON, SPIEGEL, WOODS, and PERRY.

500 Introduction to Physical Therapy U 2
   A. 2 cr.
A general orientation of physical therapy and its relation to medical services. Medical ethics, medical terminology, personal relationships, institutional contracts, and patient management. Woods.

501 Physical Therapy Arts U 2
   A. 2 cr., 1 1-hr. lab.
   Prereq.: Admission to Phys. Ther.
Orientation to hospital organization, department administration, and medical-legal problems. Techniques: asepsis, bandaging, body mechanics. Introduction to the application of physical therapy in medical problems. Perry.

502 Massage U 2
   A. 1 cr., 1 3-hr. lab.
   Prereq.: Admission to Phys. Ther., Physical 506 or equiv.
History, application, physiological effects, indications, contraindications, of massage in medicine. Surface anatomy. Woods.

503 Muscle Function Measurements and Tests U 2
   W. 1 cr., 2 2-hr. lab.
   Prereq.: Admission to Phys. Ther., Physical 506 or equiv.

510 Functional Anatomy U 4
   W. 2 cr., 3 1-hr. lab.
   Prereq.: Admission to Phys. Ther.
The application of physical therapy techniques to osteology, arthrology, and myology. Mitchell.

600 Kinesiology in Physical Therapy U 2
   Sp. 1 cr., 3 1-hr. lab.
   Prereq.: Admission to Phys. Ther.
Advanced physical therapy techniques with special emphasis or tests, measurements, and analysis of human motion. Mitchell.

602 Physical Therapy Procedures U 3
   A. 2 cr., 2 2-hr. lab.
   Prereq.: Admission to Phys. Ther.
Theory, technique, demonstration, and practice in the use of physical agents in physical therapy including: thermotherapy, heisotherapy, hydrotherapy, electrotherapy, ultrasonic therapy, Mitchell.
COURSES OF INSTRUCTION

PHYSICAL MEDICINE

603  Neurmuscular Disease  U 2
W.  2 cl.
Prereq.: Admission to Phys. Ther.
Anatomy and physiology applied to the physical therapy techniques of treating neuromuscular diseases. Clinical presentation of neurological patients. Burk.

604  Medical Science  U 4
W.  3 cl., 3 1-hr lab.
Prereq.: Admission to Phys. Ther., 602.
Lectures and clinical presentation of patients in the medical science fields related to physical medicine, to include medicine, surgery orthopedics, geriatrics, neurology, psychiatry, gynecology, obstetrics, dermatology, and roentgenology. Johnson.

605  Therapeutic Exercises  U 4
Sp.  2 cl., 3 2-hr. lab. demons. and supervised clinical practice.
Prereq.: Admission to Phys. Ther.
Theory and technique of muscle re-education and application of exercise to medical, orthopedic, post-surgical, and neurological disorders, including patient teaching methods. Mitchell.

607  Physical Rehabilitation  U 3
Sp.  2 cl., 2 2-hr. lab. demons.; field trips.
Prereq.: Admission to Phys. Ther.
Theory, technique, and equipment used in the physical restoration of the disabled, including the relation of medical aspects to total patient concept of rehabilitation. Perry.

608  Physical Therapy Clinic  U 3
Sp.  2 cl., 2 2-hr. lab.
Prereq.: Admission to Phys. Ther.
Coordination and summary practice of all physical therapy procedures, being determined by the physical disability and medical prescription. Perry.

609  Seminar  U 1-2
A.
Prereq.: Admission to Phys. Ther., permission of instructor.
Student participation in departmental medical seminars at which papers of current interest are presented by physicians and invited guests from related fields. Burke.

610  Seminar  U 1-2
W.
Prereq.: 609.
Continuation of 609.

611  Seminar  U 1-2
Sp.
Prereq.: 610.
Continuation of 610.

612  Problems in Physical Therapy  U 1-3
Sp.  2 cl., 1 1-hr. lab.
Prereq.: Admission to Phys. Ther.
Survey and analysis of selected problems and research with the opportunity for students to extend their knowledge in some specialized subject in physical therapy. Woods.

613  Clinical Conference and Observation  U 2
A, W, Sp, Su.  2 cl.
Prereq.: Admission to Phys. Ther., permission of instructor.
Therapeutic problems arising from clinical practice in the field, and the observation of surgical procedures on patients most likely to receive physical medicine and rehabilitation.

614  Clinical Practice in Physical Therapy  U 18
A, W, Sp, Su.  5 3-hr. labs.
Prereq.: Admission to Phys. Ther., permission of instructor.
Clinical application of physical therapy techniques under supervision in physical medicine and rehabilitation departments of affiliated hospitals. Practice with assigned patients.

615  Agents Used in Physical Therapy  3
W.  3 cl.
Prereq.: Admission to Phys. Ther.
Not open to students with credit for 601.
Heat, cold, light, water, electricity, sound, and exercise as used in the diagnosis and treatment of disease. Stowe.

616  Effects of Agents Used in Physical Therapy  U 3
A.  3 cl.
Prereq.: Admission to Phys. Ther.
Not open to students with credit for 601.
Physiological effects of heat, cold, light, water, electricity, sound, and exercise, as used in the diagnosis and treatment of disease. Burk.

715  Medical Rehabilitation  P 6
1 month, offered Oct., Feb.
Prereq.: Med. 4th yr. standing.
Ambulation aids, electrodiagnosis, prosthetics, physical and occupational therapy, social service, as related to acute and chronic diseases. Johnson.

735  Clinical Physical Medicine and Rehabilitation  P 6, 12, 18
1, 2, or 3 months; offered any month.
Prereq.: Med. 3rd or 4th yr. standing and permission of instructor.

745  Biophysical Basis of Physical Treatment  P 6, 12, 18
1, 2, or 3 months, offered any month.
Prereq.: Med. 3rd or 4th yr. standing, and permission of instructor.
The student will design and complete a laboratory or library research problem involving the biophysical aspects of physical diagnosis or treatment. Johnson, Stowe, Nagi.

793  Individual Studies in Physical Medicine  C 3-5
A, W, Sp, Su.
Prereq.: 735 and permission of instructor.
Minor investigations using electrodiagnostic techniques; biophysica,l physiologic, and therapeutic effects of physical agents, and other medical rehabilitation techniques. Johnson, Stowe, Nagi.

799  Residency in Physical Medicine  P 18
A, W, Sp, Su.
12 months full time, beginning July 1.
Prereq.: Appointment as Resident; University Hospital. Repeateable to a maximum of 210 cr. hrs.
Rotation through physical medicine and rehabilitation clinical inpatient and outpatient services; consultative, supervisory and teaching responsibilities in the patient-care team; rounds, conferences, seminars. Burke, Gayton, Johnson, and Spiegel.
Physics

Office: 121 Physics Bldg., 174 West 18th Avenue.

PROFESSORS 1H. NIELSEN (Chairman), 1BELL, 1BROWN, 1DICKER, 1EDWARDS, 1HAUSMAN, 1HEER, 1JASTRAM, 1JOSSEM, 1KORRINGA, 1LANDE (Emeritus), 1MILLS, 1NELSON, 1C. NIELSEN, 1OEYETJ, 1POOOL, 1PREBUS, 1RADO, 1ROMANOWSKI, 1SAFFER, 1C. SHAW, 1H. SHAW, SMITH (Emeritus), 1TANAKA and 1WADA; ASSOCIATE PROFESSORS 1ARNS, 1ERICKSON, 1GAINESS, 1HARRIS, 1HESTHAL (Emeritus), 1Hsu, 1KURBATOV (Emeritus), 1MATE, 1REIBEL, 1RILBY, 1WIGEN, 1YANG, 1YAGUB, and 1ZUMSTEIN; ASSISTANT PROFESSORS CHU, 1DONOHUE, 1KIM, 1MULLIGAN, 1PLoughe, 1SANDERSON, 1SETLIER and 1TOUGHE.

401 Nature of the Physical World U 5
A, W, Sp. 4 cl., 1 2-hr. lab.
Not open to students with credit for Gen. S. 421.
A unified elementary non-mathematical description of the physical universe for cultural value, emphasizing scientific method and current topics. Laboratory demonstration and telescopic observation. Hesthal.

402 Nature of the Physical World U 5
W, Sp. 4 cl., 1 2-hr. lab.
Prereq.: 401.
Not open to students with credit for Gen. S. 421.
Continuation of 401. Hesthal.

411 General Physics: Mechanics and Heat U 5
A, W, Sp, Su. 4 cl., 1 2-hr. lab.
Prereq.: Eligibility for Math. 409.

412 General Physics: Electricity, Magnetism, and Light U 5
A, W, Sp, Su. 4 cl., 1 2-hr. lab.
Prereq.: 411.

413 General Physics: Modern Physics U 5
A, W, Sp, Su. 4 cl., 1 2-hr. lab.
Prereq.: 412.

420 Descriptive Meteorology U 5
Sp. 4 cl., 1 2-hr. lab.
Descriptive treatment of local weather phenomena and commonly observed weather changes; laboratory includes instrumental observations, use of meteorological data, study of weather maps. J. Shaw.

505 Intermediate Geometrical Optics U 3
W. 3 cl.
Prereq.: 411-412-413 and Math. 440.
Not open to students with credit for 605.
Ray optics of thick lenses, mirrors, prisms, and their combination; apertures and aberrations. Nielsen.

506 Intermediate Physical Optics U 3
Sp. 3 cl.
Prereq.: 411-412-413 and Math. 440.
Not open to students with credit for 606.
Wave theory of optical phenomena; applications. Nielsen.

532 General Physics for Engineers and Physical Scientists: Heat, Sound, Light U 5
A, W, Sp, Su. 4 cl., 1 2-hr. lab.
Prereq.: 531 and Math. 538 or 441.
Not open to students with credit for 532.

533 General Physics for Engineers and Physical Scientists: Electricity, Magnetism U 5
A, W, Sp, Su. 4 cl., 1 2-hr. lab.
Prereq.: 531 and Math. 538 or 441.
Not open to students with credit for 533.

535 Geometrical Optics Laboratory U 2
W. 1 4-hr. lab.
Prereq. or concurs.: 505 or 605.
Not open to students with credit for 535.
Selected experiments in geometrical optics. Zumstein.

536 Physical Optics Laboratory U 2
Sp. 1 4-hr. lab.
Prereq. or concurs.: 506 or 606.
Not open to students with credit for 536.
Selected experiments in physical optics. Zumstein.

GENERAL PREREQUISITES FOR COURSES
NUMBERED 600 AND 700
Not open to freshmen or sophomores. Unless otherwise indicated, the prerequisites for 650 and 700 courses are Math 543 or 558 and Physics 531-532-533 or equivalent.

601 Intermediate Physical Mechanics U G 3
A, W, Sp, Su. 3 cl.
Not open for graduate credit to Physics majors.
Analytical treatment of vectors; kinematics and dynamics of particles; force fields; simple harmonic oscillator and modifications; emphasis on analytical methods used in other physics courses. Saffier.

602 Concepts and Methods of Modern Physics U 5
W, Sp. 5 cl.
Prereq.: 532-533 and Math. 538 or 543.
Not open to Physics majors.
Introductory analytical treatment of concepts and methods of modern Physics including topics from nuclear, atomic, molecular or solid state Physics; quantum-mechanical concepts. Heer.

603 Intermediate Heat U G 3
A, Sp. 3 cl.
Not open for graduate credit to Physics majors.
Introduction to theory of heat with applications. Erickson.

605 Geometrical Optics U G 3
A. 3 cl.
Advanced theory of geometrical optics including thick lenses, types of mirrors, combinations of lenses and mirrors, apertures and aberrations in optical systems. Zumstein.

606 Introductory Physical Optics U G 3
W, Su. 3 cl.
Introduction to diffraction; interference; and polarization phenomena. Applications in design and performance of optical instruments. Zumstein.

608 Intermediate Electricity and Magnetism U G 3
W, Sp. 3 cl.
Prereq.: 601.
Not open for graduate credit to Physics majors.
Intermediate mathematical treatment of electric and magnetic fields; problem solving emphasized. Dickey.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Description and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>610</td>
<td>Electron Physics</td>
<td>U G 3</td>
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<td></td>
<td>W, Sp.</td>
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<td>Prereq.: 601 and 614 or equiv.</td>
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<td></td>
<td>Physical phenomena and elementary theory of solids; binding and energy bands of solids; electrical, thermal and magnetic properties of metals and semi-conductors. Heer, Erickson.</td>
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<tr>
<td>612</td>
<td>Periodic and Transient Electric Currents</td>
<td>U G 3</td>
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<td>Sp.</td>
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<td>Prereq.: 601</td>
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<td></td>
<td>Study of response of circuits with constant parameters to both constant and variable voltages; electronic circuits and instruments used in physical research. Dickens.</td>
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<tr>
<td>614</td>
<td>Introduction to Modern Physics</td>
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<td></td>
<td>A, W, Sp, Su.</td>
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<td>Not open for graduate credit to Physics majors.</td>
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<td></td>
<td>Intermediate mathematical treatment, including: fundamental particles; qualitative concepts of quantum theory and their history; emission and absorption processes; atomic and molecular structure. Nielsen.</td>
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<td>615</td>
<td>Introduction to Nuclear Physics</td>
<td>U G 3</td>
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<td></td>
<td>Prereq.: 601 and 614 or equiv.</td>
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<td>Not open for graduate credit to Physics majors.</td>
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<td></td>
<td>Properties of the atomic nucleus; disintegration processes; particles and photon emission; fission; fusion. Detection techniques for nuclear radiations. Energy levels and selection rules. Heer.</td>
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<tr>
<td>616</td>
<td>Advanced Physical Laboratory</td>
<td>U G 3</td>
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<td></td>
<td>A, W, Sp, Su.</td>
<td>2 3-hr. lab.</td>
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<td></td>
<td>Prereq.: 412-413 or 532-533, Math. 538 or 543.</td>
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<td></td>
<td>Repeatable to a maximum of 24 cr. hrs.</td>
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<td></td>
<td>Experiments selected from: acoustics; atomic physics; electricity, magnetism; electron physics; electronics; heat, thermodynamics; nuclear physics; optics; solid state; spectroscopy; X-rays. Independent work emphasized. Jossen, C. Shane.</td>
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<tr>
<td>634</td>
<td>Fundamentals of Radioactivity and Instrumentation</td>
<td>U G 4</td>
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<td></td>
<td>A, Su.</td>
<td>3 lec. and 1 3-hr. lab.</td>
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<td></td>
<td>Prereq.: 2 qtrs. of college Physics or Chem., and 20 cr. hrs. of biological science or permission of instructor. Not open to students majoring in Chem., Engineering, or Physics.</td>
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<td></td>
<td>Descriptive treatment of atomic and nuclear structure; physical properties of radioactive nuclei; instrumentation; radiation hazards and safety; introduction to applications of radioactivity. Pool.</td>
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<tr>
<td>637</td>
<td>Physics Seminar for In-Service Science Teachers</td>
<td>U G 3</td>
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<td>A, Su.</td>
<td>1 3-hr. cl.</td>
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<td></td>
<td>Prereq.: 15 cr. hrs. of Physics and teaching experience; permission of instructor.</td>
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<td></td>
<td>A course to deepen teachers' understanding of basic physical concepts and methods of treatment of selected problems. Presentation will include lectures, discussions, demonstrations, and problem solving. Riley.</td>
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<tr>
<td>638</td>
<td>Physics Seminar for In-Service Science Teachers</td>
<td>U G 3</td>
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<td></td>
<td>W, Su.</td>
<td>1 3-hr. cl.</td>
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<td>Prereq.: 637</td>
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<td></td>
<td>Continuation of 637. Riley.</td>
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<tr>
<td>639</td>
<td>Physics Seminar for In-Service Science Teachers</td>
<td>U G 3</td>
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<td></td>
<td>Sp, Su.</td>
<td>1 3-hr. cl.</td>
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<td>Prereq.: 638</td>
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<td></td>
<td>Continuation of 638. Riley.</td>
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A-196

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Description and Notes</th>
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</thead>
<tbody>
<tr>
<td>641</td>
<td>Basic Principles and Recent Advances in Physics</td>
<td>U G 5</td>
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<td></td>
<td>Sp.</td>
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<td></td>
<td>Prereq.: Academic Year Science Institute students only. Primarily for high school physics teachers. A unified treatment of concepts and principles of classical physics together with selected topics in contemporary physics. Riley.</td>
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<tr>
<td>643†</td>
<td>General Meteorology</td>
<td>U G 3</td>
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<td>Prereq.: 15 cr. hrs. of natural science including one of following: Agron. 501, Bot. 402, Geog. 403, Geol. 402, Physics 412 or 532, Zool. 402. Not open to students with credit for 510. Study of atmospheric phenomena. Individual observation and prediction of weather events. J. Shaw.</td>
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<td>645</td>
<td>Descriptive Acoustics</td>
<td>U G 3</td>
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<td>Prereq.: Junior standing in Music, Speech, or Science Education. Not open to majors in Physics. Descriptive non-mathematical treatment of acoustics with applications to music and speech including; sources, propagation, reception, characteristics of sound; room acoustics; hearing; apparatus. Shaw, Shafer.</td>
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<td>648 *</td>
<td>Physics of the Upper Atmosphere</td>
<td>U G 3</td>
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<td>Prereq.: 601</td>
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<td>The structure of the upper atmosphere as obtained from studies of the ionosphere, ozosphere, aurorae, meteors, and use of rockets. J. Shaw.</td>
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<tr>
<td>701</td>
<td>Minor Problems in Physics</td>
<td>U G 1-15</td>
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<td>A, W, Sp, Su.</td>
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<td></td>
<td>Prereq.: Satisfactory advanced courses in experimental and theoretical physics and permission of instructor.</td>
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<td>A course designed to give a properly qualified student opportunity for independent reading, study, or lab. work in a specialized field of interest.</td>
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<tr>
<td>702</td>
<td>Kinetic Theory of Gases</td>
<td>U G 3</td>
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<td></td>
<td>Sp, Su.</td>
<td>3 cr.</td>
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<td></td>
<td>Prereq.: 603, and Math. 601 and 611 or 608 and 609. Not open to students with credit for 604. Introduction to kinetic theory of gases with applications to physical systems. Dusan.</td>
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<td>703</td>
<td>Thermodynamics</td>
<td>U G 3</td>
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<td>Prereq.: 603 and Math. 601 and 611. Not open to students with credit for 603-604. Modern treatment of topics in physical thermodynamics including; entropy, specific heats, third law, phase, and lattice changes, surface phenomena; applications to low temperature phenomena. Dusan.</td>
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<tr>
<td>704</td>
<td>Thermodynamics</td>
<td>U G 3</td>
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<td>W.</td>
<td>3 cr.</td>
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<td>Prereq.: 703</td>
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<td>Continuation of 703.</td>
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<tr>
<td>709†</td>
<td>Wave Motion and Sound</td>
<td>U G 3</td>
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<td></td>
<td>A.</td>
<td>3 cr.</td>
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<td></td>
<td>Prereq.: 601 and Math. 611. Theory of wave motion; production, propagation and detection of sound waves; measurements and applications. C. Shaw.</td>
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</tbody>
</table>
711 Physics of Ionized Cases
Sp. 3 cl.
Prereq.: 608 and 702.
Elementary processes and collective behavior in plasmas; analysis of ion orbits, many-particle systems, oscillations and stability; cosmic phenomena, laboratory plasmas, and the thermonuclear problem. C. Nielsen.

712 Fundamentals of Electricity and Magnetism
A. 3 cl.
Prereq.: 601, 609, Math. 661.

713 Electromagnetic Field Phenomena
W. 3 cl.
Prereq.: 601, 712 and Math. 611.
An introductory course in Maxwell's theory of the electromagnetic field. Brown.

714 Electromagnetic Theory of Light
Sp. 3 cl.
Prereq.: 608 and 713.

716 Introduction to Theory of Solids
Sp. 3 cl.
Prereq.: 610.
Fundamental properties of solids with emphasis on conduction in metals and semiconductors. C. Shao.

718 Modern Atomic Spectroscopy
A, Su. 3 cl.
Prereq.: 601, 614.

719 Spectra and Structure of Molecules
Sp. 3 cl.
Prereq.: 601 and 614.
Experimental methods and theory of molecular spectra; relation of spectra to molecular structure. Rao.

720 X-ray Physics
W. 3 cl.
Prereq.: 718.
Modern theory and experiment in X-ray emission, absorption, scattering, dispersion; application to solid state and nuclear physics. C. Shao, Jastrow.

721 Fundamentals of Nuclear Physics
W. 3 cl.
Prereq.: 718.
Topics in nuclear research; beta decay, shell structure, internal conversion, resonance, scattering, elementary particles, angular correlation, collision dynamics. Concurrent course in quantum mechanics recommended. Jastrow.

723 Nuclear Reactors and Neutron Physics
Sp. 3 cl.
Prereq.: 615 and 702.
Neutron sources; scattering and capture of neutrons; nuclear fission; resonance phenomena; material damage; diffusion; power production. Pool.

726 Methods of Theoretical Physics
A, Su. 3 cl.
Analytical course coordinating methods of dynamics of particles and systems of particles, electrical circuits, wave motion, etc.; preparation for quantum mechanics. Bell.

727 Methods of Quantum Mechanics I
W, Su. 3 cl.
Prereq.: 601, 614, and 726, or equiv.
Introduction to Schrödinger and matrix techniques of quantum mechanics; perturbation methods; resonance; application to simple problems. Bell.

728 Methods of Quantum Mechanics II
Sp. 3 cl.
Prereq.: 727.
Continuation of 727 with applications to more complicated problems; quantum mechanics of atoms and molecules; approximate methods. Bell.

730 Analysis of Physical Measurements
A. 3 cl.
Prereq.: 601, 614, and 6 hrs. of advanced lab.
Nature of physical measurements; types of data and their analytical treatment; curve fitting; errors; applications of analytical methods to typical physical problems. C. Nielsen.

733 Nuclear Measurements and Instrumentation
A, Sp. 2-3 hr. lab.
Prereq.: 615 and permission of instructor. Not open to students with credit for 633. Repeatably to a maximum of 8 cr. hrs.
Nuclear measurements from the latest types of nuclear instruments; characteristic radiation of numerous radioactive sources. The neutron experiments center around a subcritical reactor. Pool.

734 Nuclear Reactor Laboratory
W. 2 3-hr. labs.
Prereq.: 733, 723 and permission of instructor. Repeatably to a maximum of 6 cr. hrs.
Neutron diffusion, neutron shielding, radioactivity production, pile oscillation, reactor control, buckling and other pile parameters; critical reactor will be operated by student. Pool.

740 Introduction to Theoretical Physics
A. 3 cl.
Prereq.: 601 and Math. 601.
Fundamentals of classical mechanics including transformation of reference frames; dynamics of particles and collections; rigid rotators; Hamilton's principle; Lagrange's equations; vibration theory; special relativity; elasticity; fluid dynamics; wave motion. Shaffer.

741 Introduction to Theoretical Physics
W. 3 cl.
Prereq.: 740.
Continuation of 740. Shaffer.

742 Introduction to Theoretical Physics
Sp. 3 cl.
Prereq.: 741.
Continuation of 741. Shaffer.

805 Electromagnetic Field Theory
W. 3 cl.
Prereq.: 713 and Math. 721.
Electro- and magnetic-statics; Maxwell's theory of electrodynamics; general classical theory of emission, propagation, and absorption of electromagnetic waves; boundary value problems; relativistic electrodynamics. Probas.

806 Electromagnetic Field Theory
Sp. 3 cl.
Prereq.: 805.
Continuation of 806. Probas.

A-197
813* Line Spectra and Atomic Structure G 3
A. 3 cl.
Prereq.: 718, 727 or 818.
Advanced treatment of theory and interpretation of atomic spectra including contemporary problems. Hear.

816 Topics in Physics G 3-5
A, W, Sp, Su. Hrs. as arr.
Prereq.: 616 or equiv. and permission of instructor.
Repeatable to a maximum of 15 cr. hrs.
Laboratory and/or theoretical work on an individual basis on topics of current interest.

817 Quantum Mechanics G 3
A. 3 cl.
Prereq.: 718, Math. 601 and 611, Physics 727 and 740 recommended.
Advanced fundamental course including: physical bases; Schrödinger, matrix and operational formulations; approximate methods; transformation theory; relativistic modifications; hole theory, etc. Mulligan.

818 Quantum Mechanics G 3
W. 3 cl.
Prereq.: 817.
Continuation of 817. Mulligan.

819 Quantum Mechanics G 3
Sp. 3 cl.
Prereq.: 818.
Continuation of 818. Mulligan.

820* Theoretical Nuclear Physics G 3
A. 3 cl.
Prereq.: 721 and 728 or 818.
Properties of nuclei; two-body problem; complex nuclei; interaction of radiation with nuclei; reaction theory; Beta-decay; meson theory, and mesons; extremely high energy physics. Seigler.

821* Theoretical Nuclear Physics G 3
W. 3 cl.
Prereq.: 820.
Continuation of 820. Seigler.

822* Theoretical Nuclear Physics G 3
Sp. 3 cl.
Prereq.: 821.
Continuation of 821. Seigler.

823* Nuclear Spectroscopy G 3
Sp. 3 cl.
Prereq.: 718, 727, 728 or 818.
Advanced treatment of theory and interpretation of various aspects of nuclear spectroscopy including current topics. Jastram.

824 Statistical Mechanics G 3
W. 3 cl.
Prereq.: 709, 727 or 818 and 740.
Advanced treatment of fundamentals of classical and quantum statistical mechanics with application to contemporary problems. Kortring.

825 Statistical Mechanics G 3
Sp. 3 cl.
Prereq.: 824.
Continuation of 824.

833* Theory of the Solid State G 3
W. 3 cl.
Prereq.: 716, 728 or 818, and Math. 721.
Modern theory of solid state including; classification of solids and theory of such physical properties as cohesion, specific heat, conductivity, and magnetism. Deser.

834* Theory of the Solid State G 3
Sp. 3 cl.
Prereq.: 833.
Continuation of 833.

840 Advanced Dynamics G 3
A. 3 cl.
Prereq.: 742 and Math. 661.
Starts with Lagrange's equation and includes variational theorems, Hamilton's canonical equations, general transformation theory. Mills.

841 Advanced Dynamics G 3
Sp. 3 cl.
Prereq.: 840.
Continuation of 840. Selected topics in advanced dynamics. Mills.

843* Theory of Quantized Fields G 3
A. 3 cl.
Prereq.: 819 and 840.
The concepts and methods of quantum field theory, both as a fundamental description of physical interactions and as a method for use in certain relativistic problems. Mills.

844* Theory of Quantized Fields G 3
W. 3 cl.
Prereq.: 843.
Continuation of 843.

846* Physics of Elementary Particles G 3
A. 3 cl.
Prereq.: 721 and 819.
Properties of elementary particles; theory of strong and weak interactions. Mills.

847* Physics of Elementary Particles G 3
W. 3 cl.
Prereq.: 846.
Continuation of 846.

851* Advanced Molecular Spectra G 3
A. 3 cl.
Prereq.: 718, 719, and 735.
Advanced treatment of topics in theory and interpretation of electronic, vibration, rotational aspects of molecular spectra; emphasis on details of rotation-vibration spectra of poly atomic molecules. H. Nielsen.

852* Advanced Molecular Spectra G 3
W. 3 cl.
Prereq.: 851.
Continuation of 851. H. Nielsen.

860 Advanced Topics in Physics G 3
A, Su. 3 cl.
Prereq.: Permission of instructor.
Repeatable.
An advanced treatment of some field of physics of current interest not presently covered in other courses. Topic to be announced for each quarter.

861 Advanced Topics in Physics G 3
W. 3 cl.
Prereq.: Permission of instructor.
Repeatable.
Topic to be announced for each quarter.

862 Advanced Topics in Physics G 3
Sp. 3 cl.
Prereq.: Permission of instructor.
Repeatable.
Topic to be announced for each quarter.
PHYSIOLOGICAL CHEMISTRY

511 Physiological Chemistry U 4
A. 3 cl., 1 3-hr. lab.
Prereq.: Chem. 551 or permission of instructor.
Biochemistry of carbohydrates, lipids, proteins, enzymes; digestion, absorption, intermediary metabolism, biochemistry of blood and urine. Devor, Nushek.

