

## **COMPUTER SCIENCE (CPTR)**

*Note: All entering freshmen and transfer students are required to take the university placement examination in mathematics. These students may not register for any computer science course until they have taken the examination.*

*Students enrolling in CPTR classes must earn at least a grade of C in all its pre-requisite mathematics and computer science courses.*

### **105 INTRODUCTION TO DATA PROCESSING (3)**

Basic concepts of data processing, introduction to the modern digital computer and its peripheral devices, data representation and computer arithmetic. Additional course fee.

### **106 INTRODUCTION TO PERSONAL COMPUTERS (3)**

Prerequisite: MATH 098 or placement examination or consent of the department.

An introduction to personal computer environment using Windows and the Microsoft Office package: Word, Excel, and Power Point. Additional course fee.

### **107 INTRODUCTION TO WEB PAGE DESIGN AND DATABASE APPLICATIONS (3)**

Prerequisite: CPTR 106 or consent of department

Continues CPTR 106, exploring Microsoft Power Point, Access, and Explorer. Using the internet. Web page creation. Additional course fee.

### **130 FORTRAN PROGRAMMING (3)**

Prerequisite: MATH 162 or 171.

Introduction to structured FORTRAN programming; implementation of control structures using IF/THEN/ELSE and WHILE/DO. Arrays, functions and subroutines. Several programming assignments will be made. Additional course fee.

### **141 INTRODUCTION TO C++ PROGRAMMING /5 (3)**

Prerequisite: MATH 098 or 160 or 161, or by mathematics placement examination.

Basic elements of C++ programming, control structures, functions, arrays, pointers, and strings. Credit may not be given for both CPTR 140 and 141. Additional course fee. IAI: CS 911, ENR 922

### **151 INTRODUCTION TO VISUAL BASIC (3)**

Prerequisite: Math 098 or 160 or 161, or by mathematics placement examination.

Windows programming language to create powerful applications for Microsoft Windows operating system to use graphical user interface (GUI), to use other Windows applications' objects (OLEO), and to explain advanced programming techniques such as DE and DLL. Additional course fee.

### **180 INTRODUCTION TO COMPUTER PROFESSIONS (1)**

Co-requisite: CPTR 141

A survey of career opportunities for computer science professionals in industry, government, and education. Overview of the skills, training, strategies, and education required for the various occupations and computer science curriculum. Introduction to the resources available to aid the computer science major. May not be used to fulfill general education requirements.

**241 ADVANCED C++ PROGRAMMING /5 (3)**

Prerequisite: CPTR 140 or 141; CPTR 180 (or concurrent enrollment).

Classes and data abstraction, operator overloading, inheritance, virtual functions and polymorphisms, templates, file processing. Credit may not be given for both CPTR 240 and 241. Additional course fee.

**243 INTRODUCTION TO MULTIMEDIA (3)**

Prerequisite: CPTR 140 or 141.

Introduction to basic multimedia techniques including hardware and software. Manipulating media information (sound, image, and video) under Windows environment such as analog to digital data conversion and media information capturing. Additional course fee.

**250 BUSINESS APPLICATIONS PROGRAMMING (3)**

Prerequisite: CPTR 140 or 141.

Introduction to COBOL data processing computer language. File processing techniques. Retrieval, access, and maintenance of sequential and index files. Data storage manipulation. Methods of system analysis and design. Credit not given for both CPTR 211 and CPTR 250. Additional course fee.

*Note: The prerequisite for any 300-level Computer Science course is the successful completion of the English and reading qualifying examinations.*

**255 UNIX APPLICATIONS (3)**

Prerequisite: CPTR 141

UNIX operating system: UNIX standardization and implementations; the file system; files and directories; advanced I/O. Some utility programs. Use of Vi editor. Communication with other users. Formatting text. System administrator. UNIX and interprocess communication. Communicating with Post Script printer. Credit not given for both CPTR 312 and CPTR 255. Additional course fee.

