COMPUTER SCIENCE

CS 115. ELEMENTS OF COMPUTER SCIENCE 3 HRS.
(Prerequisites, 1 year of high school algebra, MA 098, or permission.)
This course covers the computer and computer application at the introductory level. Topics include the history of computing, hardware, components, software, problem solving, data types and structures, acquisition and selection of equipment and software, social and economic implications, and careers in computing. The course is designed for students who will utilize the computer in other disciplines and students desiring general information about computers and their applications.

CS 130. MICROCOMPUTER PROBLEM SOLVING 3 HRS.
(Prerequisite, one year of high school algebra.) An introductory study of problem solving using computers, with emphasis on the micro-computers. Basic programming skills and efficient techniques for setting up problems applicable for computer solution are stressed. The primary response of the student is to solve problems by writing programs, testing them, and obtaining the results on the computer.

CS 201. CURRENT TOPICS IN COMPUTER SCIENCE 1-3 HRS.
This course will provide a study of selected topics in computer science not currently found in other computer science courses. It may be repeated with different topics for a maximum of six credits. See Schedule of Classes for specific topics.

CS 220. INTRODUCTION TO COMPUTER SCIENCE 3 HRS.
(Prerequisite, high school algebra.) An overview of the discipline of Computer Science. Topics to be covered will consist of introductions to the "traditional" areas of computer science such as data structures, assemblers and compilers, theory of computing, artificial intelligence, theory of data bases, and programming languages. This is intended as a first course for computer science majors.

CS 234. SOFTWARE IMPLEMENTATION AND UTILIZATION 3 HRS.
(Prerequisites, CS 130 and CS 220.) This course will introduce the secondary education student to use of software technologies and provide a framework for utilizing software products in an educational setting. The course will provide its participants with strategies for employing these technologies to assist the secondary classroom teacher and learning community.

CS 250. INTRODUCTION TO COMPUTER PROGRAMMING 3 HRS.
(Prerequisite, MA 110.) This course is designed to introduce students to the discipline of computer science. Major emphasis will be placed on problem solving by decomposition top-down design of algorithms, elementary control and record structures, array, string, and file processing, recursion and pointer variables.

CS 260. PROGRAMMING AND PROBLEM SOLVING 3 HRS.
(Prerequisite, MA 110.) This course is designed to introduce students to the discipline of computer science. Major emphasis is placed on problem solving and program development skills. Students write computer programs in a high-level language. Major topics include program design, control structures, subprograms, arrays, pointers, and class construction.

CS 315. JAVA PROGRAMMING 3 HRS.
(Prerequisites, CS 260 or instructor permission.) Java is an object-oriented language that has become an important language for use on the Internet. This course will give an introduction to programming in Java.

CS 320. COMPUTER NETWORKS AND INTERNETS 3 HRS.
(Prerequisite, MA 110.) This course answers the basic question, "How do computer networks and internets operate?" in the broadest sense. The course provides a comprehensive, self-contained tour through all of

networking from the lowest levels of data transmission and wiring to the highest levels of application software.

CS 325. HTML PROGRAMMING 3 HRS.
This course provides the student with the information necessary to create HTML documents for the World Wide Web. The course will cover syntax and design issues as well as techniques and technologies which promote information transmission across the Internet.

CS 340. ALGORITHMS AND DATA STRUCTURES I 3 HRS.
(Prerequisites, CS 220 and CS 250.) Basic concepts of data structures and algorithms. Design and analysis of algorithms and analysis of the data structures which are appropriate to the implementation of particular algorithms. The effect of data structures and algorithms on program development, efficiency and maintenance will be covered. Applications of data structures such as lists, strings, arrays, trees, stacks, queues, and graphs in file processing and bulk data storage will be covered.

CS 345. ALGORITHMS AND DATA STRUCTURES II 3 HRS.
(Prerequisite, CS 340 or consent of instructor.) Continuation of CS 340. The analysis of a variety of algorithms which arise frequently in computer applications. Basic principles and techniques for analyzing and improving algorithms in areas such as List Searches, Sorting, Pattern Recognition, Polynomial and Matrix Computations.

CS 350. PROGRAMMING LANGUAGES 3 HRS.
(Prerequisite, CS 340.) The study of the general concepts and principles of underlying computer programming languages. Case studies of specific computer languages which illustrate these general concepts and principles.

CS 355. UNIX 3 HRS.
This course provides an overview of the commands, utilities and supporting architecture used in the UNIX operating system. This course provides the student with skills needed to operate UNIX based computers on the Internet and perform file/system operations on graphics workstations and servers. Topics include installation, common utilities, making files, creating and manipulating databases, servers, editors, and the C, Bourne, and Korne shells.

