515. Health, Medical Care, and Society II
Winter. 2(1-3) 514 or approval of department.
Continuation of 512. Medical economics and finance for the general practitioner. Principles of medical management. Field experiences with health care agencies and programs.

516. Health, Medical Care, and Society III
Spring. 2(1-3) 515 or approval of department.
Clerkship in community medicine. Consideration is also given to patient care issues. Practical problems of health care delivery are analyzed which occur in clerkship. Some issues are explored directly with the principal parties involved.

517. Health, Medical Care, and Society IV
Summer. 2(1-3)
Community-based studies of health care delivery systems.

620. Directed Studies in Community Medicine
Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 24 credits. Approval of department.
Individual projects on special problems related to community medicine.

COMPUTER SCIENCE

College of Engineering

110. Introduction to Computer Programming
Fall, Winter, Spring, Summer. 3(3-0)
Students may not receive credit in both 110 and 120.
FORTAN programming, number systems and basic computer structure. Applications from various areas including business and social science.

120. Computer Programming for Engineers and Scientists
Fall, Winter, Spring, Summer. 3(3-0) MTH 111 concurrently. Students may not receive credit in both 110 and 120.
FORTAN programming, number systems and basic computer structure. Applications from engineering, mathematics and physical science.

124. APL-Computer Programming for Scientists
Fall, Winter, Spring. 3(3-0) LBC 112 or concurrently. Interdepartmental with and administered by Lyman Briggs College.
APL programming; interactive programming techniques; arithmetic, logical, and extended APL operators; functions, applications to concurrent topics in mathematics; principles of operators of time-shared computers.

130. Computers in Society
Fall. 3(2-1)
A non-technical introduction to computers, programming, applications and to the computer revolution. Topics: automation, data banks, privacy, the engineered society.

255. Computer Models in Science and Engineering
Spring. 3(3-0) 110 or 120 or equivalent FORTAN. Interdepartmental with and administered by the Mechanical Engineering Department.
Problem-solving, development of student's ability to formulate computable models based on finite physical elements, examples from statics, dynamics, electrical resistance, and conduction heat transfer.

290. Special Problems
Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 9 credits in 290 and 490 combined. Approval of department.
Independent undergraduate research in computer science.

300. Computer Programming
Fall, Winter, Spring. 3(3-1) 110 or 120; MTH 108 or 111.
Development and implementation of numeric and non-numeric algorithms using FORTRAN. Number systems and representations of data. Concepts of storage, processors and compilers.

305. List Processing Languages
Winter. 3(3-0) 290 or approval of department.
Development and implementation of computer programs in string and list processing languages. Emphasis upon non-numeric applications. Structure of a simple list processing language. Comparison of list processing languages.

306. COBOL Programming
Spring. 3(3-0) 110 or 120.
The material covered in COBOL, a business data processing language, presented with illustrative problems.

311. Assembly Language and Machine Organization
Fall, Winter. 4(3-1) 300. MTH 113 or concurrently; or approval of department.

312. Generative Coding and Information Structures
Winter. Spring. 4(5-1) 311. MTH 214 or concurrently; or approval of department.
Macro facilities, conditional assembly, interaction with monitor, assembly language 1/O. Use of buffer, stack, queue, deque, tree and list data structures. Interpreters, recursive routines.

313. Introduction to System Programming
Fall, Spring. 4(3-1) 312.
Loaders and operating systems. Study of existing batch and time-sharing systems. Design and implementation of part of an operating system. Segments, overlays, multi-processing and multi-programming.

321. Introduction to Discrete Structures
Fall, Winter. 3(3-0) 300, MTH 113.
Set operations, relations, functions and mappings. Boolean algebra, Boolean matrices, truth tables, minimization. Propositional and predicate calculus, well formed formulas, precedence relations, quantifiers. Applications to computer science.

322. Introduction to Theory of Computing
Winter, Spring. 3(3-0) 321, MTH 215 or 334.
Finite-state machines, stack automata, Turing machines. Effective procedures and computability. Introduction to recursive functions. Symbol manipulation systems.

