515. *Health, Medical Care, and Society II*

Winter. 2(1-3) 514 or approval of department.

Continuation of 514. Medical economics and finance for the general practitioner. Principles of medical management. Field placements 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 CPS

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.

FORTRAN 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.

FORTRAN 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 FORTRAN. 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, Summer. 3(2-1) 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) 300 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 mechanics of 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.

Machine structure, registers and operations. Programming in assembly language. Discrimination of assembler, loader and execution tasks. Comparison with interpretive processing. Introduction to program and data structures. Subprogram linkage.

312. *Generative Coding and Information Structures*

Winter, Spring. 4(3-1) 311. MTH 214 or concurrently or approval of department.

Macro facilities, conditional assembly, interaction with monitor, assembly language I/O. Use of buffer, stack, queue, deque, tree and list data structures. Interpreters, recursive routines.

313. *Introduction to System Programming*

Fall, Spring, Summer. 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 multiprogramming.

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, 421.

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.

Background. Sampling theorems. Discrete linear systems. The digital filter. Digital filter design. Discrete Fourier transforms. Applications and generalizations.

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. *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) 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 contex-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.

833. Mathematical Theory of Formal Languages III

Spring. 3(3-0) 832.

Current literature and advanced topics in formal language theory.

837. Computer-Aided Design of Deterministic Systems

Spring. 3(3-0)

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.

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.

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 equivalance 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 deterrance, 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.