CS 386. INTERNSHIP: COMPUTER SCIENCE 1-3 HRS.
(Prerequisite, 20 hours in computer science courses.) An academic course to provide students with an opportunity to gain field experience in computer science through professional experience. The academic experience is developed jointly by the student and the faculty advisor. No more than 3 hours in CS 386 may be counted toward the computer science major.

CS 410. SEMINAR IN COMPUTER SCIENCE 1-4 HRS.
(Prerequisite, permission of mathematics department.) A seminar involving various topics in computer science.

CS 444. DATABASE ORGANIZATION 3 HRS.
(Prerequisite, CS 260 or instructor permission.) Investigations of strategies for deploying database application. Overview of database architectures, including the Relational, Hierarchical, Network and Objects Models. Database interfaces, including the SQL query language. Issues such as security, integrity, and query optimization. Database design using the Entity-Relationship Model. Develop familiarity with modeling, design and implementation techniques used in the construction of database applications.

CS 472. TEACHING COMPUTER SCIENCE 2 HRS.
(Prerequisites, CS 130 and CS 115.) A methods course to aid the prospective computer science teacher in high school and junior high school with aspects of hardware and software selection and evaluation; use of the computer in other disciplines and in the home; organization of computer topics for presentation; design of computer projects; careers in the computer science field; computer architecture; practicum in

the teaching of computer science.

CS 480. INDEPENDENT STUDY COMPUTER SCIENCE **1-4 HRS.**
(Prerequisite, permission of mathematics department. Open only to qualified juniors and seniors.) Topics of special interest in some area of computer science study not included in regularly listed courses.

CS 501. ADVANCED COMPUTER PROGRAMMING **1-3 HRS.**
(Prerequisite, CS 250 or consent of instructor.) Elementary and advanced programming techniques for a particular language will be studied along with applications of the language. The student will have many opportunities to learn these skills through frequent programming assignments. Course may be repeated for credit.

CS 520. MICROCOMPUTER PROJECTS **3 HRS.**
(Prerequisites, MA 161 or MA 165 & CS 130 or instructor's permission.) This course is designed to introduce students to additional features and capabilities of microcomputers, such as cassette tape or floppy disk storage and retrieval, used to solve scientifically oriented problems. With minimal instruction, students are required to complete advanced projects, primarily using the programming language BASIC, on each of the available micro-computers.

CS 523. ARTIFICIAL INTELLIGENCE **3 HRS.**
(Prerequisites, CS 501 and CS 345, or equivalent course work.) This course includes problem solving methods, game playing, and knowledge representation.

CS 542. DISCRETE STRUCTURES **3 HRS.**
(Prerequisite, MA 240.) Computer oriented course. Theory and applications with regard to trees, graphs, partial orders, lattices, Boolean algebra, finite groups and combinatorics.

CS 545. DATABASE THEORY **3 HRS.**
(Prerequisites, MA 240, CS 345.) This course will provide a rigorous treatment of database theory and the implementation of database structures. Topics will include: data modeling, relational algebra, relational calculus, dependencies and normalization theory, and external implementations of data structures such as B-Trees and hash tables.

CS 552. PRINCIPLES OF SOFTWARE ENGINEERING **3 HRS.**
(Prerequisite, CS 345.) This course covers the phases of software development including formalization of requirements, architectural and detailed design, implementation, testing, and maintenance.

CS 554. PRINCIPLES OF COMPUTER ARCHITECTURE **3 HRS.**
(Prerequisites, CS 345 and CS 542.) A lecture-laboratory course where students will learn the hierarchical structure of computer architecture. A hands on experience will be included.

CS 555. PRINCIPLES OF COMPUTER ORGANIZATION **3 HRS.**
(Prerequisite, CS 345.) This course stresses the hierarchical structure of computer architecture. Levels of computer organization include digital logic, microprogramming, machine language, macro language, operating systems. Topics covered are instruction execution, memory, registers, addressing, input/output, control, instruction sets, data flow, control flow, interrupts, and multitasking. Hands on experience will include assembly language programming using macros, linkers, and loaders.

CS 557. OPERATING SYSTEMS **3 HRS.**
(Prerequisite, CS 345.) This course is designed to study the principles and problems involved in the development of an operating system of a computer. Overview of the development of operating systems, sequential and concurrent processes, cooperation, communication and mutual exclusion, synchronization constructs: monitors, conditional critical regions, semaphores; deadlocks, resource allocation, scheduling

policies, storage management, case study of the operating system of a personal computer.

CS 561. SYSTEMS PROGRAMMING 3 HRS.
(Prerequisite, CS 340.) Organization of a computer system. Internal representation of data. Memory management, input/output and interrupts. Utilizing system software in order to program the system via assembling, linking, and debugging.