512 Physiological Chemistry U 4
W. 3 cl., 1 3-hr. lab.
Prereq.: 511.
A continuation of 511.

601 Physiological Chemistry P 8
A. 150 cl. or lab. hrs.
Prereq.: Med. 1st yr. standing.

602 Physiological Chemistry P 4
W. 75 cl. or lab. hrs.
Prereq.: 601.
Continuation of 601. Experimental studies in biochemical control mechanisms in normal and pathological states including nutritional deficiencies.

603 Physiological Chemistry U G 5
Sp. 3 cl., 2 3-hr. lab.
Prereq.: 612.
Intermediary metabolism, specialized tissues, blood and other body fluids.

611 Physiological Chemistry U G 5
A. 3 cl., 2 3-hr. lab.
Prereq.: Chem. 521, 522, 647, 648, 649, 650, or 655, 650, 657, 659, 660, or equiv.
Chemistry of carbohydrates, lipids, and proteins. Wikoff, Devor, and Staff.

612 Physiological Chemistry U G 5
W. 3 cl., 2 3-hr. lab.
Prereq.: 611.
Biochemistry of digestion, metabolism, and excretion. Wikoff, Devor, and Staff.

614 Biochemical Methods of Analysis U G 5
(Food Analysis)
W. 2 cl., 3 3-hr. lab.
Prereq.: 611 or equiv.
The quantitative analysis of the proteins, fats, and carbohydrates. Special methods for the analysis of biological materials. Devor and Assistants.

632 Physiological Chemistry P 6
Sp. 4 cl., 2 3-hr. lab.
Prereq.: Dent. 1st yr. standing, Chem. 551, 552.
Chemistry of the carbohydrates, lipids, and proteins. Biochemistry of digestion, absorption, metabolism, and excretion. The tissues: Alben, Devor, Cornell, McCloud, Nushek, Richardson, and Assistants.

633 Physiological Chemistry (Human Nutrition) P 2
A. 2 cl.
Prereq.: Dent. 1st yr. standing, 632.
The elements of human nutrition with a special emphasis on the relation of diet to dentistry. Brown.

702 Physical Methods in Biochemistry G 3
W. 2 cl., 1 3-hr. lab.
Prereq.: 621, Physical Chemistry, or permission of instructor.
A practical and theoretical introduction to the use of the analytical ultracentrifuge, Tiselius electrophoresis, spectroscopy, chromatography and radioisotopes.

715 Biochemical Biography U G 1
Sp. 1 cl.
Prereq.: 612.
Wikoff.

720 A Biochemical Approach to the Study of Disease P 6
Jan., May—1 month.
Prereq.: Med. 3rd or 4th yr. standing.
Subcellular organization, model systems in disease, injury and inflammation, toxic agents, deficiency states, genes, enzymes and disease, biochemical changes in growth. Fussenthal.

793 Individual Studies in Physiological Chemistry P 4
3, or 4 months, all months.
A, W, Sp, Su.
Prereq.: 602, 612 or equiv., and permission of instructor.
Qualified students may avail themselves of the facilities of the department for conducting a minor investigation under the direction of a senior staff member.

812 Seminar in Physiological Chemistry G 2
A, W, Sp, Su.
Repeatable to a maximum of 8 cr. hrs.
Topic to be announced.

815 Seminar G 1
Prereq. or concur.: 601 or 611 or equiv.
Repeatable to a maximum of 9 cr. hrs.
Required of all graduate students majoring in Physiol. Chem.

A-199
COURSES OF INSTRUCTION

PHYSIOLOGICAL CHEMISTRY

821 Advanced Physiological Chemistry G 3
A. 3 cl.
Pre req.: 621 or 612 or equiv., Chem. 841, 842, 843 or permission of instructor.
An advanced treatment of the chemistry of the carbohydrates, proteins, and steroids. Kruger and Staff.

822 Advanced Physiological Chemistry G 3
W. 3 cl.
Pre req.: 602 or 612 or equiv., Chem. 841, 842, 843 or permission of instructor.
An advanced treatment of the chemistry of the lipids, and intermediary metabolism. Cornell and Staff.

823 Advanced Physiological Chemistry G 3
Sp. 3 cl.
Pre req.: 602 or 612 or equiv., Chem. 841, 842, 843 or permission of instructor.
Continuation of the biochemistry of intermediary metabolism. Richardson and Staff.

825 Biochemical Preparations and Techniques G 3
A. 9 hrs. conf. and lab.
Pre req.: 821, 822 or concour.
Advanced course in biological preparations and laboratory techniques. Isolation of carbohydrates, lipids, proteins, enzymes, and hormones.

898 Interdepartmental Seminar in Nutrition and Food Technology G 1
Sp.
(See Interdepartmental Seminars.)

950 Research in Physiological Chemistry G Arr.
Research for thesis or dissertation purposes only. To be conducted under the guidance of Alben, Brown, Cornell, Decor, Endahl, Fischer, Fraden, Johnson, Kreischer, Kruger, McCluer, Nuske, Passumut, Richardson, Wikoof.

612 Introduction to Physiological Optics U G 5
A. 4 cl., 1 2-hr. lab.
Pre req.: 611.
Not for grad. credit to students majoring in Physiol. Opt.
The motility of the eye; the structure and innervation of the extraocular muscles, the center of rotation and analysis and description of eye movements. Eskridge.

613 Intermediate Physiological Optics U G 5
A. 4 cl., 1 2-hr. lab.
Pre req.: 612.
A monocular sensory mechanism of vision; analysis and specification of visual stimuli; photoreception and retino-cortical transmission; adaptation of photoreceptors; flicker; brightness discrimination; and color-vision. King.

614 Intermediate Physiological Optics U G 3
A. 3 cl.
Pre req.: 612.
Circulation and metabolism of the eye; intra-ocular pressure; lacrimal system; movements and functions of the eyelids. Hill.

615† Intermediate Physiological Optics U G 5
Sp. 4 cl., 1 2-hr. lab.
Pre req.: 613.
Binocular integration of hue and brightness; retinal correspondence; visual perception of figure-ground relations, light, color, illumination, size, shape, direction, distance, and motion. Fry.

620 Measurement and Specification of Visual Stimuli P G 4
W. 3 cl., 1 2-hr. lab.
Pre req.: Optom. 2nd yr. standing and 611.
Not for grad. credit to students majoring in Physiol. Opt.
Light sources; diffusely transmitting and reflecting surfaces and scattering of light by a medium; principles of photometry and colorimetry as applied to visual stimuli. Miller.

701 Minor Problems in Physiological U G 1-15
Optics
A, W, Sp, Su.
Pre req.: Permission of department chairman. Repeatable.
A properly qualified student may perform a minor investigation or add to his knowledge and techniques. Staff.

715 Intermediate Physiological Optics P G 5
W. 4 cl., 1 2-hr. lab.
Pre req.: Optom. 2nd yr. standing and 613.
Projection of visual impressions; the horopter, retinal correspondence; binocular integration of hue and brilliance. Eskridge.

716 Intermediate Physiological Optics P G 5
A. 3 cl., 1 2-hr. lab.
Pre req.: Optom. 3rd yr. standing and 732.
Visual perception of color, illumination, figure-ground relations, size, shape, direction, distance, motion, time and complex patterns. Fry and Miller.

730 Principles of Lighting P G 5
A. 4 cl., 1 2-hr. lab.
Pre req.: Optom. 4th yr. standing and 715.
The effect of the distribution of light in a given environment upon efficiency, comfort and safety; selection and arrangement of sources and light control. Fry.

Physiological Optics

Office: 111 Optometry Bldg., 333 West 10th Avenue.
PROFESSORS IRPT (Chairman), and IBLACKWELL; ASSOCIATE PROFESSORS HEEBARD, HILL, IMCDOGNELL, ISMIT and WILD; ASSISTANT PROFESSORS ESKRIDGE and IMILLER.
See also courses in Optometry.

611 Introduction to Physiological Optics U G 5
Sp. 4 cl., 1 2-hr. lab.
Pre req.: Physics 505 and Anmat. 608.
Not for grad. credit to students majoring in Physiol. Opt.
The eye as an optical instrument; the refracting mechanism; the mechanism of accommodation and pupillary contraction; blur of the retinal image; stray light in the eye. King.
731 Vision in Industry P G 5
W. 5 cl.
Prereq.: Optom. 4th yr. standing and 716.
Visual testing in industry; relation of vision to performing a task; visual requirements for licenses; eye hazards and protection; compensation for loss of vision. Fr.

732 Vision in Schools P G 5
Sp. 3 cl., 8 hr. lab.
Prereq.: Optom. 4th yr. standing and 716.
Visual survey methods; the prevalence of visual anomalies and eye diseases in children; basic visual skills required in school and methods for their improvement. Fr.

801 Advanced Physiological Optics G 5
A. 3 cl., 2 hr. lab.
Prereq.: 613.
The ocular image-forming mechanism; accommodation and pupil contraction, aberrations, stray light; entoptic phenomena; shape, size, distortion; retinal illumination and blur.

802 Advanced Physiological Optics G 5
W. 3 cl., 2 hr. lab.
Prereq.: 501.
Fixation disparity; photochemistry and electrophysiology of photoreceptors; luminosity; color-mixture; retinal-cortical transmission; simultaneous contrast; visibility; adaptation; after images. Fr.

803 Advanced Physiological Optics G 5
Sp. 3 cl., 2 hr. lab.
Prereq.: 802.
Binocular integration of hue and brilliance, fusional movements fixation, retinal correspondence, visual perception of figure-ground relations, light, color, illumination, size, shape, direction, distance, and motion. Fr.

950 Research in Physiological Optics G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

Physiology

Office: 319 Hamilton Hall, 1645 Neil Avenue.
PROFESSORS LITTLE (Chairman), JANGERER, BZLOTER, GRUBBS, ILLITT, LESSLER, and MIMES; ASSOCIATE PROFESSORS GROWBE, 1CALHOUN, 1LIFETZ, 1NISHIKA WARA, 1PAPIER, lSMITH, lSTOW, and 1WEISS; ASSISTANT PROFESSORS IALLISON, BEMAN, lBILLINGS, DINERS, GROSSIE, KUNZ, ILIEKY, lMATHEWS, MICHAL, PAUL, and lTOMASHEFSKI; INSTRUCTORS BLAIR, and TAPLE.

For related courses see Biology.

410 Introduction to Physiology U 5
A, Sp. 4 cl. 1 2-hr. lab.
Prereq.: 1st or 2nd yr. standing, or permission of instructor.
Not open to students with credit for 500-507.
The organization and function of the body with consideration of the various organ systems. Calhoun.

506 Principles of Physiology U 5
A, Sp. 4 cl., 1 2-hr. lab.
Not open to students with credit for 410, 421, or 422.
The concepts and principles involved in the activities of muscles and nerves; central and peripheral nervous system including sense organs; secretion; digestion and motility of digestive tract; and energy and food metabolism. Angerer.

507 Principles of Physiology U 5
W, Su. 4 cl., 1 2-hr. lab.
Not open to students with credit for 410, 421, or 422.
Continuation of 506. The concepts and principles involved in the functions of body fluids (blood, interstitial, cerebrospinal), heart and blood vessels, respiration, acid-base mechanisms, kidney and sweat glands, control of body temperature and integrative action of the endocrine organs. Angerer.

601 Advanced Mammalian Physiology U 5
A. 4 cl., 1 lab.
Prereq.: Inorganic and Organic Chem., Physics 411, 412, 413 or equiv. and 1 yr. Biol. Sc. or permission of department chairman.
Advanced physiology of muscle, nerve, central nervous system, special senses, digestion, and metabolism.

602 Advanced Mammalian Physiology U 5
W. 4 cl., 1 lab.
Prereq.: Inorganic and Organic Chem., Physics 411, 412, 413 or equiv. and 1 yr. Biol. Sc. or permission of department chairman.
Not for graduate credit to students majoring in Physiol.
Advanced physiology of body fluids and excretion, circulation, respiration, body temperature regulation, and endocrines.

603 Advanced Physiology P G 6
A. 4 cl., 2 lab.
Prereq.: Dent. 2nd yr. standing.
The cardiovascular system including blood, neuromuscular system, body fluids and excretion.

605 Advanced Physiology P G 6
W. 5 cl., 1 lab.
Prereq.: Dent. 2nd yr. standing and 604 or equiv.
The central nervous system and special senses, respiration, digestion, metabolism, the endocrines, and reproduction.

623 Cellular and Comparative Physiology U G 5
A. 4 cl., 1 lab.
Prereq.: Botany 401-402 or Zool. 404 or equiv., Chem. 551-553 or 647-648 or equiv., Physics 411-412, 413 or equiv., Math. 412-413, 414 or 460-461 or equiv., and permission of instructor.
Interactions between cells and environment cell division, differentiation, senescence, and death. The regulation and control of cellular function. Lessier.

630 Endocrinology U G 5
Sp. 4 cl., 1 lab.
Prereq.: 601 and 602, or permission of instructor.
A study of the functions of the thyroid, parathyroid, pituitary, adrenal, pancreas, gonads, and other glands with possible endocrine function. Brownell, Nishikawa and Staff.

635 Human Physiology P G 6
W. 5 cl., and labs.
Prereq.: Med. 1st yr. standing.
Neuromuscular system, reflexes, respiration, and special senses. Little and Staff.
636 Human Physiology
   Sp. 5 cl. and labs.
   Prereq.: 635.
   Cardiovascular system, digestion, kidney, endocrine system, and central nervous system. Little and Staff.

645† Principles of Biophysics
   A. 3 cl.
   Prereq.: 421-422 Elem. Physiol. or equiv. and 1 year of college Physics or permission of instructor.
   A study of physical systems in relation to biological phenomena, with specific illustrations in the application of mechanics, heat, light, sound, electricity, hydraulics, etc.

646 Radiation Biophysics
   U G 5
   A. 5 cl.
   Prereq.: 1 year each of college Biol., Math., Physics, and Physiol., and Chem. 601-602 or 611-612 or equiv.
   Stable and radioactive isotopes, biological effects of ionizing radiation. Myers and Staff.

648* Physical Instrumentation for Biologists
   U G 3
   A. 1 cl., 2 lab.
   Prereq.: Elem. Physiol. and 1 year college Physics or permission of instructor.
   The theory and practical application of physical instruments used in biological studies, including elementary electronics.

652‡ Principles of Physiology
   U G 5
   Su. 3 cl., 2 2-3 hr. lab.
   Prereq.: Academic Year Science Institute students only, 15 hrs. Biol. Sc., 15 hrs. Chem. and/or Physics and permission of instructor.
   Not for credit to graduate students majoring in Physiol.
   The nature and behavior of living organisms and their relationship to their environment with special consideration of the functions of vertebrate organ systems.

725 Advanced Human Physiology
   G 6
   W. 5 cl. and labs.
   Prereq.: Graduate standing in Physiology, permission of Department Chairman.
   Systematic study of the basic mammalian organ systems and their interactions will be presented. Little and Staff.

726 Advanced Human Physiology
   G 9
   Sp. 5 cl. and labs.
   Continuation of 725. Little and Staff.

740 Environmental Physiology
   G 3
   A., W., Sp. 3 cl.
   Prereq.: M.D. degree or graduate standing and 724, 725, and 726, or the equiv.
   Repeatable to a maximum of 9 cr. hrs.
   Study of the effects on man of stress factors in the gaseous, mechanical and electromagnetic environments and a consideration of the physiological aspects of protection against environmental stresses. Billings, Hill, Dines.

793 Minor Problems
   U C P 3-18
   A., W., Sp. Su.
   Prereq.: Permission of instructor.
   Reading, conferences, laboratory work by individual arrangement with qualified students who desire more intensive and specialized study than is available in other courses.

807 Advanced Studies in Physiology
   G 3 to 5
   A, W, Sp, Su.
   Prereq.: 601 and 602 or equiv.
   Quarter schedule of topics to be announced.
   b. Cardiovascular and Renal Physiology. Little, Calhoon, Pierpar.
   c. Aviation Physiology and Respiration. Hiatt, Smith.
   d. Digestion and Metabolism. Grubbs, Bremner.
   e. Physico-Chemical (General) Physiology. Angerer, Lederer.
   f. Biophysics, Stoel.
   h. A. Sensory Electrophysiology. Lipetz.

815 Seminar in Physiology
   G 2
   A, W, Sp, Su.
   Repeatable.

950 Research in Physiology
   G
   A, W, Sp, Su.
   Research for thesis or dissertation purposes only.

Polish

Office: 316 University Hall, 216 North Oak Drive.

601 * Polish
   U G 3
   A. 3 cl.
   Prereq.: Russ. 403 or 415 or permission of instructor.

602 * Polish
   U G 3
   W. 3 cl.
   Prereq.: 601.

603 * Polish
   U G 3
   Sp. 3 cl.
   Prereq.: 602.

604‡ Intermediate Polish
   U G 3
   A. 3 cl.
   Prereq.: 603 or equiv.

605‡ Intermediate Polish
   U 3
   W. 3 cl.
   Prereq.: 604 or permission of instructor.
   Reading texts of moderate difficulty, conversation, simple compositions.

606‡ Intermediate Polish
   U 3
   Sp. 3 cl.
   Prereq.: 605 or permission of instructor.
   Reading from modern Polish literature, practice in writing and speaking.
620*: Polish Literature in English Translation
U G 5
W. 3 cl.
Polish literature from the Medieval period to 1864. The Medieval period, renaissance, baroque, classicism, romanticism. Emphasis on Kochanowski, Mickiewicz, Słowacki, Krasiński, Norwid.

621*: Polish Literature in English Translation
U G 3
Sp. 3 cl.

Political Science

Office: 100 University Hall, 216 North Oval Drive.
PROFESSORS: HERRON (Chairman), TAUMANN, IFURNISS (Merian Professor), REIMBERGER (Emeritus), HELMS, MANSFIELD (Emeritus), ROBINSON, SPENCER (Emeritus), SPITZ, and WALKER; ASSOCIATE PROFESSORS: CHRISTOPH, HALE, KETTLER, LOTT, and NEMEZER; ASSISTANT PROFESSORS: COWARD, ORBEA, RICHARDSON, SLATER, and STEWART.

401 American National Government
U 5
A, W, Sp, Su. 5 cl.
Not open to students with credit for 507.
Introductory study of constitutional principles (federalism, civil liberty, judicial review); political processes (parties, elections, legislative process); problems of national policy in selected areas of interest. Hale and Staff.

507 Fundamentals of Government
U 5
A, W, Sp, Su. 5 cl.
Prereq.: Hist. 423.
Not open to students with credit for 401.
A study of political ideas, institutions, processes and problems, presenting comparatively the leading types of government in the modern world. Spitz and Staff.

508 Government of the United States
U 5
A, W, Sp. 5 cl.
Prereq.: 1 course in Pol. Sc.
Not open to students with credit for 401.
An intermediate study of American national government, primarily for prospective majors in the social sciences, and for pre-law students. Helm.

509 Foreign Governments and Politics
U 5
A, W, Sp. 5 cl.
Prereq.: 1 course in Pol. Sc. or Hist. 423, or Hist. 401-402.
A comparative study of the fundamentals of the government systems of Great Britain, Russia, France, West Germany, Norway, Sweden, Canada, Japan, Latin America, and India. Christoph, Lott.

510 American State Government
U 5
A, W, Sp. 5 cl.
Prereq.: 1 course in Pol. Sc.

530 International Tensions
U 5
A, W, Sp. 5 cl.
Prereq.: 2nd yr. standing.
Causes of international tensions and conflicts; international security organizations; basic issues in world politics. Lott and Staff.

595 Local Government in the United States
U 3
W. 3 cl.
County, municipal and special governmental districts comparatively treated; their legal status, political significance, governmental structures and functions; their relations with state and national governments.

599 Introduction to Political Science
U 5
A, W, Sp. 5 cl.
Not open to students with credit in Pol. Sc.
An introductory study of some important political ideas, institutions, problems and practices, including constitutionalism, democracy, authoritarianism, representation, political parties, and the legislative process. Lott and Staff.

GENERAL PREREQUISITES FOR COURSES NUMBERED 600 AND 700
Unless otherwise indicated the prerequisites for 600 and 700 courses are two courses in Political Science, or a declared major in another social science, or the consent of the instructor, or the history and social science requirements of the B.A. curriculum.

600 Contemporary Political Problems
U 5
A, Sp. 5 cl. hrs.
Repeatable to a maximum of 10 cr. hrs.

601 Introduction to Political Theory
U G 5
A. 5 cl.
An inquiry into the major problems of political philosophy: the legitimacy of governments, forms and institutions, stability and change, freedom and control of power. Kettler, Spitz.

605 Principles of Public Administration I
U G 5
W. 5 cl.
Basic problems of public administration; ends and means; the formulation of policy; organization and management; working methods of control; coordination and responsibility. Mansfield, Walker.

606 Principles of Public Administration II
U G 5
Sp. 4 cl., 1 lab.
Prereq.; 3 courses in Pol. Sc.
An examination of the principles of public administration as applied to the rendering of services to the public by national, state, and local government. Walker, Mansfield.

607 American Municipal Government
U G 5
A, Sp. 5 cl.
A study of municipalities in the United States, their social significance, governmental structure; and experience with government by council, mayor, commission, and manager. Walker.
609† Government of Ohio U G 3
A. 5 cl.
Constitution, structure, and functions; the electoral system; finance and personnel; judiciary and law enforcement; organization and conduct of administrative programs; state relations with local governments. Walker, Aumann.

611 Introduction to Jurisprudence U G 5
A. 5 cl.
A study of the concepts which legal systems develop and of the interests which law protects. Ideas of various schools of juristic thought examined. Aumann.

612 International Law U G 5
Sp. 5 cl.

613 Contemporary International Politics U G 5
A, W, Sp, Su. 5 cl.
Political relations among states; methods and goals of diplomacy; current problems in major areas of tension; tendencies toward administrative, judicial, and legislative world-organization. Furniss.

614† Public Personnel Administration U G 3
Sp. 3 cl.
Prereq.: 605.
The organization, purposes and activities of civil service agencies; and the conduct of public personnel policies and processes. Walker.

615 Administration of Justice U G 5
W. 5 cl.
A study of the nature, purposes, and limitations of law as administered through courts. The development, organization, and procedure of our judicial system. Recent trends in legal thinking. Aumann.

616 American Constitutional Law U G 5
Sp. 5 cl.
A study of leading constitutional principles in the United States as interpreted by the courts. Aumann.

618† The National Government and the National Economy Sp. 3 cl.
Prereq.: 401 or 507 and 10 cr. hrs. in Econ.
A study of the interaction of economic and political powers illustrated in major contemporary issues of national affairs. Mansfield, Hale.

621 History of Political Theory: I, U G 5
A. S cl.
The Socratic Method
The Socratic revolution in western political philosophy. Its consequences for human thought about man, the state, law, justice, property, power, happiness. Kettler.

622 History of Political Theory: II, U G 5
From Machiavelli to Hegel
W. 5 cl.
A study of representative works by major modern thinkers—including Hobbes, Montesquieu, Rousseau, Kant and Hegel—seen in historical context. Kettler.

623 History of Political Theory: III, U G 5
Contemporary Political Thought
Sp. 5 cl.
An examination of the more important contemporary ideas on the nature of the state; anarchism, syndicalism, communism, fascism, socialism, and democracy. Spitz, Kettler.

624 American Political Ideas U G 3
W. 3 cl.
An analysis of American ideas on law and government, authority and liberty, oligarchy and democracy, from the Puritans to the present day. Spitz, Hale.

625† British Government and Politics U G 5
W. 5 cl.
An analysis of the nature of politics and the conduct of government in contemporary Britain, including the making of foreign policy. Christoph.

627 Latin American Government and Politics U G 5
Sp. 5 cl.
A study of political processes, institutions, and groups in Latin America, with emphasis on constitutional, geographical, social, and economic environment in which they operate. Lott, Walker.

628 Government of Western Europe U G 5
A, Su. 5 cl.
A study of the political institutions of West Germany and France, and at time permits, one or more of the small states of Western Europe. Christoph.

633 Legislation U G 3
A, Sp. 3 cl.
The processes of law-making in the United States, constitutions, statutes, executive ordinances, popular law-making, legislative drafting. Walker.

634 Public Opinion and Political Processes U G 5
A, Sp. 5 cl.
The formation, organization, and effects of public opinion and propaganda in the modern state. Emphasis on the role of groups in political behavior. Christoph, Robinson.

635 American Political Parties and Pressure Groups U G 5
A, W, Sp, Su. 5 cl.
The organization, programs, and campaign methods of political parties and pressure groups. Methods of nomination, suffrage, qualifications, campaign finance, and the conduct of elections. Helm.

636 The Soviet Union U G 5
A. 5 cl.
A general study of the Soviet Union; governmental and party institutions; ideology and methods; problems of communist dictatorship. Nemzer.

637 Soviet Foreign Policy U G 5
W. 5 cl.
Basic concepts about, and choices in, Soviet foreign policy; development and present patterns of Soviet relations with key nations; major problems in future relationships. Nemzer.

640 The United States in World Affairs U G 5
A. 5 cl.
Domestic factors and agencies influencing American foreign policy; basic patterns of recent American relations, especially with the Soviet bloc, Western Europe, and the Middle East. Mansfield, Nemzer.

649 International Relations of the Far East U G 5
Far East
W. 5 cl.
The Far East in contemporary world politics; factors underlying the foreign policies of the nations concerned with this region.
650  The Government and Politics of the Far East  U G 5  
Sp.  5 cl.
Government institutions of China, imperial, republican, and communist. Constitutionalism vs. militarism, occupation reforms, and contemporary politics in Japan. The governments of the nearby east Asian countries.

651  Southeast Asia  U G 5  
A.   5 cl.
Governments and politics of the Philippines, Indonesia, Indo-China, Malayas, Thailand, and Burma; contemporary problems of this region in relation to world politics.

652  Regional Patterns in International Politics  U G 5  
A.   5 cl.
Repeatable to a maximum of 15 cr. hrs.
Basic power concepts, political institutions, and international relations of the following major areas, in turn:

652A  The Far East  
652B†  The Middle East  
652C†  Central Europe  
652D†  Latin America  
652F†  Africa  
652F†  The Soviet Union  

Lott, Furniss, Nemser.

655  Presidential Leadership and the Presidency  U G 5  
W.   5 cl.
A study of presidential power and responsibility; the roles of the president; the policies of leadership; the presidency as an institution. Hale.

701  Minor Problems  U G 1-5  
A, W, Sp, Su.
Prereq.: 4th yr. standing and 40 cr. hrs. in social sciences, including 15 cr. hrs. in Pol. Sc.
A special topic is assigned to each student and results are tested by papers and special examinations.

Introduction to National Security
(See National Security Policy Studies 702.)

Problems in National Security
(See National Security Policy Studies 703.)

705  Honors Courses  U 3-5  
A.
Prereq.: 4th yr. standing and 40 cr. hrs. in social sciences, including 15 cr. hrs. in Pol. Sc., with a record of A in at least half of the Pol. Sc. courses and an average of B in the remainder. At least 2 yrs. of the sequence 705-706-707 are required of candidates for the degree of Bachelor of Arts with Distinction in Pol. Sc. Failure to receive a grade of B in this course is a disqualification for special honors.
A special topic is assigned to each student and results are tested by the requirement of papers and special examinations.

706  Honors Courses  U 3-5  
W.
See prereq. for 705.

707  Honors Courses  U 3-5  
Sp.
See prereq. for 705.

714  International Organization and Administration  U G 3  
W.  3 cl.
An examination of the current system of international organization and its administrative aspects, with emphasis on the operations of the United Nations agencies. Lott.

730†  Administrative Law  U G 3  
W.  1 2-hr. cl.
Prereq.: 605, 606, 616 or equiv.
Powers and processes of administrative agencies; judicial review of administrative action. Mansfield, Walker, Hale.

