805. Water Treatment Principles
Winter. 3(3-0) C E 483.
Chemical and physical principles of water treatment.

806. Sewage Collection and Treatment
Spring. 3(3-0) C E 483.
Chemical, physical, and biological principles of sewage collection and treatment.

899. Research
(EGR 899.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

905. Biological Principles of Sanitary Engineering I
Fall. 3(3-0) C E 483.
Fundamental physical, chemical, and biological principles relating to the field of sanitary engineering.

906. Biological Principles of Sanitary Engineering II
Winter. 3(2-3) 905.
Fundamental physical, chemical, and biological principles relating to the field of sanitary engineering.

999. Research
(EGR 999.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

COMMUNICATION

College of Communication Arts

100. Human Communication I
Fall, Winter, Spring, Summer. 3(3-0)
Process and functions of communication. Principles underlying communication behavior. Practice in analyzing communication situations and in speaking and writing.

101. Human Communication II
(S T 101.) Fall, Winter, Spring, Summer. 3(3-0) 100.
Continuation of 100, with greater emphasis on speaking and writing, and on analyzing increasingly complex communication situations.

199. Methods of Inquiry
Fall, Spring. 3(3-0) Majors and minors only. 191.
Major theoretic orientations toward communication. Primary tools of scholarly inquiry.

205. Persuasion
(305, S T 305.) Fall, Winter, Spring. 4(4-0) 101.
Process of influencing human behavior through persuasive communication. Experience in creating persuasive messages and in evaluating the acceptability of persuasive attempts.

210. Leadership
(116, S T 116.) Winter. 4(4-0) 100.
Principles and practice in the utilization of communication for effective leadership.

299. Individual Projects
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 15 credits. 199, approval of project proposal by department.
Independent research, experience in communication laboratories, or tutorial work in communication skills.

300. Effects of Communication
Fall, Winter, Summer. 4(4-0) 100.
Examination of the dimensions of communication effects.

315. Organizational Communication
(311, S T 311.) Spring. 4(4-0) 101.
Principles and practice in the management of communication systems, with emphasis on conflict resolution, information exchange, innovativeness, and information management.

350. Signs and Sign-Behavior
Fall, Winter, Summer. 4(4-0) 100.
Theories of man's symbolic behaviors. Semiotics and general semanetics.

351. Message Analysis I
(440.) Winter. 4(4-0) 350.
Methods of describing messages and message codes, with emphasis on the concept of information.

352. Message Analysis II
(320.) Spring. 4(4-0) 351.
Continuation of 351, with emphasis on non-verbal codes: gesture, expression, time and space, light.

360. Critical Perspec­tives on Communication
Winter. 4(4-0) 100.
Interdependence of communication and other societal factors, emphasizing criteria for ethical and social appropriateness.

399. Seminar
(401.) Winter, Spring. 4(4-0) Majors only 360.
Contemporary issue in communication.

405. Research in Communication Strategies and Styles
(5 T 405.) Fall, Spring, Summer. 5(5-0) Seniors. 300.
Research literature in communication strategies and styles.

413. Seminar in Communication Education
(5 T 413.) Fall, Winter, Spring, Summer. 4(4-0) ED 327U.
Philosophies of curricular and co-curricular programs in communication education. Internship experience in those programs.

420. Message Design
Winter. 4(4-0) 101.
Principles and practice in message-media construction and selection.

499. Special Projects
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 15 credits. Approval of project proposal by department.
Independent research, group research, student-directed group projects.

505. Communication Research
Fall. 5(4-2) Majors.
Communication research strategy and methodology. Scientific process, bases for derivation and verification of hypotheses, and basic methods of designing research in communication.

506. Communication Research
Winter. 5(4-0) 805.
Continuation of 505.

820. Communication Theory and Process
Fall, Winter, Summer. 3(3-0)
Theoretic models of communication, with emphasis on the applications of communication theory to various professional communication areas.

821. Mass Communication Theory and Research
(921.) Spring. 4(3-0)
Current theories and research in mass communication.

822. Interpersonal Communication
(920.) Winter. 4(3-0)
Current theories and research in interpersonal communication, with emphasis on persuasion.

828. Cross-cultural Communication
(428.) Spring, Winter. 4(4-0)
Role of communication in the economic, social, and political development of less developed countries. Problems in communicating across cultural boundaries.

850. Seminar in Research Utilization
(950.) Spring, Summer. 4(3-0) May re-enroll for a maximum of 8 credits. Approval of department.
Applications of communication research to professional practice in such areas as teaching, change agencies, information system management, etc.

870. Communication and Change: The Diffusion of Ideas and Information
(470.) Fall, Spring. 4(4-0)
Research traditions underlying the diffusion of ideas and information, and acceptance of innovation and change. Strategic principles for introduction of change through the use of communication.

890. Special Problems
Fall, Winter, Spring, Summer. 1 to 6 credits. Approval of department.
Special problems as arranged with instructor.