341. Computer Aided Manufacturing
Spring. 4(3-2) 110 or 120. Interdepartmental with and administered by the Department of Mechanical Engineering.
Numerical control, Computer-Aided Numerical Control, Direct Numerical Control, and adaptive control applied in present day manufacturing. Use of the APT language to control NC machines.

411. Information Theory
Winter. 3(3-0) 110 or 120; 322 recommended. STT 351 or 441.
Measures of information content and flow. Channel capacity and theoretical limits on information transmission. Applications to coding and computer related studies.

421. Combinational Circuits
Fall. 3(3-0) 311 and 321 or approval of department.
Combinational circuits. Minimization, multiple output, NAND-NOR implementation and iterative circuits.

422. Sequential Circuits
Winter. 3(3-0) 322 or approval of department.
Synchronous and asynchronous machines. Boolean equations, state minimization, races and hazards. Regular expressions, Moore and Mealy models.

423. Computer Architecture
Spring. 3(3-0) 422.
Computer arithmetic algorithms, memory systems, computer design, input-output system design, digital system simulation.

447. Digital Filtering
Spring. 3(3-0) 300, MTH 215.

451. Design of Language Processors I
Fall. 3(3-0) 313 or concurrently, 332.
Relation between languages and automata. Properties of grammars. Lexical analysis and symbol-table management. Syntax analysis using top-down parsing, precedence, LL(k) and L(k). Preliminary design of a compiler.

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

453. Design of Language Processors III
Spring. 3(3-0) 452.
Continuation of 452. Readings from the current literature. Completion of compiler project.

490. Special Problems
Fall, Winter, Spring, Summer. 1 to 5 credits. May re-enroll for a maximum of 9 credits in 290 and 490 combined. Advanced standing and approval of instructor.
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) 390, 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
Fall, Winter, Spring, Summer. 3(3-0) 505. 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) 605. Interdepartmental with Systems Science and Social Science (College of) and administered by Systems Science.
Problems 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(3-0) 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) 445, 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 Combinatorial Circuits
Fall, 3(3-0) 433 or approval of department.
Switching algebra and related group and lattice theory; characterization of multiple-output switching functions using multi-level combinatorial circuits.

826. Theory of Digital Machines
Winter, 3(3-0) 826.
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
Fall, 3(3-0) 450 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; derivations restricted grammars.

833. Mathematical Theory of Formal Languages III
Spring, 3(3-0) 833.
Current literature and advanced topics in formal language theory.

837. Computer-Aided Design of Deterministic Systems
Spring, 3(3-0) 441.
Formal language specification of time-dependent, deterministic systems; automatic production, management, and solution of system-associated equations.

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.

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.

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

911. General Automata Theory I
(E E 982) Fall of odd-numbered years, 3(3-0) 493 or SYS 597 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 983) 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 982) Spring of even-numbered years, 3(3-0) 912. Interdepartmental with Electrical Engineering.
Degrees of difficulty of computation. Models of parallel computation, iterative automata.

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

C J

CRIMINAL JUSTICE

College of Social Science

110. Introduction to Criminal Justice
Fall, Winter, Spring, 3(3-0) 200.
Survey of agencies that compose the system: primarily the police, courts and corrections. Also, the procedures of these components and their relationships, as well as related agencies involved are examined.

235. Criminology
Winter, Spring, 4(4-0) 252 or approval of department.
Interdepartmental and jointly administered with the Department of Sociology.
Crime analyzed from sociological perspective: meaning of "crime", crime statistics, and measurements; theories of crime causation, crime types, e.g., professional organized, violent, sex, white-collar crimes, juvenile delinquency.

315. Criminal Investigation
(Spring, 3(3-0) 355.) 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, Spring, 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) 255.
Functional role of law enforcement within the criminal justice system. Law enforcement organizations and the functions 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.