

**Descriptions — Computers Science  
of  
Courses**

**451. Design of Language Processors I**  
Fall. 3(3-0) 313 or concurrently, 322.

Relation between languages and automata. Properties of grammars. Lexical analysis and symbol-table management. Syntactic analysis using top-down parsing, precedence, LR(k) and LL(k). Preliminary design of a compiler.

**452. Design of Language Processors II**  
Winter. 3(3-0) 451.

Continuation of 451. Semantics and generation of intermediate code. Pragmatics of code optimization, register allocation and machine code generation. Macro facilities, compiler generators and interpreters. Implementation of designed compiler.

**453. Design of Language Processors III**  
Spring. 3(3-0) 452.

Continuation of 452. Readings from the current literature. Completion of compiler project.

**490. Selected Topics**

Fall, Winter, Spring, Summer. 3(3-0)  
May re-enroll for a maximum of 9 credits if a different topic is taken. Approval of department.

A new developing area of computer science selected by the department.

**495. Independent Study**

Fall, Winter, Spring, Summer. 1 credit. May re-enroll for a maximum of 4 credits in 295 and 495 combined. Approval of department.

Independent undergraduate research in computer science.

**801. Special Problems**

Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 8 credits. Approval of department.

**805. Clustering and Scaling Algorithms**

Fall. 3(3-0) 300, STT 441 or approval of department.

Algorithms that organize large amounts of data. Includes metric clustering, hierarchical clustering and multi-dimensional scaling.

**810. Introduction to Linear System Theory**

(812.) Fall. 3(3-0) MTH 214. Interdepartmental with Systems Science and Social Science (College of) and administered by Systems Science.

A first course in system theory for students from a range of disciplines. Mathematical representation of system variables, transform and state space method of analysis, introduction to control theory, applications to physical, economic and social systems.

**811. System Methodology and Simulation**

Winter. 3(3-0) 810, STT 441. Interdepartmental with Systems Science and Social Science (College of) and administered by Systems Science.

Problem definition, design of abstract models for system design and control, simulation of systems described by differential and difference equations, generation of random variables, simulation of discrete object stochastic systems, simulation languages, applications to physical, economic and social systems.

**813. System Project**

Spring. 3(1-6) 811. Interdepartmental with Systems Science and Social Science (College of) and administered by Systems Science. Individual or team application of simulation methods to system design and/or management.

**817. Nonparametric Pattern Recognition**

Winter. 3(3-0) 300, STT 441, MTH 334.

Nonstatistical approach to pattern recognition. Discriminant functions, optimization techniques, feature extraction, non-parametric learning and algorithms for recognition. Error analysis.

**818. Parametric Pattern Recognition**  
Spring. 3(3-0) STT 442, MTH 334.

Decision-theoretic approach to pattern recognition using decision rules, parameter estimation, suboptimum strategies, optimum strategy without learning, learning and sequential recognition.

**825. Theory of Combinational Circuits**  
Fall. 3(3-0) 423 or approval of department.

Switching algebra and related group and lattice theory; decomposition; the synthesis of multiple-output switching functions using multi-level combinational circuits.

**826. Theory of Digital Machines**  
Winter. 3(3-0) 825.

Sequential machines; machine specification in terms of states and transitions; decomposition; state minimization and assignment.

**827. Switching Theory**

Spring. 3(3-0) 826.

Asynchronous and speed independent circuits; static and dynamic hazards; use of race conditions.

**831. Mathematical Theory of Formal Languages I**

Fall. 3(3-0) 453 or approval of department.

Definition of grammars; recursive and recursively enumerable sets; decidability and undecidability; regular sets; linear languages and context-free languages.

**832. Mathematical Theory of Formal Languages II**

Winter. 3(3-0) 831.

Context-sensitive grammars; scattered context grammars; closure properties of languages; abstract families of languages; derivation restricted grammars.

**841. Artificial Intelligence and Adaptive Systems I**

Winter of odd-numbered years. 4(4-0) 300, STT 441.

Foundations of heuristic methods; syntactic means-end analysis; semantic means-end analysis; adaptive systems.

**842. Artificial Intelligence and Adaptive Systems II**

Spring of odd-numbered years. 4(4-0)

841. Computer representation of information from natural languages; representation of two and three dimensional environments; theory of design of robots; future trends.

**861. Structured Programming**

Fall. 3(3-0) 322; 313 or concurrently.

Block structured languages, control structures and mathematical foundations of structured programming; program development by stepwise refinement; proving program correctness; extensive readings from the current literature.