**301 NUMERICAL METHODS (3)**

Prerequisite: CPTR 240 or 241 and MATH 261.

Numerical methods in problems in mathematics, including numerical integration and differentiation, calculation of roots, interpolation, numerical techniques in linear algebra, programming in a high level language. Additional course fee.

**305 ASSEMBLY LANGUAGE PROGRAMMING /5 (3)**

Prerequisite: CPTR 240 or 241.

Assembly language and numbering system. Hardware and software architecture. Macro assembler, I/O services. Conditional processing, arithmetic processing. Subroutines. High-level language interface. Additional course fee.

**307 DATA STRUCTURES /5 (3)**

Prerequisite: CPTR 240 or 241 and MATH 283 or 303

An introduction to data representations and data structures, followed by a detailed study of operations and applications with character strings (including character sorting, table searching, text editing), linearly linked lists, trees, and graphs. Additional course fee. IAI: CS 921

**308 INTRODUCTION TO FILE PROCESSING (3)**

Prerequisite: CPTR 307.

Sorting, symbol tables, hash tables, sequential and random access of files, file organization, storage management. Additional course fee.

**309 COMPUTER ALGORITHMS (3)**

Prerequisite: CPTR 307

Design and analysis of algorithms. Searching, sorting, and combinatorial algorithms. Time and space complexity. Additional course fee.

**310 COMPUTER GRAPHICS /5 (3)**

Prerequisite: CPTR 240 or 241 and MATH 163 or 171.

Among the topics covered are line drawing algorithms, tables, clipping algorithms, techniques for motion, and other topics in two-dimensional graphics. Students are required to write programs implementing the techniques discussed. Some evaluation of graphics software may be done as well as an introduction to three-dimensional graphics. Additional course fee.

**313 OBJECT ORIENTED PROGRAMMING (3)**

Prerequisite: CPTR 240 or 241

Classes, data encapsulation, inheritance, polymorphisms, OOD/OOP technologies, C++ and other OOP languages. Additional course fee.

**317 THEORY OF COMPUTATION (3)**

Prerequisites: Math 283 or 303 and a co-requisite of CPTR 307

Regular expressions and languages; finite-state machines; formal grammars; regular, context-free, context-sensitive, and unrestricted grammars; pushdown automata; context-free languages; Turing machines; Church's thesis; random-access machines; recursive functions; P-completeness problem; intractable problems. Additional course fee.

**320 PROGRAMMING LANGUAGES (3)**

Prerequisite: CPTR 307.

Language syntax; lexical properties, BNF, and parsing examples; language processors; compilers, interpreters, and direct execution; language representations and language styles. Additional course fee.

**333 COMPUTER ORGANIZATION (3)**

Prerequisite: CPTR 305.

Introduction to hardware concepts of digital computation: logical design, data representation, and transfer. Digital arithmetic, input-output facilities, system organization. Additional course fee. Credit not given for both CPTR 333 and CPTR 303. IAI: CS 922.

**339 SOFTWARE ENGINEERING (3)**

Prerequisites: CPTR 240 or 241

Project management fundamentals; software design and development; software life cycle; tools for verification and validation software; software metrics, project estimation, testing methods and strategies; walkthrough and inspection; object-oriented software engineering. Additional course fee.

**340 SYSTEMS ANALYSIS AND DESIGN (3)**

Prerequisite: CPTR 240 or 241 or 250.

An introduction to the system development life cycle. Emphasis on strategies and techniques of system planning, analysis form and file design, documentation, implementation and evaluation. Additional course fee.

**341 MODELING AND SIMULATION (3)**

Prerequisite: CPTR 307; and MATH 210 or 315.

Simulation methodology, techniques of random number generation, discrete system simulation, simulation languages, model validation, and case studies. Additional course fee.

**355 INTRODUCTION TO OPERATING SYSTEMS (3)**

Prerequisite: CPTR 305 and 307.