731  Methods of Governmental Research  G 5  
A, Sp.  1 2-hr. cl., 1 1-hr. cl.
Prereq.: 4th yr. standing and 15 cr. hrs. in Pol. Sc.
The materials of political science; history of procedure in political science research; research techniques; presentation of results of research. Herson.

734  Comparative Political Parties  U G 3  
Sp.  3 cl.
Prereq.: 635 and two courses in foreign governments or equiv.
An examination of the nature and role of political parties in modern societies by the use of the comparative method. Christoph.

735†  Contemporary Political Problems  U G 3-5  
A, W, Sp.  2-3 cr. hrs.
Prereq.: Senior standing and 15 cr. hrs. in Pol. Sc.
A.  Theory Building in the Study of Politics, Senior Staff.
W.  Theory Building in the Study of Comparative Government, Richardson.
W.  Theory Building in International Relations, Furniss.
W.  Trends in Political Science, Senior Staff.

736  The Policy Process  U G 5  
Sp.  3-5 cr. hrs.
Prereq.: Senior standing and 15 cr. hrs. in Pol. Sc.
The roles of elites, ideology, organized interests and issues in the making of government policy. Case studies in the policy process. Hale, Robinson.

737  Problems in Soviet Politics  U G 3  
Sp.  3 cl.
Prereq.: 636 or 637.
An intensive examination of selected problems such as crises of succession, conflicts of pressure groups, Soviet policies in the United States, Sino-Soviet relations. Nemzer.

GENERAL PREREQUISITES FOR COURSES NUMBERED 800 AND 900
A general foundation in undergraduate courses in history and the social sciences is assumed. Any of the 800 courses listed may be repeated provided that no student shall earn more than ten hours of credit in any single course.

Seminar in National Security Research
(See National Security Policy Studies 801.)

805  Political Thought  G 3-5  
W, Sp.  1 2-hr. cl.
Prereq.: Previous course work in political thought; permission of instructor.
Seminar in the history of political ideas and in the theoretical problems of contemporary politics for advanced students in related departments. Autumn Quarter, Fall; Winter Quarter, Kettler; Spring Quarter, Spitz.

A-205
POLITICAL SCIENCE

806 Comparative Government G 3-5
A. 1 2-hr. cl.
Prereq.: 225 and either 226 or 228 or 229 or 230 or equiv.
Seminar in the governments of foreign countries. Christoph, Nemser.

807 Political Parties and Pressure Groups G 3-5
A, W. 1 2-hr. cl.
Prereq.: 2 courses in Pol. Sc. at 200 level or above, including 615.
Seminar in American political parties and pressure groups. Robinson, Herion.

808 Public Administration G 3-5
Sp. 1 2-hr. cl.
Prereq.: Any 2 of: 605, 606, 614, 615, 720, or equiv.

809 Municipal Government G 3-5
A. 1 2-hr. cl.
Prereq.: 605, 606, 607, or equiv.
Seminar in the municipal governments of the United States and Europe. Walker, Herion.

810 International Relations G 3-5
Sp. 1 2-hr. cl.
Prereq.: 714 or 640 or 649 or 613 or equivalent.
Seminar in International relations. Nemser, Furniss.

811 Public Law G 3-5
A. 1 2-hr. cl.
Prereq.: 615 and 616.
Seminar in the field of public law, including special problems in the field of constitutional law or judicial administration. Aumann.

899 Interdepartmental Seminar G 1-5
A, W, Sp, Su.
(See under Interdepartmental Seminars.)

950 Research in Political Science C Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

PORTUGUESE

Office: 116 Derby Hall, 154 North Oval Drive.
PROFESSORS IABECOCK (Chairman), and I. GRIFFITH.

401 Elementary Portuguese U 5
A. 5 cl.
May not be taken concur. with French 401-402, Ital. 401-402, Spn. 401-402.
Not open to students who are not eligible to take Eng. 416. Credit in 401 will be counted toward graduation only if followed by successful completion of 402, or if taken after successful completion of the fourth regular university course in another foreign language.
Elements of Portuguese grammar, with oral and written exercises; attention to ear training and oral practice; elementary reading based on Brazilian geography, history and customs.

402 Elementary Portuguese U 5
W. 5 cl.
Prereq.: 401.
May not be taken concur. with French 401-402, Ital. 401-402, Spn. 401-402.
The elements of Portuguese grammar with abundant oral and written exercises; development of conversational skill; reading, vocabulary building.

403 Intermediate Portuguese U 5
Sp. 5 cl.
Prereq.: 402.
Continuation of Portuguese grammar; reading of short stories, plays and novels; increased attention to development of oral proficiency.

404 Intermediate Portuguese U 5
A. 5 cl.
Prereq.: 403.
Reading of Portuguese plays, short stories, and novels; emphasis on oral practice; non-fiction of cultural and historical significance.

701 Minor Problems in Portuguese U G 1-5
Prereq.: Permission of instructor.
Griffith.

POULTRY SCIENCE

Office: Poultry Administration Bldg., 674 West Lane Avenue.
PROFESSORS I. COOK (Chairman), I. BAKER, I. BOHL, I. CRAY, DAKAN (Emeritus), I. HARVEY, I. JAAP, I. NABER, and I. WINTER; ASSOCIATE PROFESSORS I. BROWN, I. CUNNINGHAM, MARSHEL, I. MOUNTNEY and TOUCHBURN; ASSISTANT PROFESSORS CHAMBERLIN and NESTOR.

401 Poultry Production U 5
A, W, Sp. 3 cl., 2 2-hr. lab., 1-day field trip.
An introductory course covering all phases of poultry production and marketing.

501 Poultry Meat Production U 3
W. 3 cl.
Prereq.: 401 or Zool. 401 or equiv.
Broiler, turkey and waterfowl meat production. Stock rearing, feeding, management and marketing.

503 Market and Hatching Egg Production U 3
W. 3 cl.
Prereq.: 401 or Zool. 401 or equiv.
Production, feeding, management and marketing of pullets and laying hens. Egg care, packaging, pricing and marketing.

PRINCIPLES OF ANIMAL IMPROVEMENT (402-520)
(Offered in cooperation with the Departments of Animal Sc. and Poul. Sc.)
### Preventive Medicine

Office: B-107 StarlingLovett Hall, 320 W. Tenth Ave.

PROFESSORS ELLINGSON (Chairman), FANCHER, JLEWIS, PALCHANS5 (Emeritus), HUASHNOCK, ROBERTS, SCHULTZ, SHAFER, and SHILLITO; ASSOCIATE PROFESSORS FRAJOOLA, HELLER, ITO, ASHEFRIK, and IZVON GUBECE; ASSISTANT PROFESSORS ARNOLDI, BERRY, DEWILLINGS, BUSKEE, CATTerson, DAVIS, DINES, FREEDMAN, GILMORE, GOODLIE, GRESHAM, GULLET, HARDING, HATCHE, KAUZMAN, LENTZ, LIEBAN, ODLAND, PETERSON, SCHWARTZENBERG, SCOBIE, SHARP, and STUHRING; INSTRUCTORS CAMPBELL, EHRICH, HABOLD, KAPLAN, LOWERY, SIDDALL, STEPHAN, THOMAS, and WAIN.

### 501 Introduction to Medical Dietetics

<table>
<thead>
<tr>
<th>A. 2 cl.</th>
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<tbody>
<tr>
<td>Basic knowledge and experience in functional and sociological aspects of responsibilities of the Medical Dietician. Lewis and Stoff.</td>
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</tbody>
</table>

### 510 Introduction to Patient Food Service

<table>
<thead>
<tr>
<th>U 6</th>
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<tbody>
<tr>
<td>Su. 3 cl., 12-hr. lab.</td>
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<tr>
<td>Prereq.: Home Ec. 440 or 448.</td>
</tr>
<tr>
<td>Principles and practice in food service and dietary care of the hospital patient. McConkey.</td>
</tr>
</tbody>
</table>

### 515 Quantity Food Preparation and Service

<table>
<thead>
<tr>
<th>U 6</th>
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</thead>
<tbody>
<tr>
<td>A. 2 cl., 3 4-hr. lab.</td>
</tr>
<tr>
<td>Prereq.: Home Ec. 540.</td>
</tr>
<tr>
<td>Application of basic principles of food preparation and service in selected types of quantity food service operations. Catherberg.</td>
</tr>
</tbody>
</table>

### 516 Menu Planning and Food Procurement

<table>
<thead>
<tr>
<th>U 6</th>
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<tbody>
<tr>
<td>W. 3 cl., 3 3-hr. lab.</td>
</tr>
<tr>
<td>Prereq.: 515.</td>
</tr>
<tr>
<td>Basic principles of menu planning and food procurement applied to selected types of quantity food service operations. Catherberg.</td>
</tr>
</tbody>
</table>

### 517 Organization and Management in Quantity Food Service

<table>
<thead>
<tr>
<th>U 4</th>
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<tbody>
<tr>
<td>Sp. 4 cl., 8-hr. clinic.</td>
</tr>
<tr>
<td>Prereq.: 516, Bus. Org. 696 or concur.</td>
</tr>
<tr>
<td>Principles and theories of personnel, production and financial management related to quantity food service. Hubbard.</td>
</tr>
</tbody>
</table>

### 595 Epidemiology

<table>
<thead>
<tr>
<th>U 3</th>
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<tbody>
<tr>
<td>A. W. 2 cl.</td>
</tr>
<tr>
<td>Prereq.: Microbiol. 510.</td>
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</tbody>
</table>

### 601 Nutrition in Disease

<table>
<thead>
<tr>
<th>U 6</th>
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</thead>
<tbody>
<tr>
<td>Sp. 5 cl., 4-hr. clinical study.</td>
</tr>
<tr>
<td>Prereq.: 510, Home Ec. 610.</td>
</tr>
<tr>
<td>Causes, results and dietary management of alterations in nutritional processes. Sharp and Medical Staff.</td>
</tr>
</tbody>
</table>

### 602 Nutrition in Disease

<table>
<thead>
<tr>
<th>U 6</th>
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</thead>
<tbody>
<tr>
<td>Su. 5 cl., 4-hr. clinical study.</td>
</tr>
<tr>
<td>Prereq.: 601.</td>
</tr>
<tr>
<td>A continuation of 601.</td>
</tr>
</tbody>
</table>

### 618 Introduction to Public Health

<table>
<thead>
<tr>
<th>U 3</th>
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<tbody>
<tr>
<td>W. Sp. 2 cl.</td>
</tr>
<tr>
<td>Prereq.: Nurs. 3rd yr. standing.</td>
</tr>
<tr>
<td>Consideration of community organization of health services on local, state, and national levels in relation to the health needs of contemporary society. Keller, Gresham.</td>
</tr>
</tbody>
</table>
620 Dietetics Administration  U 12
A. 4 cl., 33 hr. clinical study.
Prereq.: 517.
Application of management principles to the administration of
hospital food service.

622 Therapeutic Dietetics  U 12
W. 4 cl., 32 hr. clinical study.
Prereq.: 602.
Identification, evaluation and solution of problems involved in
performing functions of the dietitian in patient care.

624 Quantitative Methods in Medicine  P 2
Sp. 2 hr. cl.
Prereq.: Med. 1st yr. standing.
Principles of medical statistics and lab. exercises in analysis of
papers in the medical literature, with reference to experimental
design and numerical reasoning, Keller and Staff.

626 Teaching of Dietetics  U 3
A, W, Sp, Su. 5 cl., 4 hr. clinical study.
Prereq.: Med. Dietetics senior standing.
Educational principles and practices as applied to the teaching
responsibilities of the dietitian. Wernberg.

627 Community Nutrition  U 3
A, W, Sp. 2 cl., 4 hr. clinical study.
Prereq.: 602 or permission of instructor, concurs 638.
Public health nutrition programs and their services to the com-
community, with particular reference to nutrition problems of special
groups of the population. Scobie and Keller.

628 Pediatric Nutrition  U G 2
Su. 2 cl.
Prereq.: Graduate or senior standing in Medical Dietetics
and permission of instructor.
The nutrition of children. The influence of physical, psychological
and social growth and development from infancy through ado-
lescence. Stumbo and Pediatric Staff.

735 Advanced Preventive Medicine  P 2
1 month, offered Oct., Feb.
Prereq.: Med. 4th yr. standing.
Ecology of health and disease in the modern community; environ-
mental health; public health methods; medical nutrition; and
biometric applications. Ashe.

750 Epidemiologic Methods  G 3
Su.
Prereq.: Permission of instructor.
Principles of epidemiology with special emphasis on methods
employed in current epidemiologic studies of chronic diseases.
Keller and Staff.

753 Principles of Public Health Administration  P 6
1 month, offered all months except June.
Prereq.: Med. 3rd yr. standing.
Administration, organization, and function of Public Health
agencies. Principles of sanitation, food inspection, immunization,
and school health. Goodloe and Staff.

755 Seminar in Preventive Medicine  G 1 or 3
A, W, Sp, Su.
Prereq.: Med. 3rd yr. standing.
a. Selected topics in Occupational and Aviation Medi-
cine. Ashe and Staff.
b. Selected topics in advanced nutrition. Lewis and
Medical Staff.

760 Nutrition in Systemic Disease  G 3
W.
Prereq.: Med. senior standing or grad. standing in Nutrition
or Medical Dietetics.
The physio-pathological background of systemic disease and the
rationale of specific diets in their prevention and treatment.
Lewis and Medical Staff.

761 Community Nutrition  G 3
W, Sp.
Prereq.: Med. senior standing or grad. standing in Nutri-
tion.
Methods of discovering problems in public health nutrition and
practical application of nutrition information for improvement of
nutritional status at various age levels. Scobie.

785 Minor Problems in Nutrition or  U G 1-5
Dietetics
A, W, Sp, Su.
Prereq.: Graduate or senior standing in Medical Dietetics
and permission of instructor.
Problems in various phases of nutrition or Medical Dietetics not
included in current course offerings. Lewis and Staff.

793 Special Studies in Preventive  Medicine  P 6
1, 2, 3 or 4 mon.; offered all months
except June.  P 6, 12, 15, 24
A, W, Sp, Su.
Prereq.: Med. 3rd yr. standing or graduate standing in
a. Aerospace Medicine
b. Biometrics
c. Clinical Environmental Medicine
d. Environmental Health
e. Epidemiology
f. Nutrition
g. Occupational Medicine

799 Residency in Preventive Medicine  P 12
Prereq.: Appointment as Resident in University Hospitals.
Repeatable to a maximum of 72 cl. hrs.
Assignment to accredited area for training in Aerospace and
Occupational Medicine.

810 Environmental Health Principles  G 1
A, Sp, Su. 1 hr. conf.
Prereq.: Resident standing in Aviation and Occupational
Medicine.
Repeatable to a maximum of 4 cl. hrs.
Intramural and extramural relationships of the physician to
industry; administrative design, physical facilities, personnel,
equipment, costs and benefits, preplacement and periodic em-
ployee examinations, health maintenance, environmental
Dinman.

820 Applied Toxicology In Aviation and  G 2
Occupational Medicine
A, W, Sp. 2 hr. conf. and hospital ward observa-
tions.
Prereq.: Resident standing in Aviation and Occupational
Medicine.
Repeatable to a maximum of 8 cl. hrs.
Chemical and physical hazards of work and flying environ-
mental test procedures; interpretation of toxicologic data;
comprehensive survey of specific toxic agents; clinical signs
and intoxication. Ashe and Staff.
Advanced Preventive Medicine: Public Health  
A. 2-3 hr. conf.  
Prereq.: n 750 or equiv. and permission of instructor.  
Principles of public health, vital statistics, epidemiology, environmental sanitation, and communicable disease control on local, national, and global bases. Keller and Staff.

Advanced Preventive Medicine: Industrial Hygiene  
W. 3 conf. and lab.  
Prereq.: 850, resident standing in Aviation and Occupational Medicine.  
Engineering appraisal of environmental health hazards, sampling techniques, instrumentation and analytical methods; the industrial hygiene survey. Dinman, Roberts and Staff.

Advanced Preventive Medicine: Environmental Control  
Sp. conf. and field exercises.  
Prereq.: 850 and 851; resident standing in Aviation and Occupational Medicine.  
Principles of substitution, enclosure, isolation of hazardous operations; local exhaust ventilations; general ventilation-air conditioning. Noise control, radiant energy; ionizing radiation. Personal protective equipment, medical supervision of persons exposed to conditions of special hazards. Roberts and Staff.

Interdepartmental Seminar in Nutrition and Food Technology  
Sp.  
(See Interdepartmental Seminars.)

Interdepartmental Seminar in Industrial Engineering  
A, W, Sp, Su.  
Prereq.: Resident standing in Aviation and Occupational Medicine.  
The departments of industrial engineering and preventive medicine conduct a seminar annually with industrial psychologists in an area of common interest. Topic to be announced.

Research in Preventive Medicine  
A, W, Sp, Su.  
Research for thesis purposes only.

Psychiatry

Office: 571 Upham Hall, 473 West 12th Avenue.  
PROFESSORS: GREGORY (Chairman), HARDING, ILISS, MARKS, PALMER and PATTerson; ASSOCIATE PROFESSORS: CORSOn, FISChER, GREEN, MICHAEL, MIS-SILdINE, PARKER, SPINE, Rettig, Rustine; ASSISTANT PROFESSORS: Bieker, Bieker, Butcher, GardNer, GoldMAn, Gove, GwynNE, Harding, Haas, HaebLING, KARRAs, KING, Knoff, LOHMAN, Mc-CleuER, McGOUGH, NEW, Rond, Stevenson, VECOzOLS, and WhiELdOn.

Clinical Psychiatry  
2 months, offered July, Sept., Nov., Jan., Mar., and May  
Prereq.: Med. 3rd or 4th yr. standing.  
Psychopathology and dynamics of psychiatric syndromes. Diagnosis, treatment, and interview techniques in ward work, case studies, conferences and seminars. Correlations of medical, psychological, and social factors.

Individual Studies in Biological Psychiatry  
1, 2, or 3 months, offered all months.  
Prereq.: Med. 3rd or 4th yr. standing and permission of Chairman.  
a. Electroencephalography in Psychiatry.  
b. Experimental Psychology  
c. Learning and Motivation  
d. Neuroendocrine and Other Correlates of Conditioned Reflexes and Hypnosis.  
f. Neuroendocrinology, Goldman.  
g. Neuropathology, Lin.  
h. Neurophysiology, ArTsLaG.  
i. Physiological Psychiatry, Fasmanick.  
j. Biological Psychiatry, Patterson.

Individual Studies in Clinical Psychiatry  
1, 2, or 3 months, offered all months.  
Prereq.: Med. 3rd or 4th yr. standing and permission of Chairman.  
a. Advanced Psychotherapy, Lohrman.  
c. Epidemiology of Mental Illness. Fasmanick.  
d. Experimental Psychopathology.  
e. Mental Health Administration. Rustine.  
g. Psychosomatic Medicine, Patterson.  
h. Social Psychiatry, Dinsite.  
i. Social Psychology, Retting.  
j. Clinical Psychiatry, Patterson.

Group Studies in Psychiatry  
1 mo.  
Prereq.: Med. 3rd or 4th yr. standing and permission of dept. chairman.  
c. Pathology of Mental and Neurological Disease. Nov. L. Lin.  
d. Psychological Aspects of Psychiatry, Jan. N. Beach.  
799 Residency in Psychiatry  P 18
A. W., Su., Su.
12 months, full time, beginning July 1.
Prereq.: Appointment as Resident, University Hospital.
Repeatable to a maximum of 210 hrs.
Rotation through in-patient and out-patient services in the
diagnosis and treatment of psychiatric disorders of adults and
children: rounds, conferences and individual supervision.

800 Seminars in Psychiatry  G 1-2
A. W., Sp., Su. 1 cl.
Prereq.: M.D., residency in Psychiatry, and permission
of chairman.

a. Clinical Psychiatry, Patterson and Staff.
b. Research Methodology, Panamonic and Staff.
c. Psychotherapy, Patterson and Staff.
d. Psychiatric Literature, Patterson and Staff.
e. Seminar in Child Psychiatry.

807 Clinical Psychiatry  G 2
A, W., Sp., Su. 2 cl.
Repeatable to a maximum of 6 cr. hrs.
Current diagnostic and treatment methods of dealing with major
psychiatric disorders. Patterson and Staff.

950 Psychiatric Research  G 5-15
A, W., Sp., Su.
Prereq.: M.D., and residency in Psychiatry.
Research for thesis purposes only.

Psychology
Office: 321 Arts Hall, 1945 North High Street.
PROFESSORS: WHERRY (Chairman), BURTT (Chairman Emer-
itus), FRESSEY (Emeritus), RENSHAW (Emeritus), ROSEBROOK
(Emeritus), SANDERSON (Emeritus), STODDILL (Emeritus),
TOOPS (Emeritus), IBBING, IBURNETT, ICASSIDY, SCOOK,
IFLETCHER, IROROCKS, IREUHSMAN, MACMILLAN,
IMARKS, IMEYER, IEPINSKY, IROBINSON, ISHARTEL,
ISTEWART, ITHOMPSON, and IWHICENS; ASSOCIATE
PROFESSORS: BRITIN, IBROCK, IFUST, IHOWELL, IHUNT,
IJOHNSON, IILOWN, IINAYELT, ISCHMIDT, ISMITH,
IJWENAR, and IWolf; ASSISTANT PROFESSORS BEIER,
ICAVIN, ICLARK, ICAMPEEL, ICRAWFORD, IERICKSON,
IERNEY, IGARDNER, IGOLDSTEN, IGREENWALD, IJOHN-
STON, ILIBBY, IOSTROM, IOwen, IRASSLER, ISCHONEMANN,
IWALSH, and IWEAVER; LECTURERS: ALBRECHT, IBEISCH,
IGONAWAY, IHERITHEIN, IPSYCHOLOGIST: IAMES, INSTRUC-
TOR STUDIOVANT.

401 General Psychology  U 5
A, W., Sp., Su. 5 cl.
Introductory psychology, a prerequisite to advanced courses.
The application of the scientific method to behavior. Topics include:
Learning, Motivation, Perception, Personality, Physiological basis
of behavior.

402 General Psychology  U 5
A, W., Sp. 5 cl.
Prereq.: 401.
Continuation of 401. Further emphasis on the development of
a scientific attitude toward personal psychological problems in the
fields of learning, thinking, intelligence, and personality.

403 Introductory Psychology  U 5
A, W., Sp. 5 cl.
Prereq.: Zoool. 401-402 or Bot. 401-402 or 20 hrs.
Natural Sci.
Not open to students with credit for 401.
An introduction to psychology for students with science back-
ground: topics covered similar to 401.

404 Educational Psychology for Medical Personnel  U 5
Sp., Su. 5 cl.
Prereq.: 401 and Zoool. 401.
Not open to students with credit for 407.
Human capacities, abilities, interests, individual differences and
total development through the life span. Aspects of learning and
personality of interest to medical personnel. Ruma.

407 Educational Psychology  U 5
A, W., Sp., Su. 5 cl.
Prereq.: 401.
Not open to students with credit for 404.
Facts and principles of human development and learning are
applied to the problems of education. Scientific evidence in the
solution of educational problems is stressed. Horrocks, Clark, Libby.

408 Mental Hygiene  U 3
A, W., Sp. 3 cl.
Prereq.: 401.
Not open to seniors.
Survey of the principles of mental hygiene. Social and emotional
adjustment, and personality in light of the principles of mental
hygiene. Adjustment problems of the college student.

411 Psychology of Effective Student  U 3
Adjustment
A, W., Sp., Su. 5 lab. hrs.
Credit does not count toward graduation.
The psychological principles of effective learning and performance
in college. The psychological problems involved in the transition
from control of adults to self-management. Schmidt and Staff.

504 General Psychology: Sensation and  U 3
Perception
A, W., Sp., Su. 3 cl.
Prereq.: 3rd yr. standing and/or concur. 508.
Subject matter and methods of psychology as a life science, with
special reference to problems of sensory intensity, the sensory
discrimination functions, and perceptual functions, Raisel, Erickson.

505 General Psychology: Motivation and  U 3
Action
A, W., Sp. 3 cl.
Prereq.: 3rd yr. standing and/or concur. 508.
A behavioristic presentation of experimental work on learning and
motivation. Erickson, Miles.

506 General Psychology: Learning and  U 3
Thinking
W, Sp. 3 cl.
Prereq.: 3rd yr. standing and 505.
The principles developed in 505 are extended to complex human
behavior, especially verbal. Johnson.

507 Genetic Psychology  U 3
A, W., Sp., Su. 3 cl.
Prereq.: 401 or 405.
The facts of human development with some phylogenetic perspec-
tive. Topics cover physical and mental development, innate
tendencies, mental states, and personality development. Clark, Libby, Wenar.
508 Quantitative Methods in Psychology  U  5
A, W, Sp, Su.  5 cl.
Prereq.: 401 or 403.
Methods of measurement in psychology, procedures used in expressing behavior in terms of quantity, the significance of quantity in the study of human traits. Eriksen, Schönenmann.

521 Social Psychology  U  3
A, W, Sp, Su.  3 cl.
Prereq.: 508.
The influence of group processes, organizational variables, and culture upon the social modification of basic drives, attitudes and language. Oetrem, Greenwald.

541 Psychology of Abnormal Behavior  U  3
A, W, Sp, Su.  3 cl.; Observation clinics at State Hospital.
Prereq.: 10 cr. hrs. in Psychol.
A consideration of the symptomatology, etiologies and therapies of the major neuroses and psychoses with special emphasis on psychoanalytic theory and methods. Weaver and Staff.

581 Advising Freshman Students  U  1-4
A, Sp.
Prereq.: Permission of instructor.
Repeatable to a maximum of 4 cr. hrs.
Mature student assistants of freshmen will have actual experience in advising younger students concerning their scholastic and social orientation and personal development. Welsh and Staff.

601 Experimental Psychology  U  2
A, W, Sp.  1 cl., 2 lab. hrs. arr.
Prereq.: 504, 505, and 506, or permission of instructor.
The experiments are selected both for general and cultural values and for preparation for technical research in experimental psychology. Reissler, Goldstein, Johnston.

605 Physiological Psychology  U  3
W.  3 cl.
Prereq.: 402 or 403.
Some physiological correlates of psychological phenomena. The properties of integrated organ systems, with emphasis upon the characteristics of their elements. Psychosomatic abnormalities will be considered. Reissler.

606 Advanced Physiological Psychology  U  3
Sp.  3 cl.
Prereq.: 505.
Further physiological correlates of psychological phenomena. Sensory and motor processes will be special topics. Reissler.

608 Elementary Statistical Methods  U  4
A, W, Sp, Su.  2 cl., 2 2-hr. labs.
Prereq.: Math 417 or equiv., or permission of instructor.

609 Exceptional Children: General Survey  U  3
A, W, Sp, Su.  3 cl.
Prereq.: 10 cr. hrs. in Psychol.
Exceptional children and their problems including intellectual deviant, the partially sighted and hard of hearing children with speech problems, other physically handicapped and emotionally disturbed. Cassidy and Staff.

610 Adolescence  U  3
A, W, Sp, Su.  3 cl.
Prereq.: 407 or 402.
A study of the outstanding characteristics of the adolescent boy or girl, the educational and social problems arising at this period, and means for dealing with the problem. Horrock, Clark.

611 The Intellectual Deviate  U  3
W, Su.  3 cl.
Prereq.: 609 or permission of instructor.

613 Mental and Educational Tests  U  3
A, W, Su.  3 cl., 1 lab. hr.
Prereq.: 402 or 407.
An overview of theoretical and practical aspects of the assessment and prediction of human behavior. Topics include achievement, intelligence, personality, attitudes, interests and interpersonal relations. Horrock, Fast.

615 Psycho-Educational Diagnosis and Treatment  U  3
For sections B, 693. Sections C and D each repeatable to a maximum of 9 cr. hrs.

615A A. Binet-type Tests. Theory, development and use of Binet tests. Introduction to interviewing and writing of psychological reports. Smith.