**862. Advanced Data Structures**

Winter. 3(3-0) 313; 322 or concurrently.

Structured data types; recursive and structured data structures and semantics; hierarchical program structures; models for programming languages; extensive readings from the current literature.

**863. Structured Multiprogramming Systems**

Spring. 3(3-0) 313; 322 or concurrently.

Advanced software techniques for computer operating systems. Term project to design, implement and analyze an operating system using quality structured program construction.

**899. Research**

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

**911. General Automata Theory I**

(E E 981.) Fall of odd-numbered years. 3(3-0) 423 or SYS 827 or approval of department. Interdepartmental with Electrical Engineering.

Characterization of machines and programs as automata; mathematical decomposition of finite automata.

**912. General Automata Theory II**

(E E 982.) Winter of even-numbered years. 3(3-0) 911. Interdepartmental with Electrical Engineering.

Reliability and redundancy of finite automata. Probabilistic sequential machines. Languages definable by probabilistic and deterministic automata. Axioms for equivalence of regular expressions.

**913. General Automata Theory III**

(E E 983.) Spring of even-numbered years. 3(3-0) 912. Interdepartmental with Electrical Engineering.

Degrees of difficulty of computation. Models of parallel computation. Iterative automata.

**999. Research**

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

**CRIMINAL JUSTICE C J**

**College of Social Science**

**110. Introduction to Criminal Justice**  
Fall, Winter, Spring. 3(3-0)

Survey of agencies that compose the system: primarily the police, courts and corrections. Also, the processes of these components and their relationships, as well as related agencies involved are examined.

**235. Criminology**

Winter, Spring. 4(4-0) SOC 241 or C J 110 or approval of school. Interdepartmental and jointly administered with the Department of Sociology.

Crime analysed from sociological perspective: meaning of "crime", crime statistics, and measurement, theories of crime causation, crime typologies, e.g., professional organized, violent, sex, white-collar crimes, juvenile delinquency.

