630. Alcoholism Clerkship
Fall, Winter, Spring, Summer. 2 to 12 credits. May reenroll for a maximum of 12 credits. COM students: Satisfactory completion of terms 1 through 3 with credit. Application for credit using FORTRAN. Number systems and representations of data. Concepts of storage, processors and compilers.

Computer Science (CPS)

College of Engineering

115. Introduction to Computing
Fall, Winter, Spring. 3(3-0) Not open to students with credit in CPS 120 or LBS 124, CPS 130 or CPS 251. Applications of computers in business, education, government and industry. Introduction to computing systems and programming in BASIC.

120. Computer Programming for Engineers and Scientists
Fall, Winter, Spring. 3(3-0) MTH 113 or concurrently. Students must receive credit in both CPS 110 and CPS 120. FORTRAN programming, number systems and basic computer structure. Applications from engineering, mathematics and physical sciences.

124. APL-Computer Programming for Scientists
Fall, Winter, Spring. 3(3-0) LBS 112 or concurrently. Interdepartmental with and administered by Lyman Briggs School. 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(3-1)
A non-technical introduction to computers, programming, applications and to the computer revolution. Topics: automation, data banks, privacy, the engineered society.

251. Algorithms and Computing I
Fall, Winter, Spring. 3(3-2) MTH 112.
Algorithms, numeric and character data, data types, variables, expressions, decision structures, arrays, and procedures. Design and implementation of algorithms in PASCAL.

252. Algorithms and Computing II
Winter, Spring, Summer. 3(3-2) CPS 251, MTH 113.
Problems solving methods, numeric computation, string processing, number and character representation, data structures, and programming style. Design and implementation of algorithms in PASCAL.

292. Selected Topics
Fall, Winter, Spring. 1 to 3 credits. May reenroll for a maximum of 6 credits when different topics are taken. Topics selected will in general supplement and enrich existing courses, and lead to the development of new courses.

295. 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 department. Independent undergraduate research in computer science.

300. Computer Programming
Fall, Winter, Spring. 3(3-0) CPS 120 or approval of department; MTH 111. Development and implementation of numeric and non-numeric algorithms using FORTRAN. Number systems and representations of data. Concepts of storage, processors and compilers.

301. FORTRAN Laboratory
Fall, Winter, Spring. 1(0-3) CPS 252 or concurrently. Students may not receive credit in CPS 301 and in CPS 120. Programming laboratory using FORTRAN.

303. FORTRAN Programming
Fall, Spring. 3(3-0) CPS 250, MTH 113. Students with credit in CPS 251 may not receive credit in CPS 304. Programming style, problem solving methods, linear data structure, trees. Design and implementation of algorithms in FORTRAN.

305. List Processing Languages
Fall, Winter, Spring. 3(0-3) CPS 290 or CPS 301 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) CPS 115 or CPS 120 or CPS 251. The mechanics of COBOL, a business data processing language, presented with illustrative problems.

311. Assembly Language and Machine Organization
Fall, Winter. 4(3-2) CPS 252, CPS 301 or CPS 300, CPS 304, MTH 214 or LBS 216. Machine structure, registers and operations. Programming in assembly language. Discrimination, assembler, loader and execution tasks. Comparison with interpretive processing. Introduction to program and data structures. Sub-program linkage.

312. Generative Coding and Information Structures
Winter, Spring. 4(3-2) CPS 311.
Macro facilities, conditional assembly, interaction with monitor, assembly language I/O. Use of buffer, stack, queue, dequeue, tree and list data structures. Interpreters, recursive routines.

313. Introduction to System Programming
Fall, Spring. 4(3-2) CPS 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) CPS 252 or CPS 300, MTH 214 or LBS 216.
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) CPS 321, MTH 215 or LBS 217.

340. Computer Aided Manufacturing
Fall, Winter. 3(3-0) CPS 115 or CPS 120 or CPS 251 or LBS 124. Interdepartmental with and administered by the Department of Metallurgy, Mechanics and Materials Science. APT and COMPAC: numerical control languages. Group technology and computer-aided process planning. Introduction to manufacturing robotics.