615B W. Wechsler. Intelligence Scales for Children and Adults. Theory, development and use of the wechsler scales. Smith.


621 Delinquent Children  U  3
Sp.  3 cl.
Prereq.: 18 cr. hrs. including 609, or permission of instructor.
The meaning and significance of delinquency in a cultural context; its psychological basis from a theoretical and empirical framework; present modes of detection and treatment.
623 Engineering Psychology U G 3
A. Sp. 3 cl.
Prereq.: 504 or 508 or equiv., and 15 cr. hrs. in Psychol. or 5 cr. hrs. in Psychol. and 9 cr. hrs. in engineering courses on time and motion study, quality control, or machine design.
Application of methods and techniques from experimental psychology to problems of equipment design for human use; the design, operation and management of man-machine systems. Briggs, Goldstein.

626 Psychology of Learning U G 4
A. 4 cl.
Prereq.: 402 or equiv.
The principles that underlie the discovery, fixation, and retention of new modes of human behavior. Emphasis is placed on theoretical formulation of the necessary conditions of learning and forgetting. Johnson.

627 Performance Theory U G 3
W. 3 cl.
Prereq.: Permission of the instructor.
Human information processing in the continuous and in the discrete cases. Decision theory and servo-theory as applied to the human operator of complex man-machine systems. Goldstein.

628 Principles and Economy of Learning U G 3
A. 3 cl.
Prereq.: Grad. standing or 10 cr. hrs. in Psychol.
The psychological principles involved in the practical control of learning activities, especially the more complex forms as seen in school and in industrial training. Libby.

629 Systematic Psychology U G 3
A. 3 cl.
Prereq.: 25 cr. hrs. in Psychol. including 504, 508, 601 and 608 or equiv.
Scientific method in psychology. A consideration of scales of measurement, the use of models and problems of psychophysics. Erickson.

631 Differential Psychology U G 3
W. 3 cl.
Prereq.: 508 or 608 or equiv. and permission of instructor.
Critical consideration of the traits wherein individuals and groups differ. Factorial data as to differences between men and women, races and ethnic groups, social classes, etc. Johnson.

632 The Psychology of Speech U G 3
W. 3 cl.
Prereq.: 10 cr. hrs. in Psychol. and 10 cr. hrs. in Speech.
Descriptive and experimental studies of speech processes and activities. Learning, personal and social adjustments, vocal and visible symbolism, language and semantics, thinking. Speech behavior patterns. Knoeber.

633 The Psychology of the Audience U G 2
Sp. 2 cl.
Prereq.: 675 and 10 cr. hrs. in Speech or permission of instructor.

635 Psychology of Advertising U G 3
A. 3 cl.
Prereq.: 10 cr. hrs. in Psychol.
The psychological principles involved in effective advertising, notably attention, memory and action, with the contributory factors of association, feeling, instinct, suggestion, and reasoning. Nagler.

636 Educational Disability U G 3
A. Sp. 3 cl.
Prereq.: 609, 683, and permission of instructor.
An overview of theory and practice including causes, diagnostic procedures, remediation, and instructional materials. Hudesman.

637 Industrial Psychology U G 3
A. 3 cl.
Prereq.: 10 cr. hrs. in Psychol.
Industrial training, effective work methods, equipment design, environmental factors; fatigue, monotony and accidents; morale. Goldstein.

639 Psychology and Industrial Personnel U G 3
Sp. 3 cl.
Prereq.: 10 cr. hrs. in Psychol.
The application of psychology to problems of personnel. Selection and placement of employees by tests of intelligence and special ability. Trade tests, job analysis, and rating scales. Goldstein.

640 Educational and Vocational Guidance U G 3
W., Su. 3 cl.
Prereq.: 402 or 407.
Theory and techniques of appraisal of individual characteristics as related to the formulation of future educational and vocational plans. Walsh.

644 Techniques of Human Motivation U G 3
W. 3 cl.
Prereq.: 10 cr. hrs. in Psychol.
The techniques of optimizing human motivation. The incentive values of environmental patterns. Naylor.

646 Contemporary Viewpoints in Psychology U G 3
Sp. 3 cl.
Prereq.: 15 cr. hrs. in Psychol.
A consideration of the development of modern scientific psychology from its roots in the school of the nineteenth century to its contemporary status. Raiber.

648 Prejudice and Personality U G 3
Sp. 3 cl.
Prereq.: 521.
Social psychological theories of group conflict. Personality dynamics in prejudice. Approaches to the reduction of intergroup hostility.

650 Minor Problems U G 1-15
A, W, Sp, Su.
Prereq.: 16 cr. hrs. in Psychol. and permission of instructor.
By permission of the chairman of the department and the Director of the Bureau of Educational Research and Service, students enrolled in this course may obtain credit for research work done under the supervision of the Bureau staff.
Investigation of minor problems in the various fields of psychology.

655 Comparative Psychology U G 3
A. 1 cl., 2 2-hr. lab.
Prereq.: 504, 505, 506, or 20 hrs. in Psychol. or Zool. including 605 or equiv. and permission of instructor.
Principles of animal behavior, with emphasis upon the contributions of zoology and B. F. Skinner. Lauen.

659 Counseling Psychology: An Introduction U G 3
A. Sp, Su. 3 cl.
Prereq.: 10 cr. hrs. in Psychol.
A course designed for students who are interested in counseling and personnel work. Discussion of counseling psychology, counseling, and testing. Schmidt, Stewart.
663 Psychology of Childhood  U G 3
A, W, Sp, Su. 3 cl.
Prereq.: 402, 403, or 407.
Psychological development from birth to age 12. Influence of
school, family, and other out-of-school activities. Provision for the
child's psychological needs. Thompson, Libby, Wolf.

666 Studying the Individual Child  U G 2-3
W. lab. hrs.
Prereq. or concur: 610 or 663; and permission of in-
structor, or 507 or Home Ec. 501.
Repeatable in the following quarter to a maximum of
5 cr. hrs.
The student is assigned a normal child for individual study.
Observation of the child's behavior at home, at school, in varied
social situations (using tests where appropriate); coordination of
information obtained from records and interviews and a weekly
report. Wexar.

667 Psychology of Music  U G 3
W. 3 cl.
Prereq.: Permission of instructor.
Psychological factors in musical learning, memorization, rhythm,
harmony, form, tone color, interpretation, dictation, and music
talent. Poland.

670 Psychological Problems of Adult Life  U G 3
Su. 3 cl.
A survey regarding changes in capacity for learning through
adulthood and old age, in interests, emotions, psychological prob-
lems of work, adult education, leisure. Herron, Clark.

671 Principles of Treating the Problem Child  U G 3
W, Su. 3 cl.
Prereq.: 13 cr. hrs. in Psychol. 609, or permission of in-
structor.
Methods used in dealing with behavior and personality problems
of children. Ames.

674 Psychological Study of Individuals and Groups  U G 3
A, W, Su. 3 cl.
Prereq.: Permission of instructor.
Repeatable to a maximum of 6 cr. hrs.
Basic concepts and techniques of personnel work in the student
living center. Stewart, Walsh.

676 Advanced Educational Psychology  U G 3
A, W, Su. 3 cl.
Prereq.: 402 or 407 or permission of instructor.
A course in advanced educational psychology, giving a critical
appraisal of the implications for education of modern psychological
findings. Furst, Libby, Clerk.

677 Experimental Social Psychology  U G 4
A, W, Sp. 2 cl., 4 lab. hrs.
Prereq.: 511 or equiv., 608 and permission of in-
structor.
Repeatable to a maximum of 12 cr. hrs.
Typical experiments in such social psychological areas as attitude
change, group processes, and group influences upon the indi-
vidual. Ostrom, Brock.

678 Psychology of Personality  U G 3
W, Sp. Su. 3 cl.
Prereq.: 10 cr. hrs. in Psychol.
Not open to graduate students in Psychol.
A theoretical approach to the problems of personality development
measurement and functioning. Emphasis is given to a critical
evaluation of the major theories of personality. Weaver.

679 Psychology of Public Attitudes  U G 3
W, Su. 3 cl.
Prereq.: 521 and 508 or equiv.
Attitude organization and change. Study of the determinants of
attitude, Ostrom.

680 Educational Tests and Measurements  U G 3
Sp. 3 cl.
Prereq.: 4th yr. or grad. standing and permission of in-
structor.
A service course for those majoring in Elementary and Secondary
Education, Guidance, School Psychology, and School Administra-
tion. Stress is on use of measurements in school. Furist.

683 Psychology of Reading  U G 3
A, Sp, Su. 3 cl.
Prereq.: 402 or 407.
Psychological analysis of the reading process. The relationship of
this to teaching and remedial methods. Discussion of remedial
reading techniques. Huelzman, Robinson.

687† Psychology of Vision  U G 3
W, Su. 3 cl.
Prereq.: 504 or permission of instructor.
Phenomena, methods, and theory in all areas of current visual
research; provides a foundation in sensory psychology as exempli-
fied in vision. Owen.

689 Occupational Information  U G 3
A, Su. 3 cl.
A survey of the development, significance, and use of occupational
information in counseling and personnel work. Campbell.

690 Mental Hygiene for Professional Workers  U G 3
A, Sp, Su. 3 cl.
Prereq.: 402 or 407.
The determinants of maladjustment and principles used in the
prevention of maladjustment for teachers, personnel workers, social
workers, psychologists, occupational therapists, and other profes-
sional groups. MacMint, Pepinsky.

695 Clinical Psychology  U G 3 or 5
A. 3 cl., 2 optional lab.
Prereq.: 13 cr. hrs. in Psychol., 3 cr. hrs. at 600 level.
Discussion of the field of clinical psychology; its methods, its
problems and its use in guidance, education, hospitals, industry,
and other areas. Moher.

National Security Policy Studies
(See National Security Policy Studies 702, 703.)

700 Honors Course  U G 3
A, W, Sp. 3 cl.
Prereq.: Permission of the departmental Undergraduate
Program Committee.
Repeatable to a maximum of 9 cr. hrs.
A program of readings, conferences, and reports selected to
provide maximum individual development and preparation for
graduate study in the field. Ouen, Lecson.

703 Special Topics in Psychology  U G 3
A, W, Sp. 3 cl.
Prereq.: 15 cr. hrs. in Psychol. at 600 level or above
and permission of instructor.
The topics will vary from quarter to quarter and will be an-
nounced at least one month in advance.

A-213
COURSES OF INSTRUCTION
PSYCHOLOGY

704 Tests and Measurements in Speech U G 3
Sp. 3 cl.
Preq.: 608.
Procedures in developing, using, and evaluating tests in speech education, radio and television, theatre, speech and hearing disorders, and general communication. Fetheringham.

713 Laboratory in Psychological and Educational Measurement U G 2
A, Sp. 4 lab. hrs.
Preq.: 610 or 680 and permission of instructor.
Repeatable to a maximum of 8 cr. hrs.
A laboratory practicum in the construction and validation of psychological measuring instruments with particular emphasis upon measures of achievement and inter-personal relations. Cook, Wolf.

7181 The Psychology of Group Therapy U G 2
W, Sp. 2 cl.
Preq.: 671 or permission of instructor.
Primarily for students who may use psychological group methods in professional work. General principles of group therapy and specific methods with children and adults described and evaluated.

782 Laboratory in the Psychology of Campus Groups U G 3
W, Sp. 1 cl., 6 lab. hrs.
Preq.: 674 and 621.
Experience in the advancement of campus organizations and in services to special student groups is paralleled with continuous discussion of psychological principles and appropriate technique. Walsh, Stewart.

788 Laboratory in Industrial Psychology U G 3
1 cl., 4 lab. hrs.
Preq.: 608 or equiv. and permission of instructor.
Repeatable in different sections to a maximum of 12 cr. hrs.

788A Attitude and Morale Scales Sp.
Ostrum.

788B Industrial Testing W.
Napier.

788C Job Analysis and Evaluation A.
Shuttle.

788D Merit Rating Su.
Werry.

802 Seminar in Experimental Psychology G 2
A, W, Sp. 2 cl.
Preq.: Permission of instructor.
Wickens, Larson, Briggs, Miles, Hocell.

803 Seminar in Educational Psychology Sp. 2 cl.
Preq.: Permission of instructor.
Horrocks, Thompson, Cook.

804 Seminar in Psychological Measurement G 2
2 cl.
Preq.: Permission of instructor.
a. Analysis of Psychological Integrations W.
b. Measurement of Cognitive Functions W.
Furner.

805 Contemporary Psychological Literature G 1
Lewon, Horrocks.

806 Seminar in Clinical and Abnormal Psychology G 2 or 4
Preq.: Permission of instructor.
Two sections, A and B may be offered in any one qtr.
Kelly, Barker, Fischer, Mosher.

807 Seminars in Industrial Psychology G 2
2 cl.
Preq.: Permission of instructor.
b. Criterion Development W.
c. Leadership and Organizational Values W.
Shuttle.
d. Motivation and Morale A.
e. Selection and Placement Theory W.
f. Training Methods and Devices Sp.
g. Current Practices and Trends W.
Shuttle.

810 Psychological Problems in Higher Education G 2
A. 2 cl.
Designed to give graduate students preparing for college teaching positions more contact with current educational research regarding problems in higher education. Quasten.

811 Advanced Theoretical Psychology G 4
Sp. 4 cl.
A description and evaluation of the major advanced psychological behavior theories. Wickens. A.

812 Advanced Social Psychology G 3
A. 2 cl.
Preq.: 25 cr. hrs. in Psychol, excluding 521, and 621- or 622 or equiv.
Problems of learning and perception relative to the social environment, the influence of culture in the development of individual behavior patterns, and related topics. Brock.

813 Seminar in Social Psychology G 3
3 cl.
Preq.: Permission of instructor.
a. Contemporary Attitude Theory and Research W.
Brock.
d. The Psychology of Social Movements e. Current Research Trends A.
Greenwood.
814 Intermediate Statistical Methods

A. 2 cl., 2 2-qr. hrs.
Prereq.: 605 or equiv., or permission of instructor.
Principles and techniques for deriving statistical equations; their modification to handle special cases. Clarifying assumptions and their application. Ericson.

815 Seminars in Psychological Statistics

2 cl.
Prereq.: Permission of instructor.
a. Analysis of Variance
   W.
   Lawson.
b. Experimental Design
   Sp.
c. Factor Analysis
   A.
   Wherry.
d. Mathematical Models and Theory
   W.
   Ericson.
e. Non-Parametric Statistics
   A.
   Wherry.
f.g. Prediction Statistics
   Neylor.
g. Current Practices and Trends
   W.
   Neylor.

816 Correlational Analysis

Sp. 4 cl.
Prereq.: 825 or permission of instructor.
Techniques and rationale of using quantitative and qualitative data for prediction. Test and battery analysis and validation. Wherry.

818 Theories of Personality

W, Sp, Su. 3 cl.
Prereq.: Advanced work in personality and social Psychol. and permission of instructor.
A critical consideration of the theories of personality structure and origin. Barker, Mosher.

819 Machine Programming for Psychological Research

W. 2 cl., 1 lab.
Prereq.: 816 and Math 590 or equiv. and permission of instructor.
An introduction to mnemonic symbolic language and loop theory. Applications to the more common psychological statistical problems will be stressed. Wherry.

821 Psychology of Counseling

A, W, Su. 3 cl.
Prereq.: 13 cr. hrs. in Psychol.
Assumptions and facts fundamental to counseling; factors in the interview situation; nature of counseling techniques; resources in counseling; relation of counseling to other personnel procedures. Robinson, Schmidt.

822 Seminar in Counseling Psychology

A, W, Sp. 2 cl.
Prereq.: Permission of instructor.
Pepinsky, McMinn, Fletcher, Schmidt, Stewart.

823 Advanced Counseling Psychology

Sp. 3 cl.
Prereq.: 852.
A survey and critical analysis of literature and research regarding effects of sequence of work activity, vocational exploration, and career development. Pepinsky, Fletcher.

824 Psychological and Child Study Services in the Public Schools

Sp, Su. 3 cl.
Prereq.: Permission of instructor.
Professional problems in school psychology. Cassidy, Smith, Huelsman.

825 Methodological Foundations of Experimental Psychology

W. 5 cl.
Problems of definition of psychological concepts, formulation and testing of hypotheses, theory, construction and formulation of empirical generalizations with reference to design of psychological experiments. Wickens.

827 Administrative Aspects of Student Personnel Work

W, Sp. 2 cl.
Prereq.: Permission of instructor.
Advanced graduate students have the opportunity of relating principles and concepts of student personnel administration to operating procedures on the campus. Stewart, MacMinn.

829 Intermediate Statistical Methods

3 cl.
Principles and techniques for deriving statistical equations; their modification to handle special cases. Clarifying assumptions and their application.

830 Advanced Statistical Methods

3 cl.
Techniques and rationale of using quantitative and qualitative data for prediction. Test and battery analysis and validation.

831 Advanced Experimental Laboratory

Prereq.: Permission of instructor.
Repeatable to a maximum of 15 cr. hrs.
Advanced training in the experimental and quantitative methods in the several areas of general experimental psychology and comparative psychology. Meyer, Briggs, Leesman, Wickens.

832 Beginning Practicum in Counseling

A, Sp. 1 cl., 4 lab. hrs.
Prereq.: 821, 852, and permission of instructor.
Repeatable to maximum of 6 cr. hrs. (Prior credit for 825A will count against this total.)
Supervised practice in assisting college students in their adjustment to college. Emphasis on diagnosis and treatment. Special help is given in interviewing procedures. Fletcher, Robinson, Schmidt.

833 Advanced Practicum in Counseling

Prereq.: 823, 832, and permission of instructor.
Repeatable to 9 cr. hrs. (Prior credit for 828A, D, or E will count against this total.)
Supervised practice in (a) assisting college students and adults with problems of personality adjustments or (b) supervising techniques through observation and discussion of work with other counselors. Fletcher, Pepinsky, Robinson, Schmidt, Walker.

A-215
834 Counseling and Therapy as Social Institutions  G 3
A review of various counseling and therapeutic practice as belief and ritual, with emphasis upon their manifest and latent functions in American Society. Prereq.: Psychology.

838 Practicum in Developmental Psychology  G 3-9
A, W, Sp. 1 cl., 4 lab. hrs. Prereq.: 2nd yr. grad. standing in Psychol., 610, 611, and permission of instructor. Repeatable to a maximum of 9 cr. hrs.
Observation of children in a representative variety of clinical settings with particular reference to developmental phenomena of growth and behavior. Application of research, diagnostic, and intervention methodology. Wenar.

840 Theory of Human Development  G 3
A. 3 cl.
Critical consideration of human development. The meaning of development, the methods of investigation, and the units of measurement will be emphasized. Horrock.

841 Advanced Psychology of Motivation  W. 3 cl.
Prereq.: 700 or 710 or permission of instructor.
An evaluation of the experimental and theoretical material on physiological drives; development and maintenance of secondary motives; perception and motivation; conflict. Miles.

842 Neuropsychology  A, W, Sp. 3 cl.
Prereq.: 443.
Repeatable to a maximum of 9 qtr. hrs.
Relationships between events within the nervous system and the processes of learning, motivation, memory and perception in the higher vertebrates and man. Meyer.

843 Psychophysiology of the Special Senses  G 3
A. 3 cl.
Prereq.: 608 or 687 or permission of instructor.
A survey of the basic physiology of the senses and the peripheral nervous system. Emphasis is upon receptor mechanisms and neural coding processes. Howlett.

844 Advanced Comparative Psychology  G 3
Sp. 3 cl.
Prereq.: 655.
Contemporary literature in comparative psychology. Lawton.

845 Perception  G 3
Sp. 3 cl.
Prereq.: 504 and 501 or permission of instructor.
Basic problems and phenomena of perception and their theoretical interpretations. Miles.

851 Seminars in Developmental Psychology  G 2
2 cl.
Prereq.: Permission of the instructor.
- Development of Social Attitudes and Research Values. A. Wenar.

852 Counseling Diagnostics  G 3-5
W, Sp. 3 cl., 2 opt. lab. per. Prereq.: 608, 613, and 621, and (for laboratory) permission of the instructor.
Theory and application of interview data, observed behavior, test results, and biographical information as a basis for diagnostics in counseling and evaluation. Fletcher.

853 History and Systems of Psychology  G 3
A. 3 cl.
Prereq.: 16 cr. hrs. in Psychol.
Development of psychology from the philosophical antecedents to its present status as a science and a profession. Assignments in original sources as far as possible. Meyer, Howell.

854 Interaction of Developmental Learning Functions  G 2
W. 2 cl.
Prereq.: 603 and 626 or 528 or equiv.
Relation of empirical data on imprinting, senescence and motor deprivation, and environmental aspects upon theoretical constructs designed to integrate such data. Thompson.

855 Theory of Test Construction and Use  G 3
Sp. 3 cl.
Prereq.: 613 or 690 or equiv.
Review of major approaches including traditional mental test theory, assessment theory, and decision theory in relation to constructing and using various types of tests. Furn.

861 Clinical Psychology  G 3 to 5
A. 3 cl., 2 optional lab.
Prereq.: Permission of instructor.
Introduction to the theory and use of clinical methods in psychology including interviewing, observation of free behavior, case documentation, professional problem, and individual testing. Designed for first-year graduate students. Fischer.

862 Psychopathology  G 3 to 5
W. 3 cl., 2 optional lab.
Prereq.: Permission of instructor.
Personality disturbances and their clinical manifestations. Mosher.

863 Psychodynamics  G 3 to 5
Sp. 3 cl., 1 optional lab.
Prereq.: Permission of instructor.
Survey of personality theories, particularly those related to methods of psychological treatment. Laboratory involves cases in children's clinics, mental hospital or school system. Kelly.

864 Psychodiagnostics  G 3 to 5
A. 3 cl., 2 optional lab. per.
Prereq.: Permission of instructor.
Theory and use of psychodiagnostic tests. Laboratory includes administration, scoring, and interpretation of projective tests. Kelly.

865 Advanced Psychological Clinic  G 2-13
Lectures: A, W. 2 cl. (Repeatable to a maximum of 13 cr. hrs.) Prereq.: 608, 613, and 621, and (for laboratory) permission of instructor.
Student may not receive credit for more than 2 trimesters of one type.
Theory and practice of psychotherapy. Offered in connection with community services of Psychology Clinic. Two practices; Type A, advisory services, and Type B, treatment services. Kelly, Barker.
880 Supervised Field Experience in Psychology
A, W, Sp, Su.
Prereq.: Psychol. 2nd yr. standing and approval of local staff of area in which student is specializing. Supervised by member of local staff and some members of the outside agency approved by the Department of Psychology.

Supervised experience, either research or operational, in any agency doing professional psychological work such as a school system, a psychological clinic, an industrial personnel department, or a counseling center.

899 Interdepartmental Seminar
G 1 to 5
(See under Interdepartmental Seminars.)

950 Research in Psychology
G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.

Radiology
Office: University Hospital, 410 West 10th Avenue.
PROFESSORS INELSON (Chairman), MOLINAR, MYERS, POMEROY, CHISTOFORIDIS, and FREIMANIS; ASST. PROFESSORS DUNBAR, HARRIS, MOUNTS, SCHLOSS, RICOBONO, STOCKUM, RIEBEL, and SOPP.

740 Radiological Diagnosis in Clinical Medicine
P 6, 12, 18, 24
1, 2, 3, or 4 months, offered all months except June, July, August.
Prereq.: Med. 3rd and 4th yr. standing.
Participation in diagnostic radiology; special seminars and clinics; optional research project. Nelson.

750 Radiology, Advanced
P 1
1 month, offered Oct., Feb.
Prereq.: Med. 4th yr. standing.
Clinical clerkship in the Department of Radiology, University Hospitals; instruction in radiation therapy and film reading techniques.

783 Individual Studies
P 6, 12, 18 or 24
in Radiology
1, 2, 3, or 4 months, offered all months except June, July, August.
Prereq.: Med. 3rd or 4th yr. standing.
Graduated participation in diagnostic and therapeutic radiology. Optional research project after 6 cr. hrs. in 783.

799 Residency in Radiology
P 18
A, W, Sp, Su.
12 months full time, beginning any month.
Prereq.: Appointment as Resident, University Hospital.
Repeatable to a maximum of 216 cr. hrs.

General diagnostic radiology, nuclear medicine, and radiation therapy; special diagnostic and therapeutic procedures, consultations, and conferences.

950 Research in Radiology
G Arr.
A, W, Sp, Su.
Research for thesis purpose only.

Romance Linguistics
Office: 118 Derby Hall, 154 North Oral Drive.
PROFESSORS 1BAECK (Chairman), 1BULATKIN, and 1GRIFFIN.

701 Minor Problems in Romance Linguistics
U G 1-5
Prereq.: Permission of instructor.

822 Seminar in Romance Linguistics
C 3-5
Sp.
Prereq.: Permission of instructor.

847 Romance Linguistics I
G 5
W, 5 cl.
Prereq.: Permission of instructor.
Not open to students with credit for 847.
A general survey of the development of the Romance languages and an introduction to the basic materials and techniques of investigation. Griffin.

848 Romance Linguistics II
G 5
Sp, 5 cl.
Prereq.: 847 or permission of instructor.
Not open to students with credit for 848.
Topics and problems, both synchronic and diachronic. Special attention to the minor Romance languages. Griffin.

Rural Sociology
Office: Department of Agricultural Economics and Rural Sociology 163 Agricultural Administration Building, 2120 Ferry Road.
PROFESSORS 1SMITH (Chairman), 1BAILEY, 1BAUMER, 1CRAVEN, 1CRAY, 1DAMBACH, DOUGAN, HENNIN (Emeritus), 1MANGUS, 1MCCORMICK, MILNER, 1TOYLER, 1SHARP, 1SHIRER, 1SITTERLEY, 1TOMPKIN, WERTZ (Emeritus); ASSOCIATE PROFESSORS 1R. BAKER, BAR, BLOSSER, CLAYTON, EIZELL, JACOBSON, JONNS, MCDONALD, 1MITCHELL, CHARLES MOORE, 1FADBERG, 1SHAUDYS, STEELE, 1STOUT, 1WALKER, 1WATF, 1WILLIAMS, ASSISTANT PROFESSORS BOTTOM, HINES, INGRAHAM, KROFTA, 1MAEON, POLLOCK, BASK, 1REESEER, VANDERMARK.

405 Introduction to Rural Sociology
U 5
A, W, Sp. 5 cl.
Not open to students with credit for Sociology 401, 507 or 511.
Principles of society, major social institutions and social change. Emphasizes social changes in rural life, rural organizations, population and family living. Menges, Mitchell.

506 Rural Leadership
U 3
Sp. 1 2-hr. cl., 1 2-hr. lab.
Basic principles and practices in the development of effective leadership in organization programs. Mitchell.
606 Advanced Rural Sociology U G 5
W. 5 cl.
Prereq.: 405 or Soc. 401 or 507 or 511 or permission of instructor.

An advanced course on rural society dealing with fundamentals in rural social institutions and organizations, rural social change and nature of rural social systems. Mangus.

609 Rural Social Organization U G 3
A. 2 cl., 1 3-hr. lab.
Prereq.: 405 or Soc. 401, 507, 511 or permission of instructor.

Covers elements of social organization, functions of formal and informal social systems, process of making decisions in communities. Analysis of actual rural community is made. Mitchell.

630 The Rural Family U G 4
Sp. 4 cl.
Prereq.: 405 or Soc. 401, 507, 511 or permission of instructor.

Not open to students with credit for 611.

Structure and function of contemporary rural families in a sociological perspective with emphasis upon changes affecting family life in rural America with causes and consequences. Mangus.

640 Diffusion of Information on Agricultural Technology U G 3
Agric. 3 cl.
Prereq.: 405 or Soc. 401, 507, 511 or permission of instructor.

The process by which new ideas diffuse to the farmer and homemaker. Emphasis on role of group influences, professional agricultural workers, and adoption leaders. Rogers.

660 Rural Sociology of Developing Societies U G 3
W. 3 cl.
Prereq.: 3rd yr. standing and 10 cr. hrs. of Soc. 200, 201, and/or Soc. or permission of instructor.