- 315. Criminal Investigation**  
(395., 325.) Winter, Spring. 4(4-0)  
375.  
Theory of investigation, crime scene conduct, collection and preservation of physical evidence and methods used in scientific interpretation of evidence.
- 318. Community Relations in Criminal Justice**  
Fall, Winter, Spring. 4(4-0) 235.  
Interdisciplinary survey of community relations in police and other criminal justice processes; theory and case studies. Emphasizes problem solving, conflict management, and community action in the prevention of civic disorder.
- 330. Organizational Theory in Criminal Justice**  
Fall, Winter. 4(4-0) 110, 235.  
A historic and a comparative overview of the principles of organization used by criminal justice agencies. Current theories and research on organization, with focus on the needs of the criminal justice process.
- 335. Police Process**  
Fall, Winter, Spring. 4(4-0) 235.  
Functional role of law enforcement within the criminal justice system. Law enforcement organizations and the function of operational units. Role of law enforcement in a democracy; service, crime deterrence, discretion, enforcement policies and evaluation of effectiveness.
- 355. Juvenile Justice Process**  
Fall, Winter, Spring. 4(4-0) 235.  
Prevalent interdisciplinary issues, ideas, principles and assumptions pertaining to delinquency phenomena; an overview of variables related to delinquency, duties, and responsibilities.
- 365. Corrections Process**  
(368.) Fall, Winter, Spring. 4(4-0)  
235.  
The correctional modes applied to juvenile and adult offenders. Theoretical approaches to changing and controlling criminal behavior and practical limitations. Impact of methods on past correctional behavior.
- 375. Criminal Law Process**  
Fall, Winter, Spring. 5(5-0) 235.  
Administration of criminal justice: investigation, detection, arrest, search, seizure, charging, adjudication, sentencing, probation, corrections, parole. Constitutional safeguards and legal controls on official action emphasized.
- 392. Criminal Justice Research and Innovation**  
Fall, Winter, Spring. 5(4-1) 110 and  
235.  
The utilization of research in planned change. Problems in conducting and interpreting research concerned with decision-making. The limitations of research and selected alternative strategies in bringing about change.
- 400H. Honors Study**  
Fall, Winter, Spring, Summer. 1 to  
3 credits. May re-enroll for a maximum of 6 credits. Seniors or approval of instructor.  
Individually selected programs of supervised group or individual study dealing with some phase of the criminal justice system.
- 401. Independent Study**  
Fall, Winter, Spring, Summer. 1 to 3  
credits. May re-enroll for a maximum of 6 credits. 318, 335, 355, 365, 375, 392 or approval of instructor.  
Individual study of the various fields of emphasis in criminal justice, under direct supervision of appropriate faculty member.
- 409. Issues in Criminal Justice**  
Fall, Winter, Spring, Summer. 3 or 4  
credits. May re-enroll for a maximum of 15 credits when different topics are taken. 318, 335, 355, 365, 375, 392.  
Forum for course offerings on special issues in criminal justice, by visiting instructors or regular faculty.
- 429K. Fundamentals of Traffic Law**  
Fall, Summer. 3(3-0) Interdepar-  
tmental with and administered by the College  
of Education.  
Nature, function and application of traffic law as it applies to the safe and efficient movement of people and goods in a broadly conceived traffic accident prevention program.
- 433. Alcohol and Drugs:  
A Social Dilemma**  
(425.) Winter. 3(3-0) Seniors or  
approval of school. Interdepartmental with the  
College of Education.  
An overview investigation of the substance abuse phenomena with emphasis on alcohol. Sociological, psychological and medical aspects are discussed with implication for prevention, treatment and rehabilitation.
- 435. Analysis of Police Operations**  
Winter, Spring. 4(4-0) 318, 335,  
355, 365, 375, 392 or approval of school.  
Organization and administration of line and staff functions of police units. Interrelationships of components. Analysis of total operations of the police, including personnel, budgeting, manpower allocation, enforcement policies and specialization.
- 440. Introduction to Highway  
Traffic Administration**  
Fall. 4(4-0) Approval of instructor.  
Systems approach to highway traffic administration emphasizing the interrelationships among agencies having management responsibilities and their accident prevention and loss reduction countermeasures to combat system failures. Future needs and alternatives.
- 441. Police and Court Traffic  
Administration**  
Spring. 4(4-0) Approval of instructor.  
Police and court traffic functions relative to other police and court functions in the criminal justice system. Systems approach to managing traffic accident prevention programs. Weaknesses, future needs and alternatives.
- 455. Analysis of Delinquency  
Programs**  
Winter, Spring. 4(4-0) 318, 335,  
355, 365, 375, 392 or approval of school.  
Complexity of delinquency phenomena; evolution of programs and organizations which prevent, evaluate and treat specific youth problems.
- 465. Analysis of Correctional  
Operations**  
Fall, Spring. 4(4-0) 318, 335, 355,  
365, 392 or approval of school.  
A critical analysis of existing institutions and community corrections programs; administrative methods of program implementation and evaluation. Prevalent correctional operational policies. Problems of effecting change.
- 472. Criminal Law**  
Fall, Spring. 4(4-0) 318, 335, 355,  
365, 375, 392, or approval of school.  
Substantive criminal law as a means of defining and preserving social values. Criminal law theory, legislative role in criminal justice, victimless crimes, survey of crimes and defenses, constitutional limitations.
- 485. Security Systems**  
Fall. 4(4-0)  
Capabilities and limitations of security systems, both public and private, with particular reference to crime and crime-related problems. Interrelationships between security and other criminal justice agencies.
- 490. Criminal Justice Practicum**  
Fall, Winter, Spring, Summer. Vari-  
able credit. May re-enroll for a maximum of  
12 credits. 318, 335, 355, 365, 375, 392;  
majors only.  
Planned program of research internship, obser-  
vation, study, and work in selected criminal  
justice agencies. Supplements classroom study  
with participation in criminal justice systems of  
United States and foreign nations.
- 492. Methods of Criminal Justice  
Research**  
Fall, Winter. 4(4-0) 318, 355, 365,  
392 or approval of school.  
Elements of scientific perspective; analysis of  
published reports to illustrate theory inter-  
acting with practice. Conceptual frameworks,  
negotiating access to and collection of data,  
design choice, analytic techniques, and final  
reporting.
- 495. Crime Prevention Seminar**  
Fall, Winter, Spring. 4(4-0) 318,  
335, 355, 365, 375, 392, Seniors.  
The prevention of crime and the concept of  
deterrence, stressing a systemic approach: the  
law, the police, the community, and corrections.  
A synthesis of the undergraduate program  
stressing a systemic perspective, commitment to  
planned change, and total community involve-  
ment.
- 801. Independent Study**  
Fall, Winter, Spring, Summer. 1 to  
6 credits. May re-enroll for a maximum of 6  
credits. Majors or approval of school.  
Individual research and writing in student's  
field of interest. Requires approval and direc-  
tion by professor associated with major field  
of interest.
- 809. Special Issues in Criminal  
Justice**  
Fall, Winter, Spring, Summer. 3 to  
5 credits. May re-enroll for a maximum of 15  
credits when different topics are taken. Majors  
or approval of school.  
Forum for study of issues not given continuous  
consideration in the graduate program.
- 812. Criminal Justice Management  
Issues**  
Fall, Winter. 4(3-1) Majors or ap-  
proval of school.  
New management requirements of the criminal  
justice complex in transition. Problems and  
innovative concepts of criminal justice system  
development, decision theory, information needs,  
planning, budgeting, and new managerial per-  
spectives.