CS 563. COMPUTER ATTACK ESSENTIALS 3 HRS.
When talking about Network Security, we have to acknowledge that all systems have vulnerable points. This course examines the fundamental and historical perspective of hacking methodology and psyche. The hacking topics are explored in order to examine the current systems associated with these vulnerable points. This course researches and studies the techniques and tools to detect and evaluate these vulnerable points of known exploits in network and operating systems. Types of hackers include those that snoop around networks, vandalize websites or even steal proprietary information by the use of well-known schemes, such as viruses, worms, Trojan horses, denial-of-service attacks and buffer overflows.

CS 564. NETWORK DEFENSE AND COUNTERMEASURES 3 HRS.
Network Defense and Countermeasures focuses on students' understanding of the architecture for network defense. Students will work with layered network defense structures and implement firewalls on various platforms. Students will also gain a working knowledge of Virtual Private Networks and Intrusion Detection Systems, perform packet and signature analysis, identify different methods of risk analysis, and create a security policy.

CS 565. COMPUTER FORENSICS 3 HRS.
This course examines procedures and tools for identifications, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered, and preparation of expert testimonial evidence.

CS 569. DATA SECURITY PRACTICUM 3 HRS.
This course takes a practical look at using good security practices in software. We take a broad look at the issues of correctly implementing security strategies, including why some strategies fail. Students will apply concepts from software engineering, cryptography, and security theory. Students will study state-of-the-art implementation techniques and learn appropriate conditions under which these techniques apply (or not). Students will implement a non-trivial project that will stress correct secure programming techniques.

CS 570. THEORY OF COMPUTATION 3 HRS.
(Prerequisite, CS 542.) This course covers the basic theoretical principles of computer science embodied in finite automata context free grammars, computability, and computational complexity.

CS 580. INTRODUCTION TO COMPUTER NETWORKS 3 HRS.
(Prerequisite, CS 345, MA 161.) An introductory examination of the Open System Interconnection Reference Model (OSI). Special emphasis will be given to real world implementations of the various sub-levels of the OSI model.

CS 584. RAPID APPLICATION DEVELOPMENT 3 HRS.
This course introduces the student to Rapid Application Development Languages as well as the theory and practice of using these programs to access the internet.

CS 620. COMPUTER NETWORKS AND INTERNETS 3 HRS.
(Prerequisite, MA 110.) This course answers the basic question "How do computer networks and internets operate?" in the broadest sense. The course provides a comprehensive, self-contained tour through all of networking from the lowest levels of data transmission and wiring to the highest levels of application software.

CS 625. HTML PROGRAMMING 3 HRS.

This course provides the student with the information necessary to create HTML documents for the World Wide Web. The course will cover syntax and design issues as well as techniques and technologies which promote information transmission across the Internet.

CS 760. NUMERICAL ANALYSIS 3 HRS.
(Prerequisites, MA 322 and MA 262, and CS 260.) Techniques applicable to computers. Numerical solution of equations, interpolation, numerical differentiation and integration, numerical solution of differential equations, and theory of errors in computation.

CS 762. OPTIMIZATION TECHNIQUES 3 HRS.
(Prerequisites, MA 322 and MA 262, and CS 260.) Computer oriented course. Mathematical development of optimization techniques, linear programming, transportation problems, game theory.

CS 763. SIMULATION TECHNIQUES 3 HRS.
(Prerequisites, MA 262 and MA 332, and CS 260.) Computer oriented course, simulation of complex problems, queing, models, Monte-Carlo techniques.

CS 765. NUMERICAL LINEAR ALGEBRA 3 HRS.
(Prerequisite, MA 322.) Numerical solutions are sought for Linear systems AX = B and the corresponding eigenproblem. Direct and iterative methods are used to solve AX = B, employing various decompositions and modifications. Givens rotations, Householder reflectors, and various modifications of the QR Method are used to solve the eigenproblem.

CS 775. COMPILER DESIGN 3 HRS.
(Prerequisites, CS 350, CS 345, and CS 561.) The course is designed to study various theoretical aspects involved in construction of a compiler. Compiler organization--overview, lexical analysis, symbol tables, representation of data types in a compiler, syntactic analysis, attribute grammars, semantic analysis, address assignment, code generation, error handling, storage management; large programming project/case study or a language used on a personal computer.

CS 780. FILE STRUCTURES 3 HRS.
(Prerequisites, CS 345.) Basic physical characteristics of peripheral storage devices. File organization and processing methods for sequential, direct, indexed, B-trees and other tree structured file organizations. Application of data structure concepts to logical and physical file organization. Performance analysis. Elements of advanced data base systems.

CS 810. SEMINAR IN COMPUTER SCIENCE 0-3 HRS.
Directed reading and research in Computer Science.