Sociological principles applied to analysis of present social systems and institutions of developing nations for students preparing for foreign service with rural societies. Rogers.

701 Special Problems U G 2-5
A, W, Sp, Su.
Prereq.: 8 cr. hrs. in Soc. 200 or 300, or permission of instructor.

Eligible students plan and conduct an analysis of a special sociological problem not included in regular courses.

901 Advanced Seminars in Rural Sociology U G 2-4
Prereq.: Permission of instructor.

Topic will be announced by the department prior to registration time each quarter.

The fields of study are as follows:

a. Population Problems
b. Rural Family
c. Rural Health
d. Rural Leadership
e. Rural Community and Institutions
f. Community Development
g. Diffusion of Technology
h. Research Methods in Rural Sociology
i. Social Organization and Administrative Problems
j. Sociology of Foreign Areas
k. Rural Church
l. Farmer Organizations

950 Research in Rural Sociology G Arr.
Research for thesis and dissertation purposes only.

A-218

Russian

Office: 618 University East, 616 North Oval Drive.
PROFESSORS 11 TWAEG (Chairman), YAKAR (Visiting); ASSOCIATE PROFESSORS 1815BAJORIS; ASSISTANT PROFESSORS JOHNSON, KREKST, IOULANOFF, and ROBINSON.

401 Elementary Russian U 5
A, W, Sp, Su. 5 cl.
Credit in 401 will be counted toward graduation only if followed by successful completion of 402, or if taken after successful completion of the fourth regular university course in another foreign language.

402 Elementary Russian U 5
A, W, Sp. 5 cl.
Prereq.: 401.

403 Intermediate Russian U 5
A, W, Sp. 5 cl.
Prereq.: 402.
Reading of prose and poetry; oral and written practice; grammar review.

404 Intermediate Russian U 5
A, W, Sp, Su. 5 cl.
Prereq.: 403 or 415.
407, 408 and 409 may be taken in lieu of 404.
Reading of prose and poetry; oral and written practice; vocabulary building.

407 Scientific Russian Reading U 2
A. 2 cl.
Prereq.: 403 or 415.
407, 408 and 409 may be taken in lieu of 404.
Concentration on material of general interest to all sciences.

408 Scientific Russian Reading U 2
W. 2 cl.
Prereq.: 407 or permission of instructor.
407, 408 and 409 may be taken in lieu of 404.
Reading of undated texts from current Soviet publications.

409 Scientific Russian Reading U 2
Sp. 2 cl.
Prereq.: 408 or permission of instructor.
407, 408 and 409 may be taken in lieu of 404.
Specialized reading and translation of a major contribution in case of the sciences.

415 Intensive Russian U 5, 10 or 15
A, Sp. 11 cl. Full time reg'd.
Prereq.: Permission of chairman.
Students with no prior credit in Russian must register for 15 cr. hrs. Students with credit for 401-403 may register for 5 or 10 cr. hrs., although the course must be completed.
Not open to students with credit for 403.
Register before May 11.
Elementary and intermediate Russian for students desiring comprehensive knowledge of Russian in the shortest possible time.

430 Elementary-Intermediate Russian For Selected Students U 5
W. 5 cl.
Prereq.: Grade of A in 401.
Kreisky.
<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>431</td>
<td>Elementary-Intermediate Russian For Selected Students</td>
<td>U 5</td>
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<tr>
<td></td>
<td>Sp. 5 cl.</td>
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<tr>
<td></td>
<td>Prereq.: 430. Successful completion of the sequence 401-430-431 fulfills language requirements and provides eligibility for 500 courses.</td>
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<tr>
<td>505</td>
<td>Russian Conversation</td>
<td>U 3</td>
</tr>
<tr>
<td></td>
<td>W, Sp. 3 cl. Prereq.: 404 or permission of instructor. Drill in everyday patterns of conversation.</td>
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<tr>
<td>506</td>
<td>Russian Composition</td>
<td>U 2</td>
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<tr>
<td></td>
<td>W, Sp. 2 cl. Prereq.: 404 or permission of instructor. Practice in simple writing.</td>
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</tr>
<tr>
<td>507</td>
<td>Intermediate Conversation</td>
<td>U 3</td>
</tr>
<tr>
<td>508</td>
<td>Review Grammar and Composition</td>
<td>U 2</td>
</tr>
<tr>
<td></td>
<td>Sp. 2 cl. Prereq.: 506 or permission of instructor. Review of Russian grammar, composition on assigned topics, practice in translation.</td>
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<tr>
<td>516</td>
<td>Intermediate Intensive Russian</td>
<td>U 5 or 10</td>
</tr>
<tr>
<td></td>
<td>W, Su. 10 cl. Prereq.: 403, 415 or permission of chairman. The eqv. of 404, 505, 506. Students with credit for 404 may, with permission of the chairman, register for 5 cr. hrs. instead of 10 or hrs. The course must be taken in its entirety.</td>
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</tr>
<tr>
<td>517</td>
<td>Study Tour of the USSR</td>
<td>U 15</td>
</tr>
<tr>
<td></td>
<td>Sp. Prereq.: Minimum of 25 to maximum of 35 cr. hrs. of Russian or eqv. and permission of department chairman. At The Ohio State University students will be given advanced work in conversation and reading in order to prepare for the tour. In the USSR only Russian will be spoken. Some formal instruction will be given daily by the tour leaders.</td>
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<tr>
<td>520</td>
<td>Russian Literature in English Translation: From Pushkin to Turgenev</td>
<td>U 5</td>
</tr>
<tr>
<td>521</td>
<td>Russian Literature in English Translation: From Dostoevsky to Blok</td>
<td>U 5</td>
</tr>
<tr>
<td></td>
<td>W, Su. 4 cl. Not open to students with credit for 614 or 621. Reading and analysis of Crime and Punishment, War and Peace, The Golovlyon Family, as well as short stories and plays by Chekhov, Gorky, Bunin, Bely, and Andreyev. Chalmya.</td>
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</tr>
<tr>
<td>575</td>
<td>Introduction to Russian Literature, The Early Classics: Romanticism, the Nature School, Early Realism</td>
<td>U 3</td>
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<tr>
<td></td>
<td>A. 3 cl. Prereq.: 404 or permission of instructor. Conducted in Russian. Readings from representative authors such as Pushkin, Lermontov, Gogol, Turgenev. Kresky.</td>
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<tr>
<td>576</td>
<td>Introduction to Russian Literature, The Russian Realists</td>
<td>U 3</td>
</tr>
<tr>
<td></td>
<td>W. 3 cl. Prereq.: 404 or permission of instructor. Conducted in Russian. Readings from representative authors such as Turgenev, Dostoievsky, Tolstoy, Goncharov. Kresky.</td>
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<tr>
<td>577</td>
<td>Introduction to Russian Literature, Impressionism, Critical Realism, Symbolism, Socialist Realism</td>
<td>U 3</td>
</tr>
<tr>
<td></td>
<td>Sp. 3 cl. Prereq.: 404 or permission of instructor. Conducted in Russian. Readings from representative authors such as Chekhov, Gorky, Bunin, Blok, and Sholokhov. Kresky.</td>
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<tr>
<td>609</td>
<td>Advanced Reading, Conversation, and Composition</td>
<td>G 3</td>
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<td></td>
<td>A. 3 cl. Prereq.: 10 hrs. of 500 level courses in Russian, including 505, 506, or permission of instructor. Reading of contemporary prose and verse, presentation of oral and written reports, drill in intonation patterns, translation from English into Russian. Vakar.</td>
<td></td>
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<tr>
<td>610</td>
<td>Advanced Reading, Conversation, and Composition</td>
<td>C 3</td>
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<td></td>
<td>W. 3 cl. Prereq.: 608 or permission of instructor. Oulandoff.</td>
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<tr>
<td>611</td>
<td>Advanced Reading, Conversation, and Composition</td>
<td>G 3</td>
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<tr>
<td></td>
<td>Sp. 3 cl. Prereq.: 810 or permission of instructor. Vakar.</td>
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<tr>
<td>622</td>
<td>Russian Literature in English Translation: Soviet Literature</td>
<td>U G 5</td>
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<tr>
<td></td>
<td>Sp. 4 cl. Not open to students with credit for 616. A survey of Soviet Russian literature from 1017 to the present. Reading of representative authors such as Fadeyev, Leonov, Fedin, Sholokhov, and Pasternak. Oulandoff.</td>
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<tr>
<td>630</td>
<td>Applied Linguistics for the Russian Major</td>
<td>U G 5</td>
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<tr>
<td></td>
<td>A. 3 cl. Prereq.: 505, 506. Introduction to the categories and techniques of applied linguistics, especially phonemic and morphemic analysis; all examples drawn from Russian and English.</td>
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<tr>
<td>635</td>
<td>Practical Russian Pronunciation</td>
<td>U G 5</td>
</tr>
<tr>
<td></td>
<td>Sp. 3 cl., 2 labs. Prereq.: 505, 506. Lectures and practical exercises; use of phonetic symbols; corrective exercises; problems of teaching pronunciation.</td>
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</tbody>
</table>
COURSES OF INSTRUCTION

RUSSIAN

640  Contrastive Structures of Russian and English  U G 5
W, Su.  3 cl.
Prereq.: 505, 506.
Comparison of the structures of the Russian and English languages stressing practical difficulties in pronunciation and grammar.

645†  Survey of Russian Poetry  U G 5
W.  3 cl.
Prereq.: 575, 576, 577.
Development of poetry from the 18th century to the present; readings from major periods and movements.

650 * Dostoevsky  U G 5
A, Su.  3 cl.
Prereq.: 9 cr. hrs. in literature courses at the 600 level. Given in English but undergraduate majors in Slavic will do prescribed portions of the reading in the original.
Critical analysis of the major novels and shorter works. The intellectual and literary development of Dostoevsky. Silbajoris.

651 * Tolstoy  U G 5
W.  3 cl.
Prereq.: 9 cr. hrs. in literature courses at the 600 level. Given in English but undergraduate majors in Slavic will do prescribed portions of the reading in the original.
Analysis of all major works including the novels, plays, stories, and important polemical works. Silbajoris.

652 * Chekhov  U G 3
Sp.  3 cl.
Prereq.: 9 cr. hrs. in literature courses at the 600 level. Given in English but undergraduate majors in Slavic will do prescribed portions of the reading in the original.
Critical analysis of the major plays and the most significant stories of the later period. Oulanooff.

653†* Russian Drama  U G 3
A.  3 cl.
Prereq.: 9 cr. hrs. in literature courses at the 600 level. Given in English but undergraduate majors in Slavic will do prescribed portions of the reading in the original.

654†* Turgenev  U G 3
W.  3 cl.
Prereq.: 9 cr. hrs. in literature courses at the 600 level. Given in English but undergraduate majors in Slavic will do prescribed portions of the reading in the original.
Reading of the major novels, plays and short stories. A study of novelistische technique. Oulanooff.

670†* Pushkin and His Time  U G 3
Sp.  3 cl.
Prereq.: 575-577 or permission of instructor.
Analysis of Eugene Onegin as poetry and an encyclopedia of the times. Social, political, cultural trends in the 1820's and 1830's. Romantic Poets. Oulanooff.

690  Russian for Research  G O
A, W, Su.  5 cl.
Prereq.: Graduate standing.
Basic Elements of Russian grammar.

691  Russian for Research  G 0
W, Sp, Su.  3 cl.
Prereq.: Grade of C or above in 690 or equiv. Repeatable twice.
Satisfactory completion of this course (grade A or B) will be accepted as evidence of a dictionary reading knowledge in fulfillment of Ph.D. language requirement.

720  History of the Russian Language  G 3
W.  3 cl.
A survey of phonetic, morphological, and syntactical changes from the period of Common Slavic to the present. The formation of the Russian literary language.

721  The Structure of Russian  G 3
Sp.  3 cl.
A structural analysis of Modern Russian. Essential for those intending to teach Russian or become translators.

722†* Russian Phonetics  G 5
A.  3 cl.
Prereq.: 507, and 575-577, or permission of instructor.
The sounds, stress, rhythm, and intonation of Russian. Lectures and practical work in the Listening Center.

760† Russian Literature to 1650  G 3
W.  3 cl.
Emphasis on literature of the Kievan period. Silbajoris.

761† Russian Literature 1650-1800  G 3
Sp.  3 cl.
The baroque period, classicism and sentimentalism. Emphasis on the classical period of the 18th century. Silbajoris.

770† Russian Poetry from Turgenev to the Symbolists  G 3
Sp.  3 cl.
Turgenev, Fet, Nekrasov, and the Civic poets, Merzechkovsky, Bruinov, Balmont, Bely, and Blok. Silbajoris.

810  Old Church Slavonic  G 5
W.  5 cl.
Study of the earliest recorded Slavic language. Reading and linguistic interpretation of original documents. Robinson.

811* Readings in Old Russian  G 5
Sp.  3 cl.
Reading of texts from the medieval period including both Old Church Slavonic texts and the later Old Russian texts. Lehiste.

840  Seminar in Russian Literature to 1917  G 3-5
A, W, Su.  2 cl.
Twacag, Oulanooff, Silbajoris.

850  Seminar in Soviet Literature  G 3-5
Sp.  2 cl.
Oulanooff.
Serbo-Croatian
Office: 316 University Hall 216 N. Oval Dr.

601* Serbo-Croatian
U G 3
A, 3 cl.
Prereq.: Russ. 403 or 415 or permission of instructor.

602† Serbo-Croatian
U G 3
W, 3 cl.
Prereq.: 601 or permission of instructor.

603† Serbo-Croatian
U G 3
Sp, 3 cl.
Prereq.: 602 or permission of instructor.

604 Intermediate Serbo-Croatian
U G 3
A, 3 cl.
Prereq.: 603 or equvi.
Reading of simple Serbo-Croatian texts from the 19th century.

605 Intermediate Serbo-Croatian
U G 3
W, 3 cl.
Prereq.: 604 or permission of instructor.
Reading texts of moderate difficulty, conversational, simple compositions.

606 Intermediate Serbo-Croatian
U G 3
Sp, 3 cl.
Prereq.: 605 or permission of instructor.
Reading from modern Serbo-Croatian literature, practice in writing and speaking.

Slavic Languages and Literatures
Office: 316 University Hall, 216 North Oval Dr.

530† Slavic Languages and Cultures
A, 4 cl.
Taught in English.
Historical distribution of contemporary situation language policies of Slavic nations; interaction of Slavic cultures and their congers and neighbors; mutual impact of Slavic languages and cultures. Roja.

617* Slavic Literature in English
U G 3
A, 3 cl.
The epic tradition, renaissance, baroque literature, classicism, pre-romanticism, and romanticism, the great Slavic literary awakening. Tzvarg.

820 Seminar in Slavic Linguistics
A, W, Sp, Su 2 cl.
Selected topics in Old Church Slavonic, Old Russian, Modern Russian, and Comparatve Slavic Linguistics. Robertson.

830† Seminar in Slavic Literature
W, 2 cl.
Selected topics from Medieval and Modern Literature.

850 Bibliography and Method
A, 2 cl.
Required of all Ph.D. candidates. Recommended for M.A. candidates. To acquaint graduate students with the tools, problems, and methods of linguistic and literary research.

950 Research in Slavic
A, W, Sp, Su.
Research for thesis purposes only.

SLAVIC LANGUAGES AND LITERATURES

618* Slavic Literature in English
UG 3
Translation: From Realism and Symbolism to World War II
W, 3 cl.
Emphasis on development of the novel and drama in Czech, Polish, and Ukrainian literature: Capek, Hasek, Sienkiewicz, Reymont, Francho, and Ukrainka. Tzvarg.

701 Minor Problems in Slavic
G 2-10
A, W, Sp, Su.
Prereq.: Permission of the department chairman. Repeatable.
Epp, Silbajor, Tzvarg, Kradar, Lehite.

730 An Introduction to the Slavic Languages
A, 3 cl.
A general survey of all the Slavic languages and their common features. Robinson.

731† History of South Slavic Languages
G 5
A, 3 cl.
Prereq.: Good command of Russian and acquaintance with a second Slavic language or permission of instructor.
Bulgarian, Macedonian, Serbo-Croatian, and Slovenian, with emphasis on Serbo-Croatian and its relation to the other South Slavic Languages.

732* History of the West Slavic Languages
G 5
A, 3 cl.
Prereq.: Good command of Russian and acquaintance with a second Slavic language or permission of instructor.
Polish, Czech, Slovak, Polabian, Kashub, and Sorbian, with special emphasis on Polish and its relation to the other West Slavic Languages. Robinson.

A-221
COURSES OF INSTRUCTION

SOCIAL WORK

Social Work

Office: 300 Stillman Hall, 1947 N. College Rd.

PROFESSORS: MEHERZUR (Director), CORNELL, LIVINGSTON, and HICKEY; ASSOCIATE PROFESSORS BESSELING, GRIMEY, DAYKIN, DECKER, HAMILTON, MUELLER, NICHOLS, ll, SCHNEIDERMAN, ISSON, ESTELMAN, ASSISTANT PROFESSORS HENDRIEYCOVIC, BOUCCON, CUNNINGHAM, FOSTER, IOGOOD, HAYWARD, KNOOP, LONGO, PALMER, PANTALOS, RINFLFELD, SCHNEIDERMAN and ZIPFANG; VISITING ASSISTANT PROFESSORS ELKUS AND WOOD.

511 Social Investigation and Social Statistics
A, W, Sp, Su. 3 cl., 2 2-hr. lab.
Prereq.: Soc. 401 or 407 or 507 or equiv.
Not open to students with credit for 538 or 539.
Introduction. History of survey research; principles of science; planning studies; interviewing; coding and tabulating; elementary statistics. Laboratory instruction in calculating, card punching, sorting and tabulating equipment. Cornell, Grimes, Behling.

599 Health and Welfare Needs and Resources
A, W, Sp, Su. 3 cl.
Prereq.: Soc. 401, 407, 507 or equiv.
Development of health and welfare services. Significant changes in attitudes toward needs of people. Responsibilities and programs of the federal government for health and welfare. Foster, H. Schneiderman.

600 Health and Welfare Needs and Resources II
A, W, Sp. 3 cl.
Prereq.: 511 and 599.
Not open to students with credit for 668.
Function and programs of state and local governments and voluntary agencies. Attention given to problems of aged, unemployed, disabled and handicapped, children, and other special groups. Foster.

601 Health and Welfare Needs and Resources III
A, W, Sp. 3 cl.
Prereq.: 600 or equiv.
Not open to students with credit for 668.
Study of voluntary and governmental agencies and services involved in the orderly development, administration, financing, and coordination of health and welfare services. Stellman.

621 Principles of Probation and Parole
W, 3 cl.
Prereq.: 600, Anthrop. 501, Soc. 625 or equiv.
Not for graduate credit to students in Social Work.
A study of how offenders are placed and supervised on probation and parole. Daykin.

627 Juvenile Delinquency and Its Treatment
A, Sp. 5 cl.
Prereq.: 600, Anthrop. 501, Soc. 625 or equiv.
Not for graduate credit to students in Social Work.
Juvenile Delinquency as a social problem. Methods of treatment and prevention, including juvenile courts, clinics, probation, parole, correctional institutions, child placement, and recreational programs. Daykin.

637 Social Implications in Rehabilitation
U G 3
A, Sp. 3 cl.
Prereq.: 601 and 10 cr. hrs. of Psych. or equiv.
Not open to students with credit for 510.
Not for graduate credit to students in Social Work.
The significance of disability and employability in their social, medical, and industrial application; rehabilitation as a process; current concepts. Hamilton.

650 Principles of Group Leadership
U G 3
A, W, Sp. 3 cl.
Prereq.: 600, Psychol. 402 or 10 cr. hrs. of Psychol. or Soc.
Not for graduate credit to students in Social Work.
Examination of principles of group leadership, understanding group purposes and behavior. Use of program media. Records of actual experience used as illustrative material. Longo.

659 Social Work Aspects of the Individual and His Family
U G 4
A, W, Su. 4 cl.
Prereq.: Soc. 600, Psychol. 402 or equiv.
Not for graduate credit to students in Social Work.
The dynamics of the interpersonal relationships of the family from the view point of the worker, with emphasis upon the individual's role from infancy through old age. Simon, Pantalos.

661 The Individual and the Social Agency
U 4
Prereq.: 601 and 659 or Nurs. 539 or Ed. 505.
Not for graduate credit to students in Social Work.
The study and evaluation of social and environmental and psychological conditions as they affect the individual in his use of social welfare resources.

675 Social Welfare Observation and Experience
U 3-8
A, W, Sp, Su. Social Agency Assignment and 1 2-hr. seminar
Prereq.: 600 and 639, major standing in Social Welfare and permission of instructor.
Repeatable to maximum of 15 cr. hrs.
Individualized and supervised observation and experience in selected social welfare agencies and institutions. Comprehensive report by student and agency supervisor required. Staff.

679 Legal Aspects of Social Work
U G 3
A. Sp. 3 cl.
Prereq.: 601 and 10 cr. hrs. of Soc.
Not for graduate credit to students in Social Work.
Law as a means of social control. Study of case, statute, and constitutional law most frequently involved in social work practice. Legal aid. Livingston, Daykin.

696 Case Studies in Public Social Services
U 3
W, 3 cl.
Prereq.: 601 and 661.
Not for graduate credit.
Critical analysis of representative public service cases and practical interpretation of agency policies. Attention given to family budgeting and standards for health and decency. Livingston, Simon.

698 Senior Seminar in Social Welfare
U 3
A, W, Sp, Su. 1 2-hr. cl. with 1 hr. arr.
Prereq.: 661.
A critical examination of social problems, issues and trends and their implications for social welfare policies, programs and practice. Livingston, H. Schneiderman.
### Special Problems (1-5 credits)

A, W, Sp, Su.

**Prereq.** Social Welfare 3rd or 4th yr. standing, 601, and permission of instructor.

- Repeatable to a maximum of 10 cr. hrs.

Individual or group study projects on problems and services in selected area of social welfare. Report required.
- a. Services to Individuals.
- d. Other Areas.

#### Social Welfare Policy and Services I (3 credits)

A, 3 cr.

Social welfare as a social institution. Its development, philosophical bases and relation to societal changes. Livingston, Decker.

#### Dynamics of Behavior for Social Work I (3 credits)

A, 3 cr.

**Prereq.:** Social Work grad. standing.

Dynamic interaction of physical, intellectual, emotional, spiritual, and social influences which affect human social functioning in pre-adolescent years. Mueller, Bounous, Bendekovic, Decker.

#### Dynamics of Behavior for Social Work II (3 credits)

W, 3 cr.

**Prereq.:** Social Work grad. standing, 705. Not open to students with credit for 827.

Dynamic interaction of physical, intellectual, emotional, spiritual and social influences which affect human social functioning from adolescence through old age. Mueller, Bounous, Bendekovic, Decker.

#### Dynamics of Behavior for Social Work III (3 credits)

Sp, 2 cr., 1 2-hr. seminar.

**Prereq.:** Social Work grad. standing, 706, 735 or concurs. Not open to students with credit for 827.

Psycho-dynamic understanding of neuroses, psychoses and other developmental deviations in human social functioning relevant to social work practice. Knopf, Wood.

#### Social Welfare Policy and Services II (3 credits)

W, 3 cr.

**Prereq.:** 701. Not open to students with credit for 844.

Development of social welfare policy and its expression through governmental and voluntary agency programs and services. Special focus upon income maintenance. Livingston, Hayward.

#### Interpretation of Social Work (2 credits)

S, 2 cr.

**Prereq.:** Social Work grad. standing, 730.

Communication, interpretation and public relations in social work. Theoretical and practical aspects of methods, processes and principles of interpretation. Shimp.

#### Social Casework I (2 credits)

A, 2 cr.

**Prereq.:** Social Work grad. standing, 701 concur. Not open to students with credit for 819.

Introduction to the social casework method; basic elements in the casework process; study, diagnosis and treatment; application to practice. Schneiderman, Haywood.

#### Social Casework II (3 credits)

W, 3 cr.

**Prereq.:** Social Work grad. standing, 713. Not open to students with credit for 817.

Continued study of the social casework method with emphasis upon the process of psychosocial diagnosis and how it determines treatment aim. Haywood, Schneiderman, Rindfleisch.

#### Research Methods in Social Work I (3 credits)

Sp, 2 cr., 1 2-hr. lab.

**Prereq.:** Social Work grad. standing, 511 or equiv. Not open to students with credit for 850.

Designed to prepare students to do social work research. Case, statistical and survey methods are discussed. Cornell, Crymes.

#### Research Methods in Social Work II (3 credits)

A, 2 cr., 1 2-hr. lab.

**Prereq.:** Social Work grad. standing, 720.

Not open to students with credit for 681.

Designed to give facility in the use of appropriate methods of analysis and interpretation of statistical data and their application to social work research. Cornell, Crymes.

#### Medical Aspects of Social Work (2 credits)

Sp, 2 cr.

**Prereq.:** Social Work grad. standing, 701. Not open to students with credit for 535.

Presentation of medical knowledge about disease and disability, emphasizing symptoms, diagnosis, treatment, and convalescent care. The social implication of disease and disability is stressed. Elbers.

#### Rehabilitation I (3 credits)

W, 3 cr.

**Prereq.:** 701, 705 or equiv. and permission of instructor. Not open to students with credit for 832.

Integration of medical and extra-medical services in rehabilitation, with emphasis on the understanding of the problems of vocational adjustment of the handicapped. Hamilton.

#### Community Organization for Social Welfare I (2 credits)

A, W, 2 cr.

**Prereq.:** Social Work grad. standing, 701, 705 or equiv. Not open to students with credit for 830.

Function of social worker in developing effective community social welfare programs. Principles and methods of determining community needs and stimulating community effort toward improved program development. Cohn, Stellman, Shimp.

#### Community Organization for Social Welfare II (3 credits)

W, 3 cr.

**Prereq.:** Social Work grad. standing, 730.

Values, assumptions and social science propositions underlying planned and consciously effected change in the interest of social welfare. Stellman.

#### Social Group Work I (2 credits)

A, 2 cr.

**Prereq.:** Social Work grad. standing, 701 or concur.

Principles and concepts. Worker's role in enabling members of a group to use group experience for personal growth and development of social responsibility. Longo, Bendekovic.

#### Social Group Work II (3 credits)

W, 3 cr.

**Prereq.:** Social Work grad. standing, 763. Not open to students with credit for 854.

Role of worker in effecting group and program processes toward meeting individual member needs and group objectives. Longo, Bendekovic.

#### Agency Laboratory Experience I (3-8 credits)

A, W, Sp, Su.

**Prereq.:** Social Work 1st yr. grad. standing. Arranged by the student's faculty advisor. Repeatable to a maximum of 18 cr. hrs. Planned visits to social agencies, group analysis of observation, followed by assignment to specific agency for beginning responsibilities with recipients of agency service. Steff.
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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tr>
<td>843</td>
<td>The Administration of Social Work G 3</td>
<td>Agencies</td>
<td>Prereq.: Social Work grad, standing. 824 or 866 or 881. An introduction to the basic factors in the administration of social agencies. Livingston, Decker.</td>
</tr>
<tr>
<td>857</td>
<td>Seminar in Social Work Research I G 3</td>
<td>A. 2 cr.</td>
<td>One field project. Prereq.: Social Work grad, standing. 720, 721 or equiv. and permission of instructor. Evaluation of problems in planning and administration of social work research projects. Cornell, Crymes and Staff.</td>
</tr>
<tr>
<td>858</td>
<td>Seminar in Social Work Research II G 3</td>
<td>W. 2 cr.</td>
<td>One field project. Prereq.: Social Work grad, standing. 857 or equiv. and permission of instructor. Evaluation of methods and findings of selected studies in the various fields of social work. Cornell, Crymes and Staff.</td>
</tr>
<tr>
<td>859</td>
<td>Seminar in Social Work Research III G 3</td>
<td>Sp. 2 cr.</td>
<td>One field project. Prereq.: Social Work grad, standing. 858 or equiv. and permission of instructor. Evaluation of research related to substantive issues in social work—movement, role of social worker, prediction, brief service, multi-problem family, needs. Cornell, Crymes.</td>
</tr>
<tr>
<td>870</td>
<td>Seminar on Methods of Social Work in Corrections G 3</td>
<td></td>
<td>Prereq.: Social Work grad, standing. 823, 865 or 731. Analysis of selected problems and issues in social work in the field of corrections. Good.</td>
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</tbody>
</table>
Sociology

Office: 112 Hagerty Hall, 1775 S. College Rd.