**Descriptions — Criminal Justice  
of  
Courses**

**813. Criminal Justice Personnel  
Systems Development**

Winter, Spring. 4(3-1) 812.

Personnel administration approaches to improvement of criminal justice systems such as personnel administration by objectives, and systems analysis approach to human resource development models consonant with criminal justice systems evolution.

**814. Fiscal Administration in  
Criminal Justice**

Winter, Spring. 4(3-1) 812.

Transition from traditional budgeting to program budgeting and evaluation systems in criminal justice agencies. Implications of criminal justice systemic budgeting models.

**815. Seminar in Criminal Investigation**

Fall, Spring. 3(3-0) Majors or approval of school.

Seminar in investigative techniques; criminalistics; case studies; including discussion on quantum of proof in criminal investigations and probative value of physical evidence.

**816. Seminar in Forensic Science**

Winter. 3(3-0) Majors or approval of school.

An investigation of the role of forensic science in the administration of justice; case studies; laboratory techniques; interpretation of proof.

**817. Independent Study in Forensic  
Science**

Fall, Winter, Spring. 3(0-6) Majors or approval of school.

Directed laboratory work in forensic science.

**818. Social Control, Criminal Justice  
and Community Relations**

(823). Fall, Spring. 4(4-0) 318.

A broad-ranging seminar with a field studies aspect, emphasizing community responsibility in criminal justice processes, in the context of social change and social control.

**822. Historical and Comparative  
Criminal Justice**

Fall, Spring. 3(3-0) Majors or approval of school.

Criminal justice systems are examined on a global basis exclusive of the United States. Emphasis is placed on major different legal philosophies.

**825. Criminal Justice Educational  
Programming**

Spring. 4(4-0) Majors or approval of school.

Designed for students preparing for careers as criminal justice educators. Discussion of issues, administrative problems, and curricula for criminal justice programs.

**826. Teaching Internship**

Fall, Winter. 4(4-0) Majors or approval of school.

Assumption of complete responsibility for teaching a course in a criminal justice program. Guidance in planning lesson content and evaluating instruction provided. Attendance at a series of associated seminars required.

**830. Research for Planning**

Fall, Winter. 4(4-0) Majors or approval of school.

Techniques of applied research specially associated with the planning of operational and managerial criminal justice systems. Emphasis upon empirical basis for organizational planning programs.

**831. Criminal Justice Systems  
Development**

Fall, Winter. 4(4-0) Majors or approval of school.

Systems analysis approach to the development of criminal justice goals, priorities and strategies. Emphasis upon total systemic resource allocation, output and consonance.

**832. Criminal Justice Information  
Systems**

Fall, Spring. 4(4-0) 812.

New management requirements of the criminal justice complex in transition. Problems and innovative concepts of criminal justice system development, decision theory, information needs, planning, budgeting, and new managerial perspectives.

**833. Project Planning and Evaluation**

Winter, Spring. 4(4-0) 492; 830 recommended.

Process of managing new projects from inception through implementation and evaluation. Establishing priorities, securing funding, administering projects and designing and implementing useful evaluative research. Individual exercises in designing projects.

**835. Police Policy Development**

Fall, Winter, Spring. 4(4-0) 812.

Public policy issues affecting the definition of police goals and strategies. Facts and values which influence policy decision; the processes of policy development and linkage with delivery systems.

**836. Police Systems Development and  
Management**

Fall, Winter, Spring. 4(4-0) 812.

Analytic techniques of defining goals, and designing, testing and evaluating police operational strategies. Managerial support requirements and goals of specific police systems.

**840. Highway Traffic Administration**

Winter. 4(4-0) Approval of instructor.

The Federal-state-local partnership in highway traffic administration. Laws, standards and policies regulating the accident prevention and loss reduction countermeasures of governmental agencies and private industry. Problems and needs.

**855. Case Studies in Delinquency  
Control**

Fall. 4(4-0) 355, 455.