412. Computer Communications
Spring. 3(0-3) CPS 300 or CPS 301; MTH 251 or STT 441.
Computer networks; analysis by queueing theory; network design algorithms; routing and flow.

413. Interactive Computer Graphics
Summer. 3(3-0) CPS 312, matrix algebra.
Design of interactive graphic systems including display devices, processors, data structures, interrupt processing and graphical techniques. Two and three dimensional transformations, perspectives, hidden surface removal, shading, and other techniques.

416. Digital Design
Fall, Summer. 3(3-0) CPS 311, CPS 322.
Combination logic with MSI, LSIs (medium-scale and large-scale integrated circuits) and microprocessors. Synchronous and asynchronous machines. Processor and control logic design.

417. Digital Design Laboratory
Fall, Winter, Summer. 2(1-3) CPS 416 or concurrently.
Designing, constructing and testing computer related circuits using discrete logic, MSI, LSI and microprocessors.

423. Computer Architecture
Fall, Winter, Spring. 3(3-0) CPS 416 or E E 430 or approval of department.
Computer arithmetic, microprocessors, computer design, input/output system design, digital system simulation.

447. Digital Filtering
Spring. 3(3-0) CPS 300 or CPS 301, MTH 310.
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) CPS 313 or concurrently. CPS 322.
Relation between languages and automata. Properties of grammars. Lexical analysis and symbol table management. Synthesis 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 CPS 451.

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

450. 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 department.

Independent undergraduate research in computer science.

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

505. Clustering and Scaling Algorithms
Fall, 3-3-0 CPS 301 or CPS 304, STT 441 or approval of department.

Algorithms that organize large amounts of data. Includes metric clustering, hierarchical clustering and multi-dimensional scaling.

506. Fundamentals of Pattern Recognition
Fall, 4-4-0 CPS 301 or CPS 304, MTH 334, STT 142.
Decision-theoretic and nonstatistical approaches; discriminant functions; parameter and density estimation; feature extraction; supervised and unsupervised learning; sample size effects; error estimation; design of pattern recognition systems; computational considerations.

802. Digital Image Processing
Winter, 3-3-0 MTH 334, CPS 447 or SYS 311 or approval of instructor.


827. Switching Theory
Spring, 3-3-0 CPS 826.
Asynchronous and speed independent circuits; static and dynamic hazards; use of race conditions.

831. Theory of Formal Languages I
Fall, 3-3-0 CPS 322 or approval of department.

Definition of formal languages; automata and grammars; regular, linear and context free languages; closure properties.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

906. Advances in Pattern Recognition
Fall, 3-3-0 CPS 805, CPS 866.
Current research topics in pattern recognition, exploratory data analysis, syntactic pattern recognition and digital image processing; practical applications of pattern recognition methodology.

911. General Automata Theory I
Fall of odd-numbered years, 3-3-0
CPS 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
Winter of even-numbered years, 3-3-0
CPS 911. Interdepartmental with Electrical Engineering.


913. General Automata Theory III
Spring of even-numbered years, 3-3-0
CPS 912. Interdepartmental with Electrical Engineering.


921. Advanced Computer Systems I
Fall of odd-numbered years, 3-2-3
CPS 827, graduate course in operating systems. Interdepartmental with Electrical Engineering.

Models of single and multiple processors, their computational power, and measures of performance. Interconnection networks, data driven machines, and pipelines.

922. Advanced Computer Systems II
Winter of even-numbered years, 3-2-3
CPS 921. Interdepartmental with Electrical Engineering.

Design and characterization of parallel algorithms. Matching of algorithms with appropriate hardware configurations. Programming languages which support parallel computation.

944. Theory of Algorithms
Summer, 3-3-0 CPS 832 or CPS 812.
Formulation of computation concept and algorithm verification. Topics included are finite and infinite automata, recursive functions, program verification, decision problems, flowchart schemas, and formal theory of programs.

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