PROFESSORS: Isler, (Chairmen), ISLAY, JSCHLATTNER, JCLARKE, JCRUZ, JDIETHELK, JSCHNITZ, JBOYNE, JBRINK, JBRINK, JBRINK, JWARNER, JWILKINS, JWEISS, JZANDER, JZANDER, and JZANDER; ASSISTANT PROFESSORS: JBRINK, JBRINK, JBRINK, JBRINK, and JBRINK; ASSISTANT PROFESSORS: CLATWORTHY, CLEAVER, FITE, FLETCHER, JHALL, JHELFICH, JKRUDSEN, JNOEL, JSHWILIAN, JTHOMAS, and VAUGHAN.

401 Introductory Sociology U 5
A, W, S, Su. 5 cl.
Not open to students with credit for 410, or 507, or 511, or 606, or 607.
A study of the fundamental concepts of sociology and an introduction to the analysis of social problems. Custer.

402 Social Trends and Problems U 5
A, W, S, Su. 5 cl.
Prereq.: 5 cr. hrs. of Soc. or equiv., with permission of instructor.
Not open to students with credit for 410 or 511.
Analysis of recent social trends and contemporary social problems. Dinitz and Staff.

403 Sociology of Education U 5
A, W, S, Su.
Prereq.: 5 cr. hrs. in Soc.
Current social trends as they affect education. Backgrounds of school children, social status of teachers, role of power and bureaucracy. Cossin, Thomas, Vaughan.

SOCIOLGY

505 The Sociology of Urban Life U 5
A, W, S, Su. 4 cl., 1 2-hr. lab.
Prereq.: 5 cr. hrs. in Soc. or equiv., with permission of instructor.
The place of the city in social organization. The emergence, nature, and problems of modern urbanism. Projects based on census and field data. Jonasen, Schuerman, Cleaver.

506 Race Problems in the United States U 3
A, W, S. 3 cl.
Prereq.: 5 cr. hrs. in Soc.
Not open to students with credit for 404.
The cultural background, distribution, and adjustments of selected racial and ethnic groups in the United States. Vander Zanden, Noel.

507 Fundamentals of Sociology U 5
A, W, S, Su. 5 cl.
Prereq.: Hist. 423.
Not open to students with credit for 401, 410, or 511.
A study of the nature of society and the factors affecting its development, culture, personality, groups and institutions; selected social problems. Staff.

510 The Standard of Living U 4
Sp. 4 cl.
Prereq.: 5 cr. hrs. in Soc. or equiv., and permission of instructor, or Econ. 402 or Econ. 452.
A consideration of the content of the various standards of living in American society, their economic and social significance. Problems in family budgets and retail buying. Thomas.

518 Social Implications of Low Income U 3
W. 3 cl.
Prereq.: 5 cr. hrs. in Soc. or equiv., with permission of instructor.
A study of low-income peoples, especially concerning the effect of low-income on them, and their consequent social participation. Vaughan.

520 Factors in Successful Marriage U 3
A, W, S, Su. 3 cl.
An understanding of successful married life. Types of problems faced by dating and married couples and the methods whereby they may be dealt with successfully. Clatworthy, Fletcher.

530 Types of Sociological Inquiry U G 5
A, W, S, Su. 3 cl., 2 2-hr. lab.
Prereq.: 5 cr. hrs. in Soc. or equiv., with permission of instructor.
Not open to students with credit for 684.
Introduction to sociological research techniques, methodological approaches, and relevant quantitative procedures. Hall.

562 Social Change U 3
A, W, S. 3 cl.
Prereq.: 5 cr. hrs. in Soc. or equiv., with permission of instructor.
Not open to students with credit for 662.
Recent social changes, especially in Western civilization and the United States. Types of societies in historical perspective. Requirements of a good society. Engen.

000 The Modern Family U G 4
A, W, S, Su. 4 cl.
Impact of modern culture upon the family, including size of family, member relationships, economic problems, divorce, desertion, and status of women. Clarke, Krudsen.

A-225
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>601†</td>
<td>Types of Family Organization</td>
<td>U G 4</td>
<td>Prereq.: 600.</td>
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<td>Analysis of family organization in various societies and groups; problems of comparative study.</td>
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<td>604</td>
<td>Race Relations</td>
<td>U G 3</td>
<td>A, W, Sp, Su. 3 cl.</td>
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<td></td>
<td>A survey of the problems arising from the contacts of people who differ as to race and culture. Vander Zanden, Noel.</td>
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<td></td>
<td>Social processes and problems associated with contemporary industry including growth of formal and informal organizational structure, communication processes, attitude problems and morals. Kelrich.</td>
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<td>614</td>
<td>The Community</td>
<td>U G 4</td>
<td>A, W, Su. 4 cl.</td>
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<tr>
<td>620</td>
<td>Sociological Interpretation of Modern Values</td>
<td>U G 5</td>
<td>Sp. 5 cl.</td>
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<td>Prereq.: 401 or 507.</td>
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<td></td>
<td>The identification, classification, and measurement of values; values in relation to personality, social structure, and social problems; analysis of selective evaluative interpretations of contemporary society.</td>
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<td>621</td>
<td>Contemporary Soviet Society</td>
<td>U G 5</td>
<td>W. 5 cl.</td>
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<td>Prereq.: 10 cr. hrs. in Soc. and 15 cr. hrs. in other social sciences or permission of instructor.</td>
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<td>Organization, development, and problems of the Communist Party, the collective farm, the school, professional occupations, economic planning, and other contemporary Soviet institutions.</td>
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<td>622</td>
<td>Social Factors in Personality</td>
<td>U G 4</td>
<td>A, W, Sp. 4 cl.</td>
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<td>623</td>
<td>Collective Behavior and Social Movements</td>
<td>U G 3</td>
<td>A, W, Sp. 3 cl.</td>
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<td></td>
<td>Examination of the dynamic social processes characteristic of mass societies through an analysis of crowds, mobs, cults, cults, publics, and the initial stages of social movements. Quinney, Worsley.</td>
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<td>624</td>
<td>Culture Patterns and Personality</td>
<td>U G 3</td>
<td>Sp. 3 cl.</td>
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<td>Prereq.: 622 or Psychol. 581 or equiv.</td>
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<td></td>
<td>Anthropological contributions to the field of social psychology. Variations in personality as associated with variations in culture. The range of personality differences within various cultures. Bourdieu.</td>
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<td>625</td>
<td>Criminology</td>
<td>U G 5</td>
<td>A, W, Sp, Su. 5 cl.</td>
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<td></td>
<td>The nature, variation, and causes of crime and delinquency. Studies of criminal liability, criminal careers, and organized racketeering. Dinwitz, Eynon, Rocke.</td>
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<td>626</td>
<td>Penology</td>
<td>U G 5</td>
<td>A, Sp. 5 cl.</td>
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<td>Prereq.: 625.</td>
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<td></td>
<td>The treatment of adult offenders in detention and incarceration; short and long institutions. Field trips required. Eynon.</td>
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<td>627</td>
<td>Sociological Aspects of Mass Communication</td>
<td>U G 3</td>
<td>W. 3 cl.</td>
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<td></td>
<td>Selective analysis of communicators, contents, audiences, and effects of mass media. Research procedures, findings, and theoretical formulations, drawn primarily from studies of popular culture. Quinney.</td>
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<td>629</td>
<td>General Sociology</td>
<td>U G 4</td>
<td>A. 4 cl.</td>
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<td></td>
<td>A critical examination of the more fundamental ideas and concepts of modern scientific sociology. Warhay.</td>
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<td>630</td>
<td>Sociological Research Methods</td>
<td>U G 3</td>
<td>A, W, Su. 3 cl.</td>
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<td>Prereq.: 406, 407, 410, or 507, and a course in elementary statistics</td>
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<td>Not open to students with credit for 706 or 800.</td>
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<td>Prereq.: 10 cr. hrs. in Soc. or equiv. and permission of instructor.</td>
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<td>Not open to students with credit for 704.</td>
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<td>Changes in size, composition and distribution of populations, the dynamics underlying them, and their social consequences.</td>
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<td>643</td>
<td>Analysis of Small Groups</td>
<td>U G 4</td>
<td>A. 4 cl.</td>
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<td>Prereq.: 10 cr. hrs. in Soc. and permission of instructor.</td>
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<td>Analysis of group structure and processes; examination of roles, interpersonal structure, leadership, observation of groups in laboratory and non-laboratory settings.</td>
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<td>644</td>
<td>Sociology of Complex Organizations</td>
<td>U G 3</td>
<td>Sp.</td>
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<td>Prereq.: 10 cr. hrs. in Soc. or permission of instructor.</td>
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<td>Functioning of large complex social groupings. Goals, structures, coordination, dispersion, survival, change as seen in various organizations: e.g.—governmental, educational, religious, business, and occupational organizations. Haas.</td>
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<td>An analysis of current relationships between work and leisure, emphasizing social implications of increased leisure time, and changing conceptions of work and leisure. Clarke.</td>
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<td>The social role of religious institutions and beliefs, with particular reference to the United States; the relation between religion and other aspects of society. Dynes, Knudsen.</td>
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<td>650</td>
<td>Medical Sociology</td>
<td>U G 3</td>
<td>A, W.</td>
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<td>Prereq.: 10 cr. hrs. in Soc. or equiv. and permission of instructor.</td>
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<td></td>
<td>An analysis of the sociological factors in illness and health, as well as the role of medicine and the health professions in modern society. Nagi, Fletcher.</td>
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</tbody>
</table>
660 Development of Sociological Thought U G 5
A, W, Sp. 5 cl.
Prereq.: 15 cr. hrs. in Soc. or equiv.
A survey of major concerns and concepts in sociology in relation to their social-historical setting, from 1800 to the present time. Vaughan, Warshay.

663+ Social Control U G 3
Sp. 3 cl.
A theory of social control and analysis of selected cases of social control. Text, class reports, projects.

668+ Development of Social Thought U G 4
A.
Prereq.: 10 cr. hrs. in Soc. or equiv. and permission of instructor.
A sociological analysis of Western ideas on social relations before the advent of the social sciences.

676 Social Stratification U G 4
A, W, Sp. 4 cl.
Class distinctions as phase or social differentiation. Origin and characteristics of social classes. Significance for modern society of class consciousness, class struggle, and social mobility. Dynes, Conover.

677 Social Organization in a Changing World U G 4
A. 4 cl.

678 The School and the Community U G 3
W, Su. 3 cl.
The school as a social institution in the American community. The sociological importance of community structures, processes, and problems in determining school-community relationships. Jonassen.

680 Social Orientation of Children U G 4
W, Su (1st term). 4 cl.

700 Special Problems U G 1-4
A, W, Sp, Su.
Prereq.: 10 cr. hrs. in Soc. Permission of instructor.
A Sociological Theory
B Social Organization and Planning
C Medical Sociology
D Criminology and Penology
E Sociology of Education
F Race Relations
G Social Psychology
H The Family
I Research Methodology
J Urban Sociology
K Undergraduate Seminar on Contemporary Sociological Issues
L Unclassified
Introduction to National Security G 3
A
(See National Security Policy Studies 702.)
Problems in National Security W. G 3-5
(See National Security Policy Studies 703.)

706 Methods of Social Measurement U G 3
A, Sp. 3 cl.
Prereq.: 630 or Soc. Work 720.
Not open to students with credit for 890.
Approaches and techniques in the development and testing of social measurement instruments.

707 Problems in the Design of Sociological Research U G 3
A, W, Sp. 3 cl.
Prereq.: 550 or equiv.
Repeatable to a maximum of 8 cr. hrs. Individual sections may not be repeated.
Topics:
A A. Development and Verification of Sociological Theory
B W. Experimental Research Methods
C Sp. Advanced Analysis of Sociological Data

714 Sociological Analysis of the Community U G 3
Sp. 3 cl.
Prereq.: 505 or 614 or equiv. and permission of instructor.
Methods, techniques, sources of data and objectives of community analysis. Jonassen.

725 Control and Prevention of Crime and Delinquency U G 3
W. 3 cl.
A 1 2-hr. cl. One field project.
Prereq.: 625.
Analysis of the operational effectiveness of special measures and programs pointed toward the control and prevention of crime and delinquency. Reckless.
(See National Security Policy Studies 801.)

808 Practicum in Sociological Research G 3
W, Sp. 3 cl.
Prereq.: 706 and 3 cr. hrs. in 707.
Supervised practical experience in the independent execution of sociological research, the application of appropriate analytical techniques, and preparation of research reports.

861 Seminars in Social Organization G 3
Prereq.: Two courses in social organization and permission of instructor.
A critical examination of selected theoretical and research problems in organizations functioning in the areas listed below.
A. Systems of Community Organization.
W. Small Groups; Educational Organizations.
Sp. Health Organizations.

864 Advanced Criminology G 3
Sp.
Prereq.: 625.
A critical study of the most important aspects of criminology. Reckless, Eyon.

865 Contemporary Sociological Theory G 3
Sp.
Prereq.: 660 or equiv.
A critical examination of problems and issues central to recent developments in sociological theory. Warshay, Vaughan.

899 Interdepartmental Seminar G 1-5
A, W, Sp, Su.
(See under Interdepartmental Seminars.)
Spanish

Office: 116 Derby Hall, 154 North Oak Drive.

PROFESSORS IBARBOC (Chairman), J. GRAY, JOSEPH, and J. SCHENBERG; ASSOCIATE PROFESSORS J. ARMITAGE, J. HANSCH, and J. LOVELOCK; ASSISTANT PROFESSORS ANGELO and MARTIN (Visiting).

401 Elementary Spanish U 5
A, W, Sp, Su. 5 cl.
Prereq.: 401.
May not be taken concurrently with French 401-402, Ital. 401-402. Not open to students who are not eligible to take Eng 414. Credit in 401 will be counted toward graduation only if followed by successful completion of 402, or if taken after successful completion of the fourth regular university course in another foreign language. Successful completion of 401, 415 and 416 fulfills language requirements.

402 Elementary Spanish U 5
A, W, Sp, Su. 5 cl.
Prereq.: 401.
May not be taken concurrently with French 401-402, Ital. 401-402. The elements of Spanish grammar, with oral and written exercises. Development of conversational skill. Reading, vocabulary building, attention to Spanish idioms.

403 Intermediate Spanish U 5
A, W, Sp, Su. 5 cl.
Prereq.: 402.
Continuation of Spanish grammar, attention to idioms. Reading of short stories, plays and novels.

404 Intermediate Spanish U 5
A, W, Sp, Su. 5 cl.
Prereq.: 403.
Reading of Spanish plays, short stories, and novels. Emphasis on oral practice and Spanish idioms.

410 Elementary Spanish Conversation and Composition U 5
A, W, Sp, Su. 5 cl.
Prereq.: 404.
Course conducted in Spanish.

Intensive practice in oral and written Spanish, based on texts and periodicals concerned with contemporary Spain and Spanish America. Grammar and idiom review.

415 Elementary-Intermediate Spanish for Selected Students U 5
W. 5 cl.
Prereq.: Grade of A in 401 and permission of department.
Successful completion of 415 fulfills language requirements and satisfies prerequisites for 500 courses.

416 Elementary—Intermediate Spanish for Selected Students U 5
Sp. 5 cl.
Prereq.: 415.
Successful completion of 415 fulfills language requirements and satisfies prerequisites for 500 courses.

510 Introduction to Modern Spanish Literature U 5
A, W, Sp, Su. 5 cl.
Prereq.: 404.
Reading and discussion of important modern works.

518 Review Grammar and Composition U 3
A, W, Sp. 3 cl.
Prereq.: 410.
Review of Spanish grammar; composition on assigned topics and practice in translation.

519 Spanish Pronunciation U 5
A, W, Sp. 3 cl.
Prereq.: 410.
Abundant practice with corrective exercises. Some attention to problems of teaching pronunciation.

521 Spanish Conversation and Composition U 3
A, Sp. 2 cl.
Prereq.: 410.
Vocabulary building, practice in speaking Spanish, conversation and composition dealing with aspects of Spanish life.

522 Intermediate Spanish Conversation and Composition U 3
W. 2 cl.
Prereq.: 410.
Vocabulary building, practice in speaking Spanish, conversation and composition dealing with aspects of Spanish and Spanish American life. French, Pardo.

531 Prose Fiction and Essays U 5
A, Sp. 5 cl.
Prereq.: 517.
Reading and discussion of various types of modern prose fiction and essays.

532 Drama and Poetry U 5
W. 5 cl.
Prereq.: 517.
A selection of plays and poems representing the principal movements and tendencies of the modern period. Babcock.

570 Spanish Literature in English U 5
Translation
A. 5 cl.
Not open to Spanish majors.
Selection of major works in Spanish literature in English translation from the early Renaissance period to the present. Babcock.
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>571</td>
<td>Reading of Spanish (Basic)</td>
<td>G 0</td>
<td>A, W, Sp, Su. 5 cl. Prereq.: Graduate standing. Repeatable.</td>
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<td>Designed primarily for students who have no formal preparation in Spanish, covering basic grammar and vocabulary.</td>
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<tr>
<td>572</td>
<td>Reading of Spanish (Intermediate)</td>
<td>G 0</td>
<td>A, W, Sp, Sp. 3 cl. Prereq.: Grade of C or above in 571, or equivalent preparation demonstrated by a placement test. Repeatable twice.</td>
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<td>Satisfactory completion of this course (grade of A or B) will be accepted as evidence of a dictionary reading knowledge to fulfillment of Ph.D. language requirement.</td>
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<tr>
<td>573</td>
<td>Reading of Spanish (Advanced)</td>
<td>G 0</td>
<td>A, W, Sp, Su. 3 cl. Prereq.: Grade of A or B in 572, or equivalent preparation demonstrated by a placement test. Repeatable twice.</td>
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<td>Satisfactory completion of this course (grade of A or B) will be accepted as evidence of a thorough reading knowledge in fulfillment of Ph.D. language requirement.</td>
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<tr>
<td>605</td>
<td>Advanced Composition and Conversation</td>
<td>U G 3</td>
<td>W, Sp, Su. 3 cl. Prereq.: 518 and 521 or 522.</td>
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<td>This course is conducted in Spanish. Its subject matter will be for the most part the history, customs, and manners of Spain and Spanish America.</td>
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<tr>
<td>607</td>
<td>The Spanish Novel of the Nineteenth Century</td>
<td>U G 5</td>
<td>A. 4 or 5 cl. Prereq.: 517 and 531 or 532.</td>
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<td>A study of the development of the modern Spanish novel with particular attention to the works of Pérez Galdós.</td>
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<td>608</td>
<td>Contemporary Spanish Fiction</td>
<td>U G 3</td>
<td>A. 3 cl. Prereq.: 517, 531 or 532.</td>
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<td>A study of Spanish narrative prose from the generation of '98 to the present time.</td>
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<tr>
<td>610</td>
<td>Modern Drama</td>
<td>U G 3</td>
<td>W. 3 cl. Prereq.: 517 and 531 or 532.</td>
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<td>A survey of European drama at the beginning of the century and a detailed study of the Spanish dramatists from Benavente to Alfonso Sastre. Frosch.</td>
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<tr>
<td>611</td>
<td>Drama of the 16th and 17th Centuries</td>
<td>U G 5</td>
<td>W. 5 cl. Prereq.: 517 and 531 or 532.</td>
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<td>An intensive study of a limited number of plays of the representative dramatists of the 16th and 17th centuries.</td>
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<tr>
<td>612</td>
<td>Poetry of the 16th and 17th Centuries</td>
<td>U G 5</td>
<td>W. 5 cl. Prereq.: 10 cr. hrs. in Spanish literature at the 500 level.</td>
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<td>Major poets and movements of the 16th and 17th centuries.</td>
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<tr>
<td>613</td>
<td>Prose of the 16th and 17th Centuries</td>
<td>U G 5</td>
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<td>Sp. 4 or 5 cl. Prereq.: 517 and 531 or 532.</td>
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<td>Selected prose works by major Renaissance and Baroque authors.</td>
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<td>614</td>
<td>Cervantes</td>
<td>U G 5</td>
<td>W. 4 or 5 cl. Prereq.: 517 and 531 or 532.</td>
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<td>An intensive study of Don Quijote.</td>
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<td>617</td>
<td>Modern Spanish Syntax</td>
<td>U G 5</td>
<td>A. Sp. 5 cl. Prereq.: 517, 518 and 521 or 522.</td>
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<td>Systematic study of Spanish grammar with composition and other exercises based on contemporary authors. Modern tendencies in syntactic analysis.</td>
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<tr>
<td>620</td>
<td>Spanish Phonetics</td>
<td>U G 5</td>
<td>A. 4 cl. hrs., 1 hr. lab. Prereq.: 517 or 518, 519 and 521 or 522.</td>
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<td>A detailed analysis of the phonological structure of Spanish and a contrastive comparison with English. Practical problems of pronunciation and of teaching are stressed. Grifìn.</td>
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<td>631</td>
<td>Romanticism in the Hispanic World</td>
<td>U G 3</td>
<td>A. 3 cl. Prereq.: 517 and 531 or 532.</td>
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<td>A study of dramatists, poets, novelists, and essayists designed to bring out the literary unity of the Hispanic world in the Romantic period.</td>
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<tr>
<td>637</td>
<td>Spanish American Literature through Romanticism</td>
<td>U G 5</td>
<td>A. 5 cl. Prereq.: 10 cr. hrs. in Spanish literature at the 500 level.</td>
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<td>A study of the chronicles and main trends in colonial Spanish American literature. Works of loca Garciabo, Sor Juana and Alarcón will be included. Frosch.</td>
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<tr>
<td>638</td>
<td>Spanish American Literature since Romanticism</td>
<td>U G 5</td>
<td>W. 5 cl. Prereq.: 10 cr. hrs. in Spanish literature at the 500 level.</td>
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<td>The advent of 'americanismo literario'. A study of the romantics and the schools that followed up to 'modernismo'. Frosch.</td>
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<tr>
<td>639</td>
<td>Contemporary Spanish American Fiction</td>
<td>U G 3</td>
<td>Sp. 3 cl. Prereq.: 517 and 531 or 532.</td>
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<td>The development of narrative prose in Spanish America from 1920 to the present.</td>
</tr>
<tr>
<td>640</td>
<td>The Generation of 1898</td>
<td>U G 3</td>
<td>W. 3 cl. Prereq.: 517 and 531 or 532.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Readings in fiction, poetry and the essay from such authors as Unamuno, Azorin, Valle-Inclán, Baraja, A. Machado and J. R. Jiménez.</td>
</tr>
<tr>
<td>641</td>
<td>Contemporary Hispanic Poetry</td>
<td>U G 5</td>
<td>Sp. 5 cl. Prereq.: 517 and 521 or 532.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Currents of Spanish and Spanish American poetry from Rubén Darío to the present time.</td>
</tr>
</tbody>
</table>
### Courses of Instruction

#### Spanish

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Title</th>
<th>Credits</th>
<th>Description and Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>645</td>
<td>Spanish I, Literature</td>
<td>U G 3-5</td>
<td>Su. 5 cl. Prereq.: 517 and 531 or 532. Repeatable to a maximum of 15 cr. hrs.</td>
</tr>
<tr>
<td>705</td>
<td>Honors Course in Spanish</td>
<td>U 3-10</td>
<td>A. Conference, library or phonetics laboratory arr. Prereq.: 4th yr, standing with a record of C in at least half of the Spanish courses and an average of B in the remainder, and permission of the department. This course offers undergraduates with special aptitudes a greater opportunity to do independent study than is possible in the ordinary course.</td>
</tr>
<tr>
<td>706</td>
<td>Honors Course in Spanish W</td>
<td>U 3-10</td>
<td>Prereq.: 705. Continuation of 705.</td>
</tr>
<tr>
<td>707</td>
<td>Honors Course in Spanish Sp</td>
<td>U 3-10</td>
<td>Prereq.: 706. Continuation of 706.</td>
</tr>
<tr>
<td>729</td>
<td>History of the Spanish Language</td>
<td>U G 3</td>
<td>A. 3 cl. Prereq.: M.A. candidacy or permission of instructor. A survey from Roman times to the present with emphasis on cultural and social factors. The relation of language to literature.</td>
</tr>
<tr>
<td>730</td>
<td>Introduction to Medieval Literature</td>
<td>G 3</td>
<td>Sp. 3 cl. Prereq.: M.A. candidacy or permission of instructor. Selected readings in Spanish poetry and prose from the beginnings to the end of the fifteenth century, partly in modernized versions.</td>
</tr>
<tr>
<td>731</td>
<td>Introduction to Methods in the History and Criticism of Literature</td>
<td>G 5</td>
<td>W. 5 cl. Selected readings in basic literary history, criticism, and theory, with practice in the use of standard bibliographical aids to scholarship.</td>
</tr>
<tr>
<td>806</td>
<td>Old Spanish II</td>
<td>G 3</td>
<td>Sp. 3 cl. Prereq.: 805. A continuation of Old Spanish I, with attention to syntax, vocabulary and dialectology. Griffith.</td>
</tr>
<tr>
<td>816</td>
<td>Seminar in Spanish Literature</td>
<td>G 2-5</td>
<td>A, Su. Prereq.: Permission of instructor.</td>
</tr>
<tr>
<td>817</td>
<td>Seminar in Spanish Literature</td>
<td>G 2-5</td>
<td>W, Su. Prereq.: Permission of instructor. Su. (2nd term)</td>
</tr>
<tr>
<td>821</td>
<td>Old Spanish Literature</td>
<td>G 3</td>
<td>W. A literary approach to medieval poetry and prose.</td>
</tr>
<tr>
<td>880†</td>
<td>Bibliography and Method</td>
<td>G 3</td>
<td>Sp. A course to acquaint graduate students with problems, tools, and methods of linguistic and literary research.</td>
</tr>
</tbody>
</table>

### Speech

**Office:** 205 Derby Hall, 154 North Oakland Drive.

**Professors:** Yeager (Chairman), Black, Bowen, Fotheringham, Harding, Huestetler, Hull, Irwin, Knowler, Lewis, Lynch, Malin, McDowell, Moser, Schlangen, Summers (Emeritus), and Wiley (Emeritus); Adjunct Professor Abernathy; Associate Professors Brittin, Brooks, Crepeau, DeWeey, Ewing, Coff, Monaghan, Hickey, Schreck, and Stromsta; Assistant Professors Brennan, Crawford, Glancy, Morrow, Rieke, and Ritter.