Evaluation of primary and secondary delinquency prevention, control and treatment programs. Current hypotheses, recent developments in the field. Use of cases to evaluate past and current practices and future needs.

**856. Juvenile Corrections**

Spring. 4(4-0) 855.

A more theoretical extension of 355 and 455. Review and analysis of entire treatment and rehabilitation process for juvenile offenders.

**865. Correctional Programming**

Fall. 4(4-0) Majors or approval of school.

Changing criminal behavior. Traditional and institutional methods and theories. Reintegration: high stress on offenders and community. Motivating the offender. Developing community resources and alternatives. Examining the change agent.

**866. Correctional Management**

Spring. 4(4-0) Majors or approval of school.

Planning, organizing, controlling and evaluating in relation to measurable correctional objectives. Establishing objectives from well defined alternatives. Change capable administration styles and decision making as functions of objectives.

**871. Law of Corrections**

Spring. 4(4-0) Majors or approval of school.

Constitutional limitations and impact of law on correctional practice. Due process, judicial sentencing, probation, prisoners' rights, parole grant, revocation of probation and parole.

**872. Law of Criminal Procedure**

Fall, Winter, Spring. 4(4-0) A law course.

Constitutional limitations on police activity. Due process, bill of rights, right to counsel, arrest, search and seizure, electronic eavesdropping, entrapment, confessions, lineups, scope of exclusionary rules.

**874. Law of Administrative Procedure**

Fall. 4(4-0) Majors or approval of school.

General principles of administrative law, labor law. Application of principles. Law enforcement policy making. Implementation of constitutional safeguards. Police unions and political activity.

**885. Security Management**

Fall. 4(4-0) 485 or concurrently, or approval of instructor.

The organization and management of security units, in industry, businesses, governments, institutions, etc. The protection of manpower, facilities, and other assets. Administrative, legal and technical problems. Loss prevention and control.

**886. Advanced Security Management**

Winter. 4(4-0) 885.

Salient problems and issues of concern to professional security administrators. "Growing edge" technologies. Specialized programs—e.g., government internal security controls; employee dishonesty; shoplifting.

**890. Practicum**

Fall, Winter, Spring, Summer. 1(0-4) to 6(0-24) Majors or approval of school.

Planned program of research observation, study and work in selected criminal justice agencies. Designed to supplement classroom study with participation in domestic and foreign criminal justice systems.

**892. Quantitative Methods in Criminal  
Justice**

Spring. 4(4-0) 492.

Views the relationship and application of statistical techniques to theory building and concept construction. Gives an overview of statistical methods with an emphasis on those most useful for research in criminal justice.

**898. Comprehensive Readings**

Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 4 credits. Majors or approval of school.

Individualized reading program for students who elect not to complete a thesis. Means of extending breadth and depth of course work to achieve mastery of criminal justice areas of interest.

**899. Thesis Research**

Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 6 credits. Majors or approval of school. Planned research and writing directed by student's thesis committee.

**930. Seminar on Criminal Justice Systems**

Winter. 3(3-0) Graduate students. Topical issues on the development, functioning, and interrelationships of components of criminal justice systems and how systemic coherence can be achieved within a democratic society.

**990. Readings in Criminal Justice and Criminology**

Fall. 3 to 5 credits. Graduate students. Topical reading of major research contributions to criminology and criminal justice. Consideration of applicability of criminological research to functioning of the criminal justice system.

**992. Research Utilization and Application in Criminal Justice**

Spring. 3(3-0) Majors or approval of school. Substantive and administrative problems of conducting research and existing attempts to solve these. Utilization of research in bringing about change in the criminal justice system. Methods of maximizing research utility.

**CROP AND SOIL SCIENCES**

**CSS**

**College of Agriculture and Natural Resources**

**101. Crop Science**

Fall. 3(3-0) Principles of identification, adaptation, management, and utilization of field crops for food and fiber. Fundamentals of crop management, breeding, weed control, crop quality, and tropical crops in world agriculture.

**202. Soils and Man's Environment**

Winter. 3(3-0) Interdepartmental with the departments of Fisheries and Wildlife and Resource Development, and Natural Resources. Use of soil-water resources in a technological society as it relates to environmental quality. Nature of pollution problems and their possible solutions. Food production and world population.

**210. Fundamentals of Soil Science**

Fall, Winter. 5 credits. Principles of the origin and development of soils. Relationship of properties to utilization and soil fertility to plant composition and animal health. Emphasis is placed on changing soils to serve man.

