

- 490. Selected Topics**
Fall, Winter, Spring, Summer. 3(3-0)
May reenroll 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 reenroll for a maximum of 4 credits in CPS
295 and CPS 495 combined. Approval of de-
partment.
Independent undergraduate research in compu-
ter science.
- 801. Special Problems**
Fall, Winter, Spring, Summer. 1 to 4
credits. May reenroll for a maximum of 8 credits.
Approval of department.
- 805. Clustering and Scaling
Algorithms**
Fall. 3(3-0) CPS 300, STT 441 or ap-
proval of department.
Algorithms that organize large amounts of data.
Includes metric clustering, hierarchical cluster-
ing and multi-dimensional scaling.
- 806. Fundamentals of Pattern
Recognition**
Spring. 4(4-0) CPS 300, MTH 334, STT
442.
Decision-theoretic and nonstatistical ap-
proaches; discriminant functions; parameter and
density estimation; feature extraction; super-
vised and unsupervised learning; sample size
effects; error estimation; design of pattern rec-
ognition systems; computational considerations.
- 825. Theory of Combinational
Circuits**
Fall. 3(3-0) CPS 423 or approval of de-
partment.
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) CPS 825.
Sequential machines; machine specification in
terms of states and transitions; decomposition;
state minimization and assignment.
- 827. Switching Theory**
Spring. 3(3-0) CPS 826.
Asynchronous and speed independent circuits;
static and dynamic hazards; use of race condi-
tions.
- 831. Theory of Formal Languages I**
Fall. 3(3-0) CPS 322 or approval of de-
partment.
Definition of formal languages; acceptors and
grammars; regular, linear and context free lan-
guages; closure properties.
- 832. Theory of Formal Languages II**
Winter. 3(3-0) CPS 831.
Context sensitive languages; derivation re-
stricted grammars; semantics of formal lan-
guages.
- 841. Artificial Intelligence and
Adaptive Systems I**
Winter of odd-numbered years. 4(4-0)
CPS 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)
CPS 841.
Computer representation of information from
natural languages; representation of two and
three dimensional environments; theory of de-
sign of robots; future trends.
- 861. Structured Programming**
Fall. 3(3-0) CPS 322; CPS 313 or con-
currently.
Block structured languages, control structures
and mathematical foundations of structured pro-
gramming; program development by stepwise
refinement; proving program correctness; exten-
sive readings from the current literature.
- 862. Advanced Data Structures**
Winter. 3(3-0) CPS 313; CPS 322 or
concurrently.
Structured data types; recursive and structured
data structures and semantics; hierarchical pro-
gram structures; models for programming lan-
guages; extensive readings from the current lit-
erature.
- 863. Structured Multiprogramming
Systems**
Spring. 3(3-0) CPS 313; CPS 322 or
concurrently.
Advanced software techniques for computer
operating systems. Term project to design, im-
plement and analyze an operating system using
quality structured program construction.
- 876. Performance Measurement
Techniques**
Fall. 3(3-0) CPS 313, CPS 322, STT 441.
Performance evaluations on computer systems,
evaluation of the central processor. Systems
analysis, simulation, programmed measurement,
and instrumental measurement techniques.
Case studies.
- 884. Large Data Base Theory**
Summer. 3(3-0) CPS 313, CPS 452, or
approval of department.
Data base management constituent parts; data
definition, data manipulation, data retrieval and
report generation. Hierarchical, network and re-
lational data base models. Schemas, subschemas
and access methods. Analytic and theoretical
treatment.
- 899. Research**
Fall, Winter, Spring, Summer. Variable
credit. Approval of department.
- 906. Advances in Pattern Recognition**
Fall. 3(3-0) CPS 805, CPS 806.
Theoretical foundations of pattern recognition;
classical and contemporary research themes in-
cluding structural approaches, sequential
methods, and evaluation of alternative strategies.
- 911. General Automata Theory I**
Fall of odd-numbered years. 3(3-0) CPS
423 or SYS 827 or approval of department. In-
terdepartmental with Electrical Engineering.
Characterization of machines and programs as
automata; mathematical decomposition of finite
automata.
- 912. General Automata Theory II**
Winter of even-numbered years. 3(3-0)
CPS 911. Interdepartmental with Electrical
Engineering.
Reliability and redundancy of finite automata.
Probabilistic sequential machines. Languages
definable by probabilistic and deterministic au-
tomata. Axioms for equivalence of regular ex-
pressions.
- 913. General Automata Theory III**
Spring of even-numbered years. 3(3-0)
CPS 912. Interdepartmental with Electrical En-
gineering.
Degrees of difficulty of computation. Models of
parallel computation. Iterative automata.
- 944. Theory of Algorithms**
Summer. 3(3-0) CPS 832 or CPS 912.
Formulation of computation concept and al-
gorithm verification. Topics included are finite
and infinite acceptors, recursive functions, pro-
gram verification, decision problems, flowchart
schemas, and fixpoint theory of programs.
- 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 rela-
tionships, 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 mea-
surement, theories of crime causation, crime
typologies, e.g., professional organized, violent,
sex, white-collar crimes, juvenile delinquency.
- 315. Criminal Investigation**
(395.) Winter, Spring. 4(4-0) C J 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) C J 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) C J 110, C J 235.
A historic and a comparative overview of the
principles of organization used by criminal jus-
tice agencies. Current theories and research on
organization, with focus on the needs of the crimi-
nal justice process.
- 335. Police Process**
Fall, Winter, Spring. 4(4-0) C J 235.
Functional role of law enforcement within the
criminal justice system. Law enforcement or-
ganizations and the function of operational units.
Role of law enforcement in a democracy; service,
crime deterrence, discretion, enforcement
policies and evaluation of effectiveness.

