517. Health, Medical Care, and Society IV
Summer. 2(3-1)
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.
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.

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 status, 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. Approval of department.
Independent undergraduate research in computer science.

300. Computer Programming
Fall, Winter, Spring. 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(2-1) 300.

312. Generative Coding and Information Structures
Winter, Spring. 4(3-1) 311.
Macro facilities, conditional assembly, interaction with monitor, assembly language /O. Use of buffers, 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 multi-programming.

321. Introduction to Discrete Structures
Fall, Winter. 3(3-0) 300, MTH 112. Set operations, relations and functions. Deductive and mathematical proofs. Algebraic systems. Applications to computer science.

322. Introduction to Theory of Computing
Winter. 3(3-0) 321.
Finite-state machines, Turing machines. Effective procedures and algorithms. Symbol manipulation systems.

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

421. Combinational Circuits
Fall. 3(3-0) 300, 281; 322 desirable; MTH 215.
Combinational circuits. Minimization, multiple output, NAND-NOR implementation and iterative circuits.

422. Sequential Circuits
Winter. 3(3-0) 311, 421.
Synchronous and asynchronous machines. State minimization, flip-flops, Boolean equations, races and hazards.

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

451. Mechanical Language I
Fall. 3(3-0) 311; MTH 215; 321 or PHL 337 and MTH 324; 322 recommended.
Classification of grammars and their properties. BNF, trees, relations, top-down parsing. Sample precedence grammars using matrix techniques.

452. Mechanical Language II
Winter. 3(3-0) 451.
Floyd-Evans productions. Assignment of a tworterm project on compiler writing. Lexical analysis, semantics, register allocation, code of optimization. Hacking and other purchasing techniques. Dynamic storage techniques.

453. Mechanical Language III
Spring. 3(3-0) 453.
Finite state automata; pushdown automata. Extended precedence grammars. Precedence functions. LR(k) grammars. LL(k) grammars. Bounded context techniques.

490. Special Problems
Fall, Winter, Spring, Summer. 1 to 5 credits. May re-enroll for a maximum of 9 credits. 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.

810. Introduction to Linear System Theory
Fall, Winter. 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. Systems Methodology and Simulation
Winter. 3(3-0) 510, 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, Fall, Summer. 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. Parametric Pattern Recognition
Winter. 3(3-0) STT 441, computer programming.
The decision-theoretic approach to pattern recognition using decision rules, parameter estimation, sub-optimum strategies, minimum strategy without learning, learning, and sequential recognition.

818. Nonparametric Pattern Recognition
Spring. 3(3-0) 817.
The non-statistical approach to pattern recognition. Discriminant functions, clustering, non-parametric learning, and algorithms for 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 multiple-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.