**250. Plant and Animal Genetics**

Winter. 5(5-0) B S 211. Fundamentals of modern genetics with particular focus on problems and application in agriculture and natural resources.

**301. Forage Crops**

Fall. 3(2-2) Sophomores. Distribution, morphology, identification, physiology, management and utilization of forage crops for hay silage, and pasture for livestock and for soil improvement and conservation.

**331. Soil Management**

Winter. 4(4-0) 210. Management of soils, drainage and irrigation, organic matter, tillage, rotation, conservation practices, soil reaction, lime, fertilizers, and micronutrients. Soil management vs. soil conservation. Special study in general crops, horticultural crops, greenhouse crops, turf and organic soils.

**380. Ecology and Physiology of Agricultural Plants**

Spring. 3(3-0) FOR 220 or BOT 301. Interrelationships of physiological processes and environmental manipulation for higher yield of agricultural plants.

**390. Soil Conservation and Land Use**

Winter. 3(3-0) 210. Concepts of soil erosion by water and wind and methods for soil conservation including control of erosion and sedimentation. Interpretation of soil properties for land use decisions.

**402. Principles of Weed Control**

Fall. 3(2-2) Juniors. Interdepartmental and administered jointly with the Horticulture Department. Comprehensive study of principles underlying weed control practices, and factors involved in both mechanical and chemical control.

**406. Crop Improvement and Seed Production**

Winter. 4(3-2) Practical methods of crop improvement, seed production, storing, cleaning, packing, and distribution, seed certification of small grains, legumes, corn, beans, potatoes, visits to seed agencies and seed farms.

**408. Principles of Plant Breeding**

Winter. 4(3-2) 250. Interdepartmental with the Horticulture Department. Application of genetics and other sciences to breeding and improvement of agronomic and horticultural crops.

**411. Special Problems in Agronomy**

(407.) Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 6 credits if different problem is taken. Special crop problems in production, physiology, ecology, weed control, turfgrass management, storage, preservation and seed studies. Special soils problems in fertility, geography, classification, conservation, management, organic soils and turfgrass soils.

**412. Topics in Agronomy**

Fall, Winter, Spring, Summer. 2(2-0) or 3(3-0) May re-enroll for a maximum of 9 credits of different topics are taken. Approval of department. Topics will be selected from crop production, crop physiology, turfgrass management, organic soils, turfgrass soils and soil fertility.

**415. Turfgrass Management**

Spring. 3(2-2) Adaptation characteristics and utilization of turf grasses, management principles and physiological bases for the establishment and maintenance of turf for lawns, athletic fields, golf courses, cemeteries, parks, highways and airfields.

**420. Seminar**

Winter. 1(1-0) May re-enroll for a maximum of 4 credits.

**424. Forest Soils**

Spring. 4(3-3) CSS 210; FOR 220 or 304. Interdepartmental with and administered by the Department of Forestry. Interrelationships of forest site and the growth of forests. Classification and productivity of forest soils. Effects of silvicultural and forest management practices on the soil. Two-day field trip required.

**430. Soil Fertility and Fertilizers**

Spring. 5(4-1) 210. Assessment of the fertility of soils and alteration of fertility by the use of fertilizers, lime, manure, and cropping systems. The role of colloids in ion fixation and exchange. Soil and tissue tests. The history, technology, and use of fertilizers.

**440. Soil Biophysics**

Winter. 3(3-0) 210 and BOT 301; CSS 380 recommended. Salient features of soil physical and biological properties related to plant growth, principles and applications. Emphasis on root responses to the environment. Bioenergetics of the root-soil interface.

**442. Soil Microbiology**

Spring. 3(3-0) MPH 200 or 301 or 401. Interdepartmental with and administered by the Department of Microbiology and Public Health. Major groups of microorganisms of importance in soils are studied with emphasis on ecological, biochemical, and physical aspects.

**470. Soil Classification**

Fall, Spring, Summer of odd-numbered years. 4(0-8) 210 or approval of department. Determination of soil properties by field examination of soils. Classification of soils. Preparation of land use report based upon soil maps of assigned areas. Field trips required.

**480. Soil Geography and Land Use of North America**

Spring. 3(2-1) 210 or approval of department. Properties, geography and dominant land use of the major soils of North America.

**485. Seed Science**

Spring. 3(3-2) Approval of department. Morphological and physiological changes during seed formation, development, maturation and germination. Practical and biological aspects of seed drying, storage, deterioration, dormancy and quality. Current problems and research in seed science.