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>402</td>
<td>Group Discussion</td>
<td>U 5</td>
<td>A, W, Sp. Su. 5 cl. Designed to develop the attitudes, skills, and knowledge of methods favorable to effective participation in discussion by committees, conferences, and other small groups. Brooks and Staff.</td>
</tr>
<tr>
<td>405</td>
<td>Speech for International Students</td>
<td>U 5</td>
<td>A, W, Sp. 5 cl. Often taken in conjunction with Eng. 402. Assignment to both English and the appropriate Speech course is made on the basis of examinations given at the beginning of each quarter to all new students whose native language is not English. Black, Coff, Singh.</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Notes</td>
</tr>
<tr>
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</tr>
<tr>
<td>410</td>
<td>Personal Speech and Hearing</td>
<td>U 0 or 3</td>
<td>Rehabilitation&lt;br&gt; A, W, Sp, Su. 5 cl. Credit shall not count toward graduation. For students with speech or hearing disorders. Repeatable.</td>
</tr>
<tr>
<td>410A</td>
<td>Articulation</td>
<td>U 0</td>
<td></td>
</tr>
<tr>
<td>410B</td>
<td>Voice</td>
<td>U 0</td>
<td></td>
</tr>
<tr>
<td>410C</td>
<td>Stuttering</td>
<td>U 0</td>
<td></td>
</tr>
<tr>
<td>410D</td>
<td>Impaired Hearing</td>
<td>U 0</td>
<td></td>
</tr>
<tr>
<td>410E</td>
<td>Foreign Dialect</td>
<td>U 0</td>
<td>Coff, Stromsta, Irwin, Moser, Wallace, Asp.</td>
</tr>
<tr>
<td>416</td>
<td>Introduction to Speech</td>
<td>U 2</td>
<td>A, W, Sp, Su. 2 cl. This course is designed for students who wish to have a broad overview and understanding of the field of speech. Brooks and Staff.</td>
</tr>
<tr>
<td>504</td>
<td>Speech Functions and Responsibilities of the Teacher</td>
<td>U 3</td>
<td>A, W, Sp, Su. 3 cl. A study of speech and hearing deviations commonly found in classrooms and of the teacher's role in an improvement program. Schlanzer and Staff.</td>
</tr>
<tr>
<td>505</td>
<td>Fundamentals of Oral Interpretation</td>
<td>U 5</td>
<td>A, W, Sp, Su. 5 cl. Introductory course to develop understanding and appreciation of literature through the oral re-creation of literary materials and critical listening. Brooks, Schenen.</td>
</tr>
<tr>
<td>508</td>
<td>The Speech Situation</td>
<td>U 2</td>
<td>A, Sp. 2 cl. A study of oral communication as a social process in terms of speaker-listener relationships. Fotheringham.</td>
</tr>
<tr>
<td>509</td>
<td>Personal Speech Effectiveness</td>
<td>U 2</td>
<td>A, W, Sp. 2 cl. Not open to students with credit for 517. Development of heightened speech effectiveness for students planning work in professions requiring special speech skills. Special attention to reading effectiveness, phrasing, emphasis, pronunciation and enunciation. Riley and Staff.</td>
</tr>
<tr>
<td>525*</td>
<td>Stage Make-Up</td>
<td>U 1</td>
<td>W. 1 3-hr. lab. Fundamentals of stage make-up for straight and character roles. Crepeau.</td>
</tr>
<tr>
<td>560</td>
<td>Radio and Television Speech</td>
<td>U 3</td>
<td>A, W, Sp. 5 cl. Speaking in the radio or television situation; basic training in preparation and presentation of radio and television talk, and interview materials. Lynch and Staff.</td>
</tr>
</tbody>
</table>

A-231
COURSES OF INSTRUCTION

SPEECH

566 Broadcasting Laboratory Practice
A, W, Sp. 1 cl., 1 3-hr. lab.
Pre.: 580 or equiv.
Repeatable to a maximum of 5 cr. hrs.
Experience in presentation of radio and television programs under
broadcasting conditions. Monaghan, Mall, Riley, Lynch.

571 Radio and Television Program
Departments
W, 3 cl.
Pre.: 560 or permission of instructor.
Not open to students with credit for 572.
Organization and functions of station program departments; staff
requirements, traffic, music library organization, and continuity
department operations. Mall.

580 Bases of Speech Production
A, W, Sp. 3 cl.
An analytical study of speech, particularly an orientation to the
psychological, neurological, physiological, physical, genetic, phonetic,
sociological, linguistic and semantic aspects of speech production.
Stemmler.

585 Introduction of Phonetics
W, Sp, Su. 3 cl.
Pre.: 560 recommended.
The International Phonetic Alphabet as applied to American
speech. Analysis of the physiological positions and movements

590 Speech Development in Children
W, Sp, Su. 3 cl.
Language growth from the first vocalization to the expression of
abstract thought. Deviations from the normal patterns are noted.
Goof, Braunn.

ACADEMIC CREDIT FOR EXTRA-CURRICULAR ACTIVITIES
University Speech Activity groups are open to all students in the
University. Students enroll and receive credit toward any
undergraduate degree for a total of six quarter credit hours in
Speech A and B. To enroll in Speech Activities programs students
should observe the following pre-registration before the close of
registration for any quarter: for tryouts to forensic activities, see
Mr. Rieke; for tryouts for theatre activities, see Mr. Dewey.
Do not register for these courses without written permission of
the instructor. Students accepted for the Forensic Activity group
will register for Speech A; those accepted for the Theatre Activity
group will register for Speech B.

A
Forensic Activities
A, W, Sp. A minimum of 3 hrs. of group participa-
tion each week.
Repeatable to a maximum of 6 cr. hrs.
Rieke.

B
Theatre Arts
A, W, Sp, Su.
Repeatable to a maximum of 6 cr. hrs.
Dewey.

GENERAL PREREQUISITES FOR COURSES NUMBERED
600 AND 700.
Not open to freshmen or sophomores. Unless otherwise indi-
cated the prerequisites for 600 and 700 courses are either thirty
quarter hours in not more than two allied subjects, or ten hours in
each of the 401-403 and 410-417 sequences are advisable.

601 The Forms of Public Address
W, Su. 3 cl.
The organization, style, and delivery of speeches for special
occasions. Baker.

603 Group Thinking and Conference
Leadership
A, Sp. 5 cl.
The methods and procedures employed in setting up conferences
and in leading conferences and committee discussion. Rieke.

610 Advanced Argumentation and
Debate
Sp. 5 cl.
Pre.: 470.
History of the theories of formal argument with study of represen-
tative examples or oral argumentation. Rieke.

Behavioral Aspects of
Language Disabilities
(See Education 613)

617 Problems of American Phonetics
Su. 3 cl.
Pre.: 585.
The chief problems treated are: phonetic symbols and diction-
aries, research in dialect, and phonetic analysis. Black.

620 Ancient Rhetorical Theory
A. 3 cl.
A study of the contributions of early Greek and Roman speech
teachers and theorists. Harding.

621 British Rhetorical Theory
W. 3 cl.
The contributions of British speech teachers and theorists from
the Renaissance to the present.

623 British Speakers and Speech
Making
Sp. 3 cl.
Pre.: 611.
Analysis and criticism of leading British speeches from the Ren-
aisance through World War II. Harding.

624 American Speakers and
Speech Making
Sp. 3 cl.
Pre.: 611.
Analysis and criticism of historic American Speeches.

626 Advanced Acting
W. 2 3-hr. cl.
Pre.: 522 or equiv.
Advanced study of the theories of acting as related to historical
and contemporary developments. Bowen.

627 Stage Design
A, Sp. 2 cl., 2 hrs. lab. arr.
Pre.: 541 or consent.
Principles of design as applied to dramatic production. Crepeau.

The Teaching of Speech in Secondary Schools
(See Education 627)
The Teaching of Dramatics and Oral
Interpretation in Secondary Schools
(See Education 628)

629 Stage Lighting
Sp. 2 cl., 1 3-hr. lab.
Pre.: 541.
Theories in the illumination of stage productions and the creation
of aesthetic effects. Dewey.
631 History of the Theatre U G 3
W,
3 cl.
Prereq.: Engl. 550 or 555; Engl. 670 recommended.
Greek, Roman, Medieval and Commedia dell'Arte Theatre. McDowell.

632 History of the Theatre U G 3
Sp.; Su.
3 cl.
Prereq.: Engl. 550 or 555; Engl. 670 recommended.

633 History of the Theatre U G 3
A.
3 cl.
Prereq.: Engl. 550 or 555; Engl. 670 recommended.

The Psychology of Speech (See Psychology 632)

The Psychology of the Audience (See Psychology 633)

641 History of Stage Costume U G 3
W.
2 cl., 2 hrs. lab. arr.
Prereq.: 631 or concurs.
History of costume from the Egyptian period through the 19th century. Crepau.

646 Stage Direction U G 5
W, Su.
3 2-hr. cl.
Theories and principles of play direction. Schrock.

651 Modern Theatre Styles U G 3
A, Su.
3 cl.
Prereq.: Engl. 670 or equiv.
Realistic and non-realistic styles in the modern theatre. Schrock.

652 Broadcast Programs and Audiences U G 3
A, Sp.
3 cl.
Broadcast program types, requirements of effective structure, listener characteristics and preferences in relation to program selection and listener attention. Mall, Riley.

654 Writing for Radio and Television U G 3
A, W.
3 cl.
Prereq.: 653, Engl. 505 or equiv.
Writing of continuing elements for non-dramatic radio and television programs of types presented on local stations. Riley, Lynch.

662 Television Drama U G 3
Sp.; Su.
3 cl.
Prereq.: 10 cr. hrs. in radio-television, theatre or dramatic literature.
Analysis of dramatic program types and scripts; study of their historical background and social significance. Writing of original scripts. Riley.

670 Radio and Television Program Planning U G 2
A, W, Su.
3 cl.
Prereq.: 658.
The planning of new programs for radio and television, to the format stage. Replanning programs already on the air, for increased effectiveness. Monaghan.

SPEECH

672 Television Programming U G 3
A.
3 cl.
Prereq.: 652.
Critical analysis and evaluation of television programs and program forms; factors considered in the over-all scheduling of programs on television stations. Mall.

677 Anatomy and Physiology of the Ear and Vocal Mechanisms U G 5
A, Sp.
5 cl.
The structure and functions of the speaking and hearing mechanisms. Stromata.

678 Hearing and Speech U G 3
W.
3 cl.
Prereq.: 652 or equiv. and Physics 645.
Theoretical concepts and supporting data of the process of hearing with particular reference to the reception of speech. Black.

682 Introduction to Audiology U G 3
A, W, Su.
3 cl.
Prereq.: 10 cr. hrs. in Speech and Psychol.
Introduces the student to the study of aberrant hearing. Information on prevalence, causes, types, and effects of impairments of hearing. LaCourse.

683 Speech Reading U G 3
W, Su.
5 cl.
Prereq.: 580, 585, 682.
Study of major theories of speech reading. LaCourse, Moser, Wallace.

684 Speech Reading Clinic U G 2 or 3
A, W.
3 cl.
Prereq.: 683.
Repeatable one time.
Clinical application of principles studied in 683. Stromata, Wallace.

688 Audiometry: Principles and Practices U G 3
W, Sp., Su.
3 cl.
Prereq.: 682.
Study of the functional tests of hearing including individual and group screening and threshold tests. LaCourse.

689 Theories of Language Development of the Deaf U G 3
A.
3 cl.
Prereq.: 590, Psychol. 609.
Study of the communicative processes of acoustically handicapped individuals: symbolization, meaning, syntax. Brannon.

690 The Pre-School Deaf Child U G 3
Su.
3 cl.
Prereq.: 590, Ed. 611, 650.
Study of the problems of communication of the deaf child. Brannon.

693 Theories of Speech Development of the Deaf U G 3
W.
3 cl.
Prereq.: 580, 585, 689.
Study of the development of speech under conditions of minimum auditory stimulation and acoustic feedback. Brannon.

694 Speech Disorders Survey U G 3
A, Sp.
3 cl.
Prereq.: 580, 585, and 590.
Introduces the student to the study of disorders of speech. Information on prevalence, causes, types, and effects. Moser, Schlanger.

A-233
695 Speech Pathology I U G 3
W, Su. 3 cl.
Prereq.: 677, 694.
Consideration of the deviant voice and articulation that accompa-
nies cleft palate, cerebral palsy, maxillo-facial injuries, and
other physical disabilities. Mason.

696 Speech Pathology II U G 3
Sp. 3 cl.
Prereq.: 694 and 10 cr. hrs. in Psychol.
Consideration of psychological aspects of speech disorders, in-
cluding stuttering and psychogenic disabilities. Irwin.

697 Clinical Principles of Speech U G 2-5
Therapy
W, Su. (A) 3 cl., (B) 2 cl.
Prereq.: 694.
A study of the examination, diagnosis, and correction of speech
disorders. Irwin.

697A Study of Theories and Practices in Speech Therapy
for Vocal and Articulatory Disorders of Children and Adults

697B Principles, Methods, and Basic Tools in the Diagnosis
and Appraisal of Children and Adults with Speech Disorders.

698 Clinical Practice in Speech U G 2 or 3
Therapy
W, Sp, Su. 5 cl., other hrs. arr.
Prereq.: 417, 685, 697 or permission of instructor.
Repeateable one time.

700 Minor Problems in Speech U G 1-5
A, W, Sp, Su. Conf., library and lab. work.
Prereq.: Permission of instructor.
Repeatable to a maximum of 15 cr. hrs.
Tests and Measurements in Speech Education
(See Psychology 704)

705 Areas and Techniques of Research in Speech U G 3
A, Su. 3 cl.
Prereq.: 25 cr. hrs. in Speech.
A review and critical commentary on typical methods of research
in each of the principal areas of graduate research in speech.
Research reports. Knowl.

710 Contemporary Speeches U G 3
W. 3 cl.
Analysis of important speeches delivered since World War II.

727 Period Scene Design U G 3
W. 2 cl., 3 hrs. lab.
Prereq. or concur.: 627 and 631, 632, 633.
Advanced study in the aesthetics of stage design related to major
historical periods. Crepeau.

735 Theatrical Criticism U G 5
Sp. 5 cl.
Prereq. or concur.: one of the following: Engls. 676, or 677, or 670.
Critical theories from the Greek to the modern period with par-
ticular reference to the influence of the theorists, church, state,
and press. McDowell.

740 Theater Organization and Management U G 3
W. 3 cl.
Organization and management of the school, college, church, and
community theater. Glazcy.

741 Costume of Period Drama U G 2
Sp. 1 cl., 3 hrs. lab.
Prereq.: 641 and 651, 653, or concur.
An intensive study of the design factors requisite to the successful
costuming of the plays of major historical periods. Crepeau.

743 Children's Theatre U G 3
A, W, Su. 3 cl.
Prereq. or concur.: 646.
Directing and producing plays for children. Lewis.

745 Advanced Theater Direction and Production
Sp. 3 2-hr. cl.
Prereq.: 646.
Advanced theory of play direction in the educational theater.
Class members will produce a modern or an historical play for
public presentation. Bowes.

760 Radio and Television Program Policies
Sp. 3 cl.
Standards applied by networks and stations; effect on program
standards of FCC regulatory activities, court decisions, and
industry codes. Mall.

764 Advanced Writing for Television U G 2
Sp. 3 cl.
Prereq.: 654 or equiv. and 763.
Advanced course in writing of program continuities for television
in format form, partial script form and complete script form.
Monaghan.

765 Television Production and Direction
A, W, Su. 2 cl., 1 3-hr. lab.
Prereq.: 10 cr. hrs. in radio-television courses, including
555 or equiv.
Introduction to the art of television production; experience in
the direction of short program units. Lynch.

766 Advanced Television Production and Direction
Sp. 4-6 lab. hrs.
Prereq.: 765 and permission of instructor.
Repeatable to a maximum of 4 cr. hrs.
Advanced theories and techniques of television production and
direction; experience in producing and directing longer program
units. Lynch and Staff.

775 Hearing Aids and Auditory Training U G 3
W. 3 cl.
Prereq.: 682, 684.
Operational principles of individual and group amplification sys-
tems for those with hearing impairments. Stromata.

776 Hearing Aids and Auditory Training Practicum
Sp. 3 cl.
Prereq.: 775.
Repeatable one time.
Clinical application of principles studied in 775. Stromata.

778 Experimental Phonetics U G 3-5
Sp. 3 cl., 2 2-hr. labs.
Prereq.: 585, 578 or permission of instructor.
Repeatable to a maximum of 5 cr. hrs.
A study of laboratory investigations of phonetic problems as they
are related to functional speech. Singh.
Curricular and Instructional Adjustment for the Deaf Child

A W, Sp, Su. 3 cl.
Prereq.: 690, Ed. 735.
Laboratory projects directed toward the development of language, silent reading, lip-reading among deaf children. Brannon.

Advanced Clinical Practice in Speech, Hearing and Instruction of the Deaf
A, W, Sp, Su. 1 cl., 3 clinical hrs. for each hour of credit per week.
Each practicum 1-2 hrs. per qtr., repeatable to a maximum of 6 cr. hrs.
Include letter with number on schedule card.

a. Diagnosis and Appraisal in Speech Pathology
  W, Su.
  Prereq.: 698, 688, and 10 hours of psychology, or permission of instructor.
  Irwin.

b. Stuttering
  Prereq.: 698 and 10 hrs. in Psychol., or permission of instructor.
  Stromsta, Asp.

c. Cleft Palate and Laryngeal Speech Disorders
  A, W, Su.
  Prereq.: 695, 880C or permission of instructor.
  Moser, Schlanger.

d. Cerebral Palsy and Aphasia
  A, W, Sp, Su.
  Prereq.: 695, 880K or permission of instructor.
  Moser, Schlanger.

e. Foreign Accent
  Prereq.: 583 or permission of instructor.
  Black, Goff, Singh.

f. Voice
  A, W, Sp, Su.
  Prereq.: 697 or permission of instructor.
  Moser, Irwin.

g. Articulation
  A, W, Sp, Su.
  Prereq.: 697 or permission of instructor.
  Goff.

h. Parent Education and Counseling
  A, W, Sp, Su.
  Prereq.: 697 and 10 cr. hrs. of psychol. or permission of instructor.
  Irwin, Goff.

i. Aural Rehabilitation
  A, W, Sp, Su.
  Prereq.: 684, 880H or permission of instructor.
  Black, Stromsta, Wallace.

j. Diagnostic Audiology
  A, W, Sp, Su.
  Prereq.: 685, 880F or permission of instructor.
  Black, La Georges, Stromsta.

k. Speech Reading and Auditory Training of the Deaf
  A, W, Sp, Su.
  Prereq.: 781 or permission of instructor.
  Black, Crawford, Stromsta.

Seminars in Education
(See Education 800)
k. Educational Theatre
   Su. (2nd term).
l. Theatre History
   Su.
   McDowell.

860 Seminar in Radio and Television Programming
   A, W, Sp, Su. 3-4 cr.
   Repeatable.
   a. The History and Development of American Television
      A.
      Lynch.
   b. Viewer Gratifications in Media Selection
      A.
      Monaghan.
   c. The Documentary in Broadcasting
      W.
      Mall.
   d. The History of Broadcast Drama
      W.
      Riley.
   e. Film in American Television
      Sp.
      Lynch.
   f. Community Antenna Television (CATV)
      Sp.
      Mall.
   g. Broadcasting and the Secondary School
      Su. (1st term).
      Lynch.
   h. Research Methods in Broadcasting
      Su. (1st term).
      Monaghan.
   i. Freedom and Responsibility in Broadcasting
      Su. (2nd term).
      Mall.
   j. Propaganda in Broadcasting
      Su. (2nd term).
      Knower.

877 Advanced Speech and Hearing Pathology
   W. 1 3-hr cr.
   Prereq.: 677, 678, 698.
   Major impairments traceable to diseases of the ear and vocal mechanisms in relation to the sources of rehabilitation. Schlinger and Medical Consultants to the Speech and Hearing Clinic.

880 Seminar in Speech and Hearing Science
   A, W, Sp, Su.
   Repeatable.
   a. The Application of Psychophysical Techniques to Speech and Hearing
      A.
      A. 1967.
   b. Comparative Phonetics and Dialect
      Su.
      Su. 1967.
   c. The Speech Manifestation of Facial Maxillary, and Laryngeal Disturbances.
      W, Su.
   d. Instrumentation for Speech and Hearing Science
      W, 1968.
   e. Clinical Approach to Persons with Phonetic and Vocal Disorders
      Sp.
   f. An Analytical Study of Special Screening, Diagnostic and Threshold Tests
      Sp.
   g. The Design of Experiments in Speech Hearing
      A.
   h. Auditory Training and Hearing Aids
      W.
   i. Psychogenic Disorders of Speech
      Sp, 1967.
   j. Speech and Language of Acoustically Handicapped Persons
      Su.
   k. Language Disorders of Brain-Damaged Persons
      Su.
   l. Communicative Disorders of Adults
      Su. 1968
   m. Communication Functioning of the Mentally Retarded
      A.
   n. Acoustic Spectrography for the Deaf
      Su.
   o. Speech Diagnostics
      Su.
      Su. 1968
      Black, Moser, Schlinger, Irwin, Stromau.

881 Seminar in the Nature of Oral Language
   Repeatable.
   Analysis of the bases of word symbols and meanings. The relationship of words and behavior to speech problems.
   a. Studies in Audience Behavior
      A.
      Knower.
   b. Cross-Cultural Communication
      W.
      Knower, Monaghan.
   c. Small Group Communication
      Sp.
      Monaghan.
   d. Symbol Systems and Human Behavior
      Su. (2nd term).
      Knower.

899 Interdepartmental Seminar
   (See Interdepartmental Seminars)

950 Research in Speech
   G Arr.
   A, W, Sp, Su.
   Research for thesis or dissertation purposes only.
SURVEY COURSES IN AGRICULTURE

K. Thoracic surgery, 1 month, offered all months except June.  P 6
L. Thoracic surgery-cardiovascular. 1 month, offered all months, except June.  P 6
M. Urology, 1 month, offered all months except June.  P 6

798 Internship in Surgery  P 18
A, W, Sp, Su.
12 months full time, beginning July 1.
Prereq.: Appointment as Intern, University Hospital.
Repeatable to a maximum of 72 cr. hrs.
Broad exposure to surgical principles and practices, one-half general surgery, one-half surgical specialties; experience in operating room, wards, and emergency room; rounds, conferences.

799 Residency in Surgery  P 18
A, W, Sp, Su.
12 months full time, beginning July 1.
Prereq.: Appointment as Resident, University Hospital.
Repeatable to a maximum of 360 cr. hrs.
Rotation through general surgery and surgical sub-specialties; rounds, conferences.

900 Seminar in Surgery  G 3 or 5
A, W, Sp, Su.
Attendance at Grand Rounds and weekly X-ray and pathological conferences is required. Students are responsible for the material presented.

950 Research in Surgery  G Arr.
A, W, Sp, Su.
Research for thesis purposes only.

Survey Courses in Agriculture

401 Survey of Agriculture  U 1
A, W, Sp, Su. 3 cr.
Prereq.: 1st qtr. standing in all curricula in the College of Agriculture except Home Ec.
A development of objectives and an exploration of curricula, opportunities, student services, study skills and resident instruction, research and extension. Ritchie, Vattine.

501 Survey of Agriculture  U 1
A, W, 1 cr.
Problems of employment in agriculture, business and industry; interviews; selection and application for positions. Bader.

502 Agricultural Honors Colloquium  U 2
W, 2 cr.
Prereq.: Enrollment in Agricultural Honors Program or permission of instructor.
The relationships of technology, science, and economics in agriculture to society. Discussions are led by faculty members or outside speakers. Ritchie.

A-237
Survey Courses in Arts and Sciences

401 Orientation to the College of Arts and Sciences
A, W, Sp, Su. 1 cl. every other week.
Prereq.: 1st yr. freshmen.
Conferees for orientation of new students in the University and the College of Arts and Sciences.

605† Foundations of Contemporary Civilization
A, Su.
A study of the major movements of thought in science, social philosophy, the humanities, and religion in the development of Western civilization. Brown.

608 Development of Modern Science
Sp. 5 cl.
Prereq.: 4th yr. standing.
The nature of science and its place in human culture as revealed by detailed sequences of discovery from the history of its development. LaRoque.

750 Arts-Graduate Course
A, W, Sp, Su.
Prereq.: Senior standing and approval by the Honors Committee of the College of Arts and Sciences and the Graduate School.
A grade of B or better will be given at the end of each quarter. At the conclusion of the program, course credits and final grades will be assigned.
Registration in this course constitutes full-time enrollment, unless otherwise specified.
A program leading to the simultaneous award of the Bachelor of Arts and Master of Arts degrees.

Survey Courses in Engineering

401 Elements of Engineering
A. 1 cl.
Prereq.: Eng. 1st yr. standing.
The nature of the engineering profession, the work of the professional engineer, and unique characteristics of the various branches of engineering.

402 Elements of Engineering
Sp. 1 cl.
Prereq.: 401.
Continuation of 401.

601† Engineering Concepts and Methods
Su. 3 cl., 2 2-hr. lab.
Prereq.: Chem. 408 or equiv., Math. 440, Physics 412 and 413.
Not open to students in the College of Engineering.
The science of professional engineering; methodology of engineering analysis and design and its relation to mathematics and physical sciences.

Survey Course in Social Work

401† Survey of Social Work
A, Sp. 1 cl.
Prereq.: Soc. Work 1st yr. standing or transfer students with less than 30 academic cr. hrs.
Function of social welfare services. Philosophy, vocational opportunities and qualifications for practice. Orientation to college life; study methods; time budgeting, scheduling and counseling. Placement services. ZuPanic.

Survey Courses in Commerce

401 Commerce College Orientation
Prereq.: Admission to College of Commerce and Administration with less than 45 quarter hours credit.

402 Business and Society
A, W, Sp. 3 to 5 cl.
Prereq.: Participation in the College of Commerce Junior Division Honors Program. Permission of instructor.
Repeatable to a maximum of 15 cr. hrs.

798 College Seminar
A, W, Sp. 2 to 5 cl.
Prereq.: Permission of instructor.
Repeatable to a maximum of 15 cr. hrs.
Veterinary Anatomy

Office: 102-A Sisson Hall, 1900 Coffey Road.
PROFESSORS IVENZE (Chairman) and DISEEM; ASSOCIATE PROFESSOR ANDRES; ASSISTANT PROFESSOR HOROWITZ; INSTRUCTOR LATSHAW.

451 Veterinary Anatomy

A. 5 cl.
Not open to Veterinary Medical Students.
Lectures and demonstration on specimens from the various anatomical systems of domestic animals. Horowitz.

610 Anatomy of Domestic Animals

A. 4 cl., 6 lab. hrs.
Prereq.: Vet. Med. 1st yr. standing.
The morphology of the cow, sheep, and goat. Diesen, Venske, Horowitz.

611 Anatomy of Domestic Animals

W. 4 cl., 6 lab. hrs.
Prereq.: Vet Med. 1st yr. standing and 610.
The morphology of the horse, pig, and fowl. Diesen, Venske, Horowitz.

616 Veterinary Histology

W. 3 cl., 4 lab. hrs.
The microscopic structure of the cell and fundamental tissues. Andres, Latshaw.

617 Veterinary Histology

Sp. 3 cl., 4 lab. hrs.
Prereq.: Vet. Med. 1st yr standing and 616.
The microscopic structure of organs. Andres, Venske, Latshaw.

618 Veterinary Embryology

A. 3 cl., 4 lab. hrs.
Prereq.: Vet. Med. 1st yr. standing.
The developmental anatomy of the chick, pig, cat, and dog. Venske, Andres, Latshaw.

620 Surgical Anatomy

Sp. 2 cl., 6 lab. hrs.
Prereq.: Vet. Med. 2nd yr. standing.
A thorough dissection of the dog and lecture-demonstrations on areas of special surgical significance in other animals. Diesen, Horowitz, Venske.

701 Minor Problems

A, W, Sp, Su. 1 cl., 6-15 lab. hrs.
Prereq.: 617, 618.
Training in laboratory investigation of special problems. Venske, Diesen, Andres.

751 Anatomical Techniques

A, W, Su. 1 cl., 6-15 lab. hrs.
Prereq.: 611, 617 or equivalent, and permission of the Instructor.
Repeatable to a maximum of 15 cr. hrs.
Theory and practice of macroscopic and microscopic methods, including specimen preparation for dissection, fixings, embedding, sectioning, mounting, and staining of animal tissue. Diesen, Venske, Andres.

755 Veterinary Endocrinology

A, W, Sp, Su. 3 cl., 4 lab. hrs.
Prereq.: Vet. Physiol. 610, 611 or Physiol. 601.
Special consideration is given to the correlation of the endocrine control of cellular metabolism. Venske.

950 Research in Veterinary Anatomy

A, W, Sp, Su.
Research for thesis or dissertation purposes only.
For participation in Clinical Instruction, see courses offered under Veterinary Clinics.

Veterinary Clinics

Office: 1009 Veterinary Clinic, 2576 Kenny Road.
IVERNON L. THARP (Director) and RICHARD L. RUDY (Associate Director).
Departments participating in Veterinary Clinics: Veterinary Anatomy; Veterinary Medicine; Veterinary Parasitology; Veterinary Pathology; Veterinary Physiology and Pharmacology; Veterinary Preventive Medicine; Veterinary Surgery and Radiology; Microbiology.