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

905. Communication Research Design
Spring. 4(4-0) 806.
Methods of data collection and analysis in communication research. Designing exploratory studies of the communication process. Interviewer training and bias. Content analysis of the mass media. Writing and critiquing research reports.

940. Seminar in Communication Theory and Research
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 45 credits. Approval of department.
Theoretic and research issues in communication.

990. Special Problems
Fall, Winter, Spring, Summer. 1 to 6 credits. Approval of department.

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

COMPUTER SCIENCE

College of Engineering

110. FORTRAN Programming
Fall, Winter, Spring, Summer. 3(3-0)
Students may not receive credit in both 110 and 150.
Introduction to FORTRAN programming; use of library programs; applications from various areas.
120. Elements of Computer Programming
Fall, Winter, Spring, Summer. 3(3-0)

MTH 111 concurrently. Students may not receive credit in both 120 and 110.

FORTRAN programming; arithmetic and logical operations; functions and subroutines.

300. Computer Programming
Fall, Winter, Spring, Summer. 3(2-4) 110 or 120 or approval of department.

Computer arithmetic including number systems, operations, logic organization, instructional codes.

302. Machine and Assembly Languages
Fall, Spring, Summer. 4(4-0) 301.

Characteristics of machine languages; details of computer instructions; contrasts with compiler languages; structure of assembly languages including fixed and relocatable addresses, machine code, pseudo instructions, program linkage and macro instructions.

303. Compiler Languages and Monitors
Fall, Spring, Summer. 4(4-0) 302.

Implementation of compilers; function and implementation of higher level systems; multi-programming.

305. List Processing Languages
Winter. 3(2-0) 110 or 120 or approval of department.

The mechanics of a typical list-processing language will be presented with illustrative problems; characteristics, advantages and disadvantages of the language will be considered.

306. COBOL Programming
Spring. 3(3-0) 110 or 120 or approval of department.

The mechanics of COBOL, a business data processing language, will be presented with illustrative problems; characteristics, advantages and disadvantages of the language will be considered.

411. Information Theory
Winter. 3(3-0) 303, STT 441.

Information measure, coding, transmission and recognition associated with man-machine systems.

421. Digital Computer Design
Fall. 3(3-0) 303, PHY 296.

Number systems; Boolean algebra; switching problems using combinational logic; minimization of combinational networks.

422. Sequential Machines I
Winter. 3(3-0) 421.

Digital computer operations and the associated design of control elements using synchronous and combinational switching circuits.

423. Sequential Machines II
Spring. 3(3-0) 422.

Design of asynchronous, memory, and input-output units including the use of asynchronous switching circuits.

451. Mechanical Language I
Fall. 3(3-0) 303; MTH 215.

The basis of mechanical language, conventions, literals, variables; arithmetic and logical operations; structured operands.

452. Mechanical Language II
Winter. 3(3-0) 451.

Search and scanning methods for ranking; key transformations; metaprograms.

453. Mechanical Language III
Spring. 3(3-0) 452.

Computation graphs and minimization techniques relating to memory use; compiled instruction generation and special register allocation.

490. Special Problems
Fall, Winter, Spring, Summer. 1 to 5 credits. Approval of department.

Investigation of a topic in the computer area, either hardware or software.

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

827. Switching Theory
Spring. 3(3-0) 826.

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

851. Operator Precedence Grammars
Fall. 3(3-0) 453 or approval of department.

Grammar definition; techniques of recognition; matrix representation of precedence relations; sentence decomposition using precedence matrices.

852. Bounded Context Translation
Winter. 3(3-0) 851.

Algorithms for analyzing bounded context grammars; introduction to transformational grammars.

853. Formal Programming Systems
Spring. 3(3-0) 852.

Construction of a formal programming language; processes for formal languages.

835. Data Structures in Information Processing
Fall. 3(3-0) 853.

Memory hierarchy and allocation algorithms; information collection; management, processing, retrieval and display; implications for machine, language and problem organization.

836. Simulation of Stochastic Systems
Winter. 3(3-0) 854.

Computational aspects of the development, verification, and utilization of algorithms for simulating models of discrete, stochastic systems; processing using Random Walks and Markov Chains.

857. Computer-Aided Design of Deterministic Systems
Spring. 3(3-0) 855.

Formal language specification of time-dependent, deterministic systems; automated production, management, and solution of systems-associated equations.

911. General Automata Theory I
(E E 981.) Fall. 3(3-0) SY 811 or approval of department. Interdepartmental with the Electrical Engineering Department.

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

912. General Automata Theory II
(E E 982.) Winter. 3(3-0) 911. Interdepartmental with the Electrical Engineering Department.

Linear bounded automata; turing machines; recursive sets; degree of difficulty of computations.

913. General Automata Theory III
(E E 983.) Spring. 3(3-0) 912. Interdepartmental with the Electrical Engineering Department.

Reliability and redundancy of finite automata; threshold logic nets; pattern recognition automata; command and control automata.

CROP SCIENCE
CSC
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.