Introduction to the basic components and functions of operating systems, resources management and performance evaluation. Writing Emphasis Course. Additional course fee.

**356 COMMUNICATION AND COMPUTER NETWORKS I (3)**

Prerequisite: CPTR 255 or 312; CPTR 355.

Digital data flow and error control, multiplexing, switching architecture, satellite communication, network structure and topology, layering, protocols, interfaces, OSI reference model, IEEE 802 LAN. Writing Emphasis Course. Additional course fee.

**357 INTRODUCTION TO DATABASE SYSTEMS (3)**

Prerequisite: CPTR 307.

Database system architecture. Relational, hierarchical, network database models. Query languages and data definition languages. Security and system evaluation. Case studies. Additional course fee.

**358 RELATIONAL DATABASE AND MANAGEMENT (3)**

Prerequisite: CPTR 357.

Relational data model. Normalization. SQL. Concurrent control. Query optimization. Emphasis in laboratory work including system development using a software package. Additional course fee.

**362 NETWORK SECURITY (3)**

Prerequisite: CPTR 356

Computer systems, network, and data security; formal definitions of security, privacy, and integrity; risk assessment and management; establishing security policies; securing the infrastructure; perimeter security components; encryption technology overview; coding, cryptography, and crypto-analysis; authentication methods and digital signatures; network security management tools; malicious software (e.g. viruses and logic bombs); audit and control methods; legal factors; databases and inference controls; security kernels and verification methods; internet/intranet firewalls. Additional course fee.

**365 NETWORK ADMINISTRATION (3)**

Prerequisites: CPTR 356

Simple network management protocol; structure and identification of management information bases; managing interfaces; address translation; IP addresses; ICMP, TCP, and UDP management; gateway protocol management; reporting SNMP traffic; managing the Ethernet; token ring; FDDI; PPP; X.25 and the frame relay interface; bridge management. Additional course fee.

**366 COMMUNICATION AND COMPUTER NETWORKS II (3)**

Prerequisite: CPTR 356.

Local area network topology. Protocols. Access media. Client/server. Network management and trouble shooting. Novel network. TCP/IP. Open system. Emphasis in laboratory work. Additional course fee.

**368 TCP/IP INTER-NETWORKING AND APPLICATIONS (3)**

Prerequisite: CPTR 355

The OSI model and TCP/IP protocol; TCP/IP architecture; IP addressing, subnetting, and routing. ARP and RARP address resolutions; internet control message protocol; user datagram protocol; routing protocols; application layer and client-server model; domain name system; file transfer protocol; simple mail transfer protocol; Telnet remote login; network security. Additional course fee.

**370 SPECIAL TOPICS IN COMPUTER SCIENCE (1-3)**

Prerequisite: To be determined by instructor and consent of the department.

Computer science topics of current interest. May be repeated for credit with a different topic. Additional course fee.

**371 PATTERN RECOGNITION (3)**

Prerequisite: CPTR 307; and MATH 210 or 315.

Decision theory, parameter estimation, supervision learning, nonparametric methods, clustering, unsupervised learning, introduction to image processing. Additional course fee.

**372 INTRODUCTION TO ARTIFICIAL INTELLIGENCE (3)**

Prerequisite: CPTR 307.

Problem representation, problem solving, game playing, knowledge representation, and predicate calculus, resolution and refutation, expert systems, robot problem solving, A.I. languages (LISP and/or PROLOG). Additional course fee.

**381 COMPUTER SCIENCE INTERNSHIP (3-6)**

Prerequisite: Grade of C or higher in three 300-level computer science courses, earned 80 semester hours toward the bachelor's degree and major in computer science; or consent of the department.

A student project or activity in a computer science environment outside the Department where the techniques of computer science are applied in an essential way. Activity to be performed must be approved in advance by the department. A written final report is required. Additional course fee.