721 Veterinary Clinics

A. 7 2-hr. lab.
Prereq.: Vet. Med. 3rd yr. standing.
Not open to students with credit for 731.

722 Veterinary Clinics

W. 7 2-hr. lab.
Prereq.: 721.
Not open to students with credit for 732.

723 Veterinary Clinics

Sp. 7 2-hr. lab.
Prereq.: 722.
Not open to students with credit for 733.

724 Veterinary Clinics

Su. 7 24-hr. lab. duty, 1 cl.
Prereq.: 723.
Not open to students with credit for 740.
Intense training in clinical work for one term.

725 Veterinary Clinics

A, W, Sp. 7 24-hr. lab duty, 1 cl.
Prereq.: Vet. Med. 4th yr. standing.
2 quarters required.
Not open to students who have credit for 741.
COURSES OF INSTRUCTION
VETERINARY MEDICINE

Veterinary Medicine

Office: 1069 Veterinary Clinic, 3375 Kenny Road.
PROFESSORS: KRILL (Chairman), DODON- 
VAN, HENTHOINSE, VENZKE, and RHEINS; ASSOCIATE 
PROFESSORS DONHAM, WEARLY, WHITES, and LOEB; 
ASSISTANT PROFESSORS GARDNER, MARTIN, MURDICK, 
RAINER, WYMAN, CARSON, BAY, and STILSON.

620 Physical Diagnosis  P 2
Sp.  1 cl., 1 2-hr. lab.
Prereq.: Vet. Med. 2nd yr. standing.
To acquaint the student with the principles, techniques, and 
instrumentation required to conduct a thorough physical exami-
nation of all the domestic animals. Wearly, Murdick, Donovon, 
Martin, Wymen.

701 Minor Problems  P G 2-8
Prereq.: Vet. Med. 4th yr. standing. Adequate clinical 
training and permission of instructor.
Special problems in veterinary medicine. Wearly, Donovon, 
Tharp, Murdick, Whites.

719 Veterinary Practice  P 1
W.  2 cl.
Prereq.: Vet. Med. 4th yr standing.
To acquaint the student with veterinary laws, business practices, 
opportunities and responsibilities that will be thrust upon him at 
graduation. Whites.

720 Veterinary Practice  P 1
Sp.  2 cl.
Prereq.: 719.
Continuation of 719.

730 Diseases of Small Animals  P 3
A.  3 cl.
Prereq.: 620.
A study of the diseases of small animals with emphasis on the 
diagnosis and treatment. Donovon, Martin, Wymen.

731 Diseases of Small Animals  P 3
W.  3 cl.
Prereq.: 730.
Continuation of 730.

732 Diseases of Small Animals  P 3
Sp.  3 cl.
Prereq.: 731.
Continuation of 731.

735 Diseases of Large Animals  P 4
A.  4 cl.
Prereq.: 620.
A study of the diseases of large animals with emphasis on diag-
nosis and treatment. Wearly, Donham, Gardner, Rainier.

736 Diseases of Large Animals  P 3
W.  3 cl.
Prereq.: 735, 740.
Continuation of 735 and 740.

738 Obstetrics and Genital Diseases  P 5
Sp.  5 cl.
Prereq.: Vet. Med. 3rd yr. standing.
Lectures and demonstrations in obstetrics, diseases associated with 
reproduction and artificial insemination of domestic animals. 
Tharp, Murdick.

740 Diseases of Large Animals  P 4
A.  4 cl.
Prereq.: 620.
A study of the diseases of large animals with emphasis on diag-
nosis and treatment. Wearly, Murdick.

750 Ophthalmology  P G 3
Prereq.: 620, 732. Vet. Physiol. and Pharmacol. 610, 
611.
A study of the eye of domestic animals with emphasis upon 
diagnosis of the eye and the relation of this organ to general 
diseases. Donovon, Wymen.

950 Research in Veterinary Medicine  C Arr.
Research for thesis or dissertation purposes only.
For participation in Clinical Instruction, see courses offered 
under Veterinary Clinics.

Veterinary Parasitology

Office: 304 Sisson Hall, 1900 Coffey Road.
PROFESSOR 1.KOUTZ (Chairman); ASSOCIATE PROFESSOR 
1.GROVES, ASSISTANT PROFESSOR SCOTTHORN.
Open only to Students Registered in the College of 
Veterinary Medicine

623 Advanced Veterinary Parasitology  P G 2-5
Prereq.: 621, 622, or equiv., and permission of chair-
mans.
Repeatable to a maximum of 15 hrs.
A review of literature, detailed study of classification, morphology, 
life histories and economic importance of animal parasites. Koutz, 
Groves.

640 Veterinary Parasitology  P 4
Sp.  4 cl., 1 2-hr. lab.
Prereq.: Vet. Med. 1st yr. standing.
Lectures and demonstrations on the classification, structure, re-
production, habitat, life history, control and treatment of the 
nematode, cestode and trematode parasites found in domestic 
animals. Koutz, Groves.
642 Veterinary Parasitology
A. 3 cl., 1 2-hr. lab.
Prereq.: Vet. Med. 1st yr. standing.
Lectures and demonstrations on the classification, structure, reproduction, habitat, life history, control and treatment of the arthropods found in domestic animals. Kouts, Groves.

646 Veterinary Parasitology
W. 3 cl., 1 2-hr. lab.
Prereq.: Vet. Med. 1st yr. standing.
Lecture and demonstrations on the structure, reproduction, habitat, life history, control and treatment of the protozoal parasites found in domestic animals. Kouts, Groves.

701 Minor Problems
A, W, Sp, Su.
Kouts, Groves.

827 Seminar in Veterinary Parasitology

950 Research in Veterinary Parasitology
A, W, Sp, Su.
Research for thesis or dissertation purposes only.
For participation in Clinical Instruction, see courses offered under Veterinary Clinics.

Veterinary Pathology

Office: 307 Veterinary Pathology Bldg., 1925 Coffey Road.
PROFESSORS 1COLE (Chairman), 2FARRELL, 3GRIESEMER, and 1KOESTNER; ASSOCIATE PROFESSOR MARSH; ASSISTANT PROFESSORS CAPEN, KASZA, HOER, and McKISSICK; INSTRUCTOR STORTS.

610 Pathology Technic.
A, W, Sp, Su.
Prereq.: 621 or equiv. and permission of instructor.

621 General Pathology
A. 4 cl., 4 lab. hrs.
Prereq.: Vet. Med. 2nd yr. standing.
The principles of pathology, including etiology, reaction to injury, course and termination of disease. Emphasis on functional, chemical and morphological alterations in disease. Koestner, Wolf, Copeman.

622 Systemic Pathology
W. 4 cl., 4 lab. hrs.
Prereq.: 621.
Diseases of the nervous, endocrine, cardiovascular, hemic and lymphatic, digestive, respiratory, urinary, genital, musculo-skeletal and integumentary systems, and organs of special senses. Griesemer, Koestner, Storts, McKissick.

701 Minor Problems
A, W, Sp, Su.
Prereq.: 621 or equiv. and permission of instructor.

732 Avian Pathology
W. 3 cl.
Prereq.: 731.
Diseases of chickens, turkeys, caged birds, game birds, and water fowl. Marsh, Wolf.

733 Veterinary Clinical and Systemic Pathology
Sp. 4 cl., 4 lab. hrs.
Prereq.: 622.
Correlation of functional, morphological and chemical abnormalities in diseases of domestic and laboratory animals caused by toxic and radioactive materials, nutritional and metabolic disturbances, and infectious agents. Griesemer, Lack, Farrell.

776 Advanced Systemic Pathology
A, W, Sp, Su.
Prereq.: 610, 622, 701 or equiv., and permission of instructor.
An advanced study of animal diseases as they affect all organ systems of the body. Farrell, Koestner, Griesemer.

778 Veterinary Surgical Pathology
Sp.
Prereq.: 776, and permission of instructor.
Biopsy methods and diagnosis. Surgical specimens are studied, and emphasis is placed upon the correlation of lesions and functional pathology. Koestner.

786 Animal Oncology
A.
Prereq.: 776 or equiv. and permission of instructor.
A study of neoplasms occurring in animals, including identification, epidemiology, experimental production, cell culture, transplantation and biological behavior. Cole, Griesemer.

957 Seminar in Veterinary Pathology
A, W, Sp, Su.
Repeatable.

950 Research in Veterinary Pathology
A, W, Sp, Su.
Research for thesis or dissertation purposes only.
For participation in Clinical Instruction, see courses offered under Veterinary Clinics.
Veterinary Physiology and Pharmacology

Office: 351 Sisson Hall, 1900 Coffey Road.
PROFESSORS S. SMITH (Chairman), S. MARSH, B. REDDING, AND
P. POUNDEN; ASSOCIATE PROFESSORS B. POWERS AND R. HAM-
LIN; ASSISTANT PROFESSOR RAY.

516  Animal Physiology  U 5
Sp. 4 cl., 1 3-hr. lab.
Prereq.: Chem. 408 or Chem. 412.
Not open to students with credit for Vet. Physiol. 610 and 611.
Concepts and principles involved in the function of various body
systems and principles of growth and ageing will be considered.
C. R. Smith and Staff.

517  Animal Physiology  U 5
W. 4 cl., 1 3-hr. lab.
Prereq.: Chem. 408 or Chem. 412.
Not open to students with credit for Vet. Physiol. 622.
Comparative study of physiological concepts and principles in-
volved in reproduction and metabolism in various species of
domestic animals. C. R. Smith and Staff.

610  Physiology of Domestic Animals  P 5
Sp. 4 cl., 3 lab. hrs.
Prereq.: Vet. Med. 1st yr. standing.
Physiology of peripheral nerves, central nervous system, sense
organs, blood lymph, and special fluid systems of body. Redding.

611  Physiology of Domestic Animals  P 5
A. 4 cl., 3 lab. hrs.
Physiology of the cardiovascular and respiratory systems, digestion
in the simple stomach and rumen. Smith, Hamlin, Ray.

622  Physiology of Domestic Animals  P 5
W. 4 cl., 3 lab. hrs.
Prereq.: 632.
Physiology of digestion, metabolism; renal physiology, reproduc-
tion, and endocrinology. Powers, Ray.

630  Veterinary Pharmacology  P 5
A. 5 cl.
Pharmaceutical standards and preparations, metrology, pharmacology,
prescription writing, basic principles of pharmacodynamics, drugs
acting on the neuromuscular systems, skin and mucous mem-
branes and digestive tract of domestic animals. Redding, Powers, Ray.

632  Veterinary Pharmacology  P 4
W. 4 cl.
Anti-infective drugs. Hormones used as drugs, drugs affecting
fluid and electrolyte balance and drugs acting on the cardio-
vascular system of domestic animals. Powers, Ray, Smith, Redding.

701  Minor Problems  P G 3-15
A, W, Sp, Su.
Prereq.: 622 and 632 or equiv. and permission of instruc-
tor.
Smith, Redding, Poudam, Powers, Hamlin.

950  Research in Veterinary Physiology and Pharmacology  G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.
For participation in Clinical Instruction, see courses offered under
Veterinary Clinics.

Veterinary Preventive Medicine

Office: 232 Sisson Hall, 1900 Coffey Road.
PROFESSORS HELWIG (Chairman), L. JONES, I. TITZIN, and
H. BOHL; ASSOCIATE PROFESSORS HAMDY; ASSISTANT PROF-
ESSORS KREIDER and ROBINSON, INSTRUCTORS BULLER,
LINERODE, and LIBBY; LECTURERS ADAMS, BENDER,
KRAMER, WITTICH, GOLDSTEIN, and RUSSELL.

452  Basic Animal Hygiene  U 3
A. 3 cl.
Prereq.: 2nd yr. standing.
Causes of disease and the relationship of these causes to the
animal's environment. Helwig, Jones, Buller, Linerode.

453  Applied Animal Hygiene  U 3
W. 3 cl.
Prereq.: 452 or equiv.
Various common diseases responsible for losses to the livestock
industry, with emphasis on control. Helwig, Jones, Buller, Linerode.

620  Hygiene and Environmental Sanitation  P 3
A. 3 cl.
Prereq.: Vet. Med. 3rd yr. standing.
A disease prevention study of the environmental factors which
have a direct influence on animal and human health. An intro-
duction to epidemiology and biostatistics. Helwig, Jones, Buller,
Linerode.

701  Minor Problems  P G 2-5
A, W, Sp, Su.
Prereq.: 620, and permission of instructor.
Helwig, Jones.

730  Biological Research Techniques  P G 3
A, W, Sp. 2 2-hr. cl. and lab.
Prereq.: Advanced standing in biological sciences, Microbiol. 607 or equiv., and permission of instructor.
The more common laboratory animals used in biological research and
testing will be dealt with as they relate to research purposes,
design, and application. Staff.

740  Applied Preventive Medicine  P 15
A, W, Sp. Full time off-campus cl. and lab.
Intensive practical training: Public Health and Food Hygiene,
meat inspection, Federal and State Disease Control Programs,
and Herd Disease Management. Department Staff and Cooper-
ing Governmental Agencies.

742  Food Hygiene and Public Health  P 4
Sp. 3 cl., 2 2-hr. lab.
Prereq.: Vet. Med. 3rd yr. standing or permission of instructor.
Principles and practices of food sanitation with emphasis on the
veterinarian's role in protecting the public food supply. Staff.

745  Prevention and Control of Communicable Diseases  P 3
A. 3 cl.
Prereq.: Vet. Med. 3rd yr. standing or permission of instructor.
The prevention of animal communicable diseases based on con-
temporary medical knowledge is correlated with administrative
control and public health. Helwig and Staff.
WELDING ENGINEERING

730  Germfree and Gnotobiotic Animals  P  C  G  5
W, Sp.  3-2 hr. cl. and lab.
Preq.: Advanced standing in biological sciences, Microbiol. 607 or equiv., and permission of instructor.
The instrumentation of biological research through application of germfree and gnotobiotic animals. Henrthorne and Staff.

800  Seminar in Veterinary Preventive Medicine  G  1

810  Veterinary Public Health  G  3-8
A, W, Su.
Helsigel, Jones, Russell.

950  Research in Veterinary Preventive Medicine  G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.
For participation in Clinical Instruction, see courses offered under Veterinary Clinics.

Veterinary Surgery and Radiology

Office: 1185 Veterinary Clinic, 2478 Kenny Road.
PROFESSORS: RUDY (Chairman), GUARD (Emeritus), and JOHNSON; ASSOCIATE PROFESSORS: GABLE, HOENICK, and WILSON; INSTRUCTORS: HEATH and PENNOCK.

623  General Surgery  P  5
Sp.  4 cl., 2 2-hr. lab.
Preq.: Vet. Med. 2nd yr. standing.
Lectures, recitations and demonstrations of surgery. Rudy, Gabel.

701  Minor Problems  P  G  1-5
A, W, Sp, Su.
Preq.: Vet. Med. 4th yr. standing.
Advanced work in surgery and radiology. Rudy, Johnson, Roenigk, Gabel.

731  Veterinary Radiology  P  2
A.  2 cl., 2-hr. lab.
Preq.: Vet. Med. 3rd yr. standing.
Presentation of the principles of diagnostic and therapeutic radiology, including nuclear medicine. Laboratory demonstrations include interpretation of radiographs and radiological technique and protection. Roenigk, Pennock.

732  Special Surgery  P  6
W.  6 cl.
Preq.: 633, 731.

733  Special Surgery  P  6
Sp.  6 cl.
Preq.: 732.
Continuation of 732. Johnson, Gabel, Heath.

741  Surgical Operations  P  1
A, W, Sp.  1 4-hr. lab.
Preq.: 733.
Surgical exercises.

950  Research in Veterinary Surgery or Veterinary Radiology  G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.
For participation in Clinical Instruction, see courses offered under Veterinary Clinics.

Welding Engineering

PROFESSORS: 1McCAULEY (Chairman), 1GREEN, and 1McMASTER; ASSOCIATE PROFESSORS: 1FUNK and 1JACKSON; INSTRUCTOR and LECTURER.

415  Forging, Heat Treating, and Welding  U  3
A, W, Sp.  3 cl., 3 1-hr. lab.
Not open to students with credit for 418.
Safety glasses must be worn in the laboratory.
Welding fundamentals and applications. Intended for students not having an engineering background. Laboratory work designed to augment classroom discussions and provide basic welding skills.

449  Practical Experience in a Welding Organization  U  6
A.  Ten weeks during the Su. Qtr.
Preq.: Weld E, 3rd yr. standing.
Experience in an engineering organization and the preparation of an acceptable report on the organization and the work done before beginning the 4th yr.

610  Applied Engineering Analysis  U  4
A.  3 cl., 1 3-hr. lab.
Preq.: Physics 533 and Math. 544.
The analysis of engineering systems by the application of fundamental principles of conservation of matter and energy, and operational techniques. McMaster.

640  Welding Engineering Inspection Trip  U  2
Sp.  One week between the W. and Sp. Qtr.
Safety glasses are required.
A group visit to various industrial plants. The plants selected are generally grouped in one community. A written report is required.
WELDING ENGINEERING

646 Welding Science and Its Application U G 3
W. 3 cl.
A study of the engineering fundamentals of welding. Design, materials, and processes are considered as related to the welding field. Green.

649 Practical Experience in Welding Industry U 6
A. Ten weeks during the Su. Qtr.
Prereq.: Weld. E 4th yr. standing.
Experience in an engineering organization and the preparation of an acceptable report on the organization and the work done before beginning 5th yr.

701 Physics of Welding U G 4
A. 3 cl., 1 3-hr. lab.
The application of basic principles in the welding processes. McCueley.

702 Principles of Resistance Welding U G 4
W. 3 cl., 1 3-hr. lab.
Prereq.: 610 and Elec. E. 644.
Theory and operation of resistance welding equipment, power supplies, electronic controls, welding codes and schedules, and process controls. McMaster.

703 Nondestructive Testing U G 4
A. 3 cl., 1 3-hr. lab.
Principles, equipment, techniques, and interpretation of nondestructive test with X-rays, radiotopes, magnetic fields, penetrants, ultrasonics, eddy currents, and other probing media, with materials serviceability, evaluation. McMaster.

739 Principles of Welding U G 4
Sp. 3 cl., 1 3-hr. lab.
Theory, equipment, techniques, and control of fusion welding with electric arc, gas, and other processes. Welding codes and specifications. Application of electrodes and processes. McMaster.

740 Welding Engineering Inspection Trip U 2
Sp. One week between the W. and Sp. Qtrs.
Safety glasses are required.
A group visit to various industrial plants. The plants selected are generally grouped in one community. A written report is required.

741 Theory of Welding U G 5
W. 4 cl., 1 3-hr. lab.
The application of basic metallurgical principles in the welding processes. The weldability of metals is studied. Laboratory work involves physical and metallographic examination of welded specimens. Jackson.

742 Application of Welding Engineering U G 4
Sp. 3 cl., 1 3-hr. lab.
Prereq.: 741.
The principles by which manufacturing procedures for materials may be developed. An analysis of processing methods; material, physical and mechanical properties, inspection, performance, and service testing. McCueley.

743 Welding Design U G 5
A. 3 cl., 2 3-hr. lab.
Prereq.: Civil E. 741.
The analysis and design of statistically determinate and indeterminate members and structures. A study of welding procedures for shop fabrication and field erection. Green.

744 Welding Design U G 5
W. 3 cl., 2 3-hr. lab.
Prereq.: 742, Mech. E. 736.
The analysis and design of machine elements and frames to a given set of shop conditions and facilities. Emphasis is placed on cost factor considerations. Green.

745 Welding Design U G 5
Sp. 3 cl., 2 3-hr. lab.
Prereq.: 702 and 744.
The design of resistance welded products. A selection of process and equipment and a study of tooling used in high production work. Green.

748 Special Problems in Welding Engineering U 3-15
A, W, Sp, Su.
Prereq.: 741.
Special studies not offered in the fixed curriculum in the areas related to courses 701, 703, 739, 741, and 742. This work may be taken in more than one area.

754 Thesis U 3-12
A, W, Sp. 6 lab. hrs.

841 Advanced Problems in Welding Engineering U G 2-6
A, W, Sp, Su.
Prereq.: Permission of instructor.
Repeatability to a maximum of 24 cr. hrs.
Special studies not offered in the fixed curriculum. Work may be taken under one or more of the special topics in the field including theory of welding processes and their physical mechanics, weldability of materials, advanced studies in welding design, theory and methodology of nondestructive testing, and fundamental application of welding processes to industrial technology.

950 Research in Welding Engineering G Arr.
A, W, Sp, Su.
Research for thesis or dissertation purposes only.
Zoology


PROFESSORS: WHARTON (Chairman), IDAMBACH, FIGURING, HARVEY, HAUPT, KOSTIR (Emeritus), LANGLOIS (Emeritus), D. P. MILLER (Emeritus), J. A. MILLER (Emeritus), J. R. MILLER, W. W. MYSER, PETERSON, PRICE, PUTNAM, TITID, ASSOCIATE PROFESSORS: BRUTT, CRITTS, GILTS, GOOD, HOUSE, JOHNSON, MILLER, II, MILLER, III, MOORE, ROOKHOUT, S. E. BROOKWAY, B. F. BROOKWAY, BYERS, COLINVAUX, HUBSCHMAN, KESSLER, LIN, MCGOWT, PARRISH, SKAVARAKIS, STANBURY, INSTRUCTORS: MENEFEE and ASSISTANTS.

For related courses see Biology.

404 General Zoology

A, W, S, Su. 2 cl., 3 1-hr. lab.
Prereq.: 400 or Biol. 402.
Not open to students with credit for 401 or 402.

A study of the variety of animals with emphasis on organ systems and their functions, the interrelationships with each other, space and time. Hub and Assistants.

Introduction to Ecology
(See Biology 305.)

508 Ornithology

Sp. 2 cl., 1 2-hr. lab.
Prereq.: 404 or 10 cr. hrs. of Biol. Sc.
Not open to students with credit for 408.

A study of the general biology and classification of birds, with emphasis on field identification of local species. Field trip each Saturday. Reese.

605 Animal Behavior

A, 3 cl., 2 2-hr. labs.
Prereq.: 404 and 10 additional cr. hrs. of Biol. Sc.

An experimental study of the anatomical basis of animal reactions. Putnam.

607 Management of Fisheries

Sp. 5 cl., field trips.
Prereq.: 404 or equiv.

An appraisal of the capacities of environment to meet the needs of fishes and a review of programs directed towards the improvement of fishing. Motyka.

610 Animal Parasites

W, Sp. 2 cl., 3 2-hr. labs.
Prereq.: 404 or equiv. and 10 additional cr. hrs. of Biol. Sci.
The general principles of parasitology, the morphology, life history and classification of parasites, and their host relationships. Recommended for students preparing for medical or zoological work. J. N. Miller.

620 Advanced Zoology of Vertebrates

A, Sp. 3 cl., 2 3-hr. labs.
Prereq.: 404 or equiv. and 10 additional cr. hrs. of Biol. Sc., Biol. 509 and An. 613 or equiv. recommended. Permission of instructor.
A study of the various vertebrate groups, emphasizing their origin, phylogeny, classification, life histories, habits, distribution and economic importance. Price.

623 Fish Ecology

Su. (2nd term). 3 all day classes per week.
Prereq.: 404 or equiv. and permission of instructor.
Grecn only at the Frans Theodore Stone Laboratory.

Studies of life histories and interspecies relationships of fishes and of the various factors influencing their abundance. Staff.

624 Ichthyology

Su. (1st term). 3 all day classes per week.
Prereq.: 404 or equiv., 15 additional cr. hrs. of Biol. Sc. or equiv. and permission of instructor.

Given only at the Frans Theodore Stone Laboratory.

A field and laboratory study of the distribution and classification of fishes, which includes methods of identification, collection, and preservation. Staff.

629 Mammalogy

W. 3 2-hr. cl.
Prereq.: 620 or 400 or equiv.
The comparative morphology, taxonomy, life histories, distribution, and importance of the mammals. Good.

631 Animal Parasitology

Su. 3 all day classes per week.
Prereq.: 404 and 10 additional cr. hrs. of Biol. Sc.

Given only at the Frans Theodore Stone Laboratory.

A course emphasizing the parasites infecting freshwater vertebrates, including field and laboratory experiences, host examination, and techniques dealing with staining, fixation, and mounting of specimens. Staff.

632 Comparative Embryology

W. 3 cl., 2 2-hr. labs.
Prereq.: 404 or equiv. and 10 additional cr. hrs. of Biol. Sc.
A survey of various modes of embryonic development, illustrated with both invertebrate and vertebrate material with emphasis on fundamental aspects and processes. Price.

633 Invertebrate Zoology

Su. (2nd term). 3 all day classes per week.
Pre req.: 20 cr. hrs. of Biol. Sc. including 404, or equiv.

Given only at the Frans Theodore Stone Laboratory.
The collection and identification of invertebrate animals, development of methods of classification and use of keys. Staff.

634 Biology of Birds

W. 2 cl., 1 2-hr. lab.
Prereq.: 508 or equiv. and 10 additional cr. hrs. of Biol. Sc.
The aspects of anatomy, physiology, taxonomy, and behavior which are pertinent to the study of birds. Putnam.

636 Principles of Animal Ecology

Sp. 3 cl., 2 2-hr. labs. Saturday field trips.
Prereq.: 404, Bot. 401, 402.
Principles and methods of animal ecology and their application to other closely related biological sciences. Stoerzbauer.

637 * Ecological Physiology of Aquatic Animals

Su. (2nd term). 3 all day classes per week.
Prereq.: 404 or equiv. and permission of instructor. Organic Chem., Physics, Physiol. recommended.

Given only at the Frans Theodore Stone Laboratory.

Study of the aquatic habitat includes physical and chemical adjustment, tolerance, and acclimatization to environment of vertebrates and invertebrates. Staff.
### COURSES OF INSTRUCTION

#### ZOOLOGY

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<td>Methods and Techniques in Wildlife Management</td>
<td>U G 5</td>
<td>3 cr., 2 2-hr. labs.</td>
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<td>642</td>
<td>Field Zoology</td>
<td>U G 4</td>
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<td>20 cr. hrs. of Biol. Sc. including 404 or equiv.</td>
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<td>652</td>
<td>Limnology</td>
<td>U G 4</td>
<td>3 all day classes per week.</td>
<td>15 additional cr. hrs. in Biol., 10 cr. hrs. in Chem., and 10 cr. hrs. in Physics. Not open to students with credit for 630.</td>
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<tr>
<td>654</td>
<td>Advanced Ornithology</td>
<td>U G 4</td>
<td>3 all day classes per week.</td>
<td>10 additional cr. hrs. in Biol. Sc.</td>
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<td>10 additional cr. hrs. in Biol. Sc.</td>
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<td>3 2-hr. cl.</td>
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<td>658</td>
<td>Invertebrate Zoology</td>
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<td>701</td>
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<td>e. Genetics. House, Faddock, Flaine, Griffing, Harvey, Rothenbuhler, Skewaril.</td>
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<td>832</td>
<td>Advanced Zoology of Invertebrates</td>
<td>G 5</td>
<td>3 cr., 2 2-hr. labs. Field trips including a one week optional trip to a marine laboratory.</td>
<td>404 or equiv. and 15 cr. hrs. of Biol. Sc. at the 500 or higher levels, and permission of instructor.</td>
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<td>833</td>
<td>Advanced Zoology of Invertebrates</td>
<td>G 5</td>
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<td>404 or equiv. and 15 cr. hrs. of Biol. Sc. at the 500 or higher levels, and permission of instructor.</td>
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     Sp.
     (See under Interdepartmental Seminars)

897  Interdepartmental Seminar in Natural Resources  G 1
     (See under Interdepartmental Seminars.)

900  Seminar  G 1 or 2
     A.  (1 or 2 cr. hrs.), W, Sp.  (1 cr. hr.)
     Prereq.: Selection by the staff.
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