**Descriptions – Criminal Justice
of
Courses**

- 355. Juvenile Justice Process**
Fall, Winter, Spring. 4(4-0) C J 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) C J 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) C J 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) C J 110 and C J 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 reenroll 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 reenroll for a maximum of 6 credits. C J 318, C J 335, C J 365, C J 375, C J 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 reenroll for a maximum of 15 credits when different topics are taken. C J 318, C J 335, C J 355, C J 365, C J 375, C J 392.
Forum for course offerings on special issues in criminal justice, by visiting instructors or regular faculty.
- 429K. Fundamentals of Traffic Law**
Spring. Summer of odd-numbered years. 3(3-0) Interdepartmental 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) C J 318, C J 335, C J 355, C J 365, C J 375, C J 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)
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)
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) C J 318, C J 335, C J 355, C J 365, C J 375, C J 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) C J 318, C J 335, C J 355, C J 365, C J 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) C J 318, C J 335, C J 355, C J 365, C J 375, C J 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. Variable credit. May reenroll for a maximum of 12 credits. C J 318, C J 335, C J 355, C J 365, C J 375, C J 392; majors only.
Planned program of research internship, observation, 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) C J 318, C J 355, C J 365, C J 392 or approval of school.
Elements of scientific perspective; analysis of published reports to illustrate theory interacting 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) C J 318, C J 335, C J 355, C J 365, C J 375, C J 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 involvement.
- 801. Independent Study**
Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 6 credits. Majors or approval of school.
Individual research and writing in student's field of interest. Requires approval and direction by professor associated with major field of interest.
- 809. Special Issues in Criminal Justice**
Fall, Winter, Spring, Summer. 3 to 5 credits. May reenroll 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 approval 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 perspectives.
- 813. Criminal Justice Personnel Systems Development**
Winter, Spring. 4(3-1) C J 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) C J 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) C J 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) C J 812 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) C J 812 or approval of school.
The function, logical design and implementation of information systems in criminal justice agencies. Emphasis on use of information systems in managerial decision making.
- 833. Project Planning and Evaluation**
Winter, Spring. 4(4-0) C J 492; C J 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) C J 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) C J 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)
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) C J 355, C J 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) C J 855.
A more theoretical extension of C J 355 and C J 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) C J 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) C J 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) C J 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 reenroll 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 reenroll 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.

**Descriptions – Criminal Justice
of
Courses**

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) CSS 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) CSS 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 in Field Crops**
Fall. 4(3-2) CEM 132, BOT 301.

Principles underlying weed control practices for agronomic crops. Factors involved in mechanical, chemical and biological control and basic physiological aspects of herbicide applications.

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) CSS 250. Interdepartmental with the Department of Horticulture.

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 reenroll 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 reenroll for a maximum of 9 credits if different topics are taken. Approval of department.

Topics will be selected from crop production, crop physiology, turfgrass management, organic soils, turfgrass soils, soil fertility and genetic analysis.

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 reenroll for a maximum of 4 credits.

424. **Forest Soils**
Spring. 4(3-3) CSS 210; FOR 220 or FOR 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) CSS 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) CSS 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 MPH 301. 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) CSS 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) CSS 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.

- IDC. **The Impact of Animal Resource Management Upon the World's Developing Nations**
For course description, see Interdisciplinary Courses.

801. **Crop Ecology**
Fall of even-numbered years. 3(3-0) Approval of department.

Environment within the crop community and the environmental stresses limiting crop survival. Temperature, light, water and atmospheric stresses and variations in the crop canopy will be discussed.

803. **Crop Physiology**
Spring of even-numbered years. 3(3-0) Approval of department.

Role of physiological factors determining maximum crop yields and quality.

805. **Herbicidal Action and Metabolism**
Spring of odd-numbered years. 3(3-0) CSS 402; BOT 415 or concurrently.

A study of the properties and characteristics of herbicides, the fundamental processes involved in the physiological action, behavior, and metabolism of herbicides.