

**COMPUTER SCIENCE UNDERGRADUATE PROGRAM
DEPARTMENT OF COMPUTER SCIENCE
TEXAS A&M UNIVERSITY**

CURRICULUM. The curriculum in computer science is designed to prepare students to enter into the rapidly expanding computer field. It is based upon the IEEE Computer Society and Association for Computing Machinery recommendations for curricula and courses. A major in computer science at Texas A&M University includes a 12-hour supporting field in another department of the University. This allows students to design a course of study which takes advantage of opportunities offered by other departments within the colleges of the University.

The four-year undergraduate curriculum in computer science includes a sound preparation in science, mathematics, English, statistics and computing. Students select three senior electives from twelve courses. The most popular are offered in multiple sections and semesters. Elective courses are available in the areas of: languages and compilers; software systems; computer systems and architecture; artificial intelligence and cognitive modeling; graphics and robotics; and computational science and engineering. Graduate courses in these areas may be taken by advanced undergraduates.

FACILITIES. The Department of Computer Science has significant computer resources of its own, shares resources with other departments, and makes use of University systems. Departmental resources include approximately 300 general purpose PC and Macintosh workstations; 120 SUN workstations; 13 graphics workstations; 10 artificial intelligence workstations; and 30 X-windows stations. Other resources include large computer servers; disk servers; and massively parallel systems as well as network access to the University mainframes and supercomputers.

UNIVERSITY AND AREA. Texas A&M University is located in the Bryan/College Station area.(pop. 108,000, 100 miles north of Houston. The Bryan/College Station area has been recognized as one of the leading growth areas in the nation (86 percent since 1970). A growing industrial base, excellent housing, strong public school systems, and many recreational and entertainment activities characterize the area.

Texas A&M University, a land-grant, sea-grant, and space-grant university, was established in 1876 as the state's first public institution of higher education. The campus covers 5,142 acres and is within easy driving distance of the four largest cities in Texas. Enrollment is more than 40,000 students, and Texas A&M University has one of the largest enrollments in the nation in engineering, veterinary medicine as well as architecture and environmental design.

FINANCIAL AID. Presently, the Computer Science Department has no scholarship funds for supporting undergraduates. However there are many sources of support through the TAMU Financial Aid Office for students enrolled in Texas A&M University. In addition, university research projects often require the assistance of programmers, and many Computer Science students are hired to fill these jobs. The Computer Services Center hires some students as student operators, programmers, and analysts. Texas A&M University also has an active Co-operative Education Program with many openings for Computer Science students.

DEGREE PLAN INSTRUCTIONS FOR COMPUTER SCIENCE MAJORS

Fall 2000

The instructions contained in this packet are to be used as a guide in preparing the Departmental Computer Science Degree Plan Form for the Bachelor's Degree in Computer Science. After the student completes filling out the degree plan form, it is to be submitted to the Computer Science Undergraduate Advisor for approval. When the degree plan is approved by the Undergraduate Advisor, it will be returned to the student who will then **type** out a formal version and resubmit it for departmental approval by the Undergraduate Advisor. After signature by the Undergraduate Advisor, copies are given to the student and placed in the Computer Science Undergraduate Student's file in the Advising Office.

An upper division evaluation form needs to be submitted by the student to the undergraduate advisor **prior** to enrollment in upper division computer science courses. Students enrolling in upper division courses without CPSC/CECN designation will be removed from the courses. Computer Science courses at the 300 level or above are the designated upper level courses.

Degree audits are produced by the Registrar's Office after a student has 95 credit hours. Copies of this audit are available in the advisor's office, and the audits should be carefully reviewed by the student and his/her advisor, to determine one's progress toward a degree. A final audit will be mailed to the student the semester of anticipated graduation. Additionally, an audit can be done at any time upon request at Heaton Hall for a fee of \$1.00.

Hours & Technical Electives

The total hours on the degree plan must be at least 132. If, for example, the choice of supporting area includes required courses, then other courses must be chosen so that the hour total will be at least 132. These other courses can be in departments other than CPSC or the supporting area, but they should complement the student's degree plan and must be approved by the Undergraduate Advisor. **"Please note that the 132 total hours do not include a required foreign language. It is the student's responsibility to meet the University's foreign language requirement."**

Comments and Observations

Before visiting the Undergraduate Advisor about a degree plan, the student should make as many decisions as possible. One problem area is transfer credits, in that it is sometimes difficult to know which courses may be used. Efforts are made to allow 'reasonable' substitutions. A student **must** submit a copy of his/her transcript evaluation along with the degree plan form if credit for transferred courses is desired. To approve courses that transfer "By Title" to TAMU documentation of the courses content, such as a catalog description, will be required.

It is the student's responsibility to have a degree plan meet minimum requirements. Everyone involved will check, but if a graduating senior's degree plan is not acceptable (e.g. only 131 hours), the student will not graduate.

Computer Science Courses

Thirty-four (34) hours are required as follows: **CPSC 111-4, 211-4, 310-3, 311-3, 320-3, 321-4, 410-3, 431-3, 432-3, 433-3 and 481-1**. These courses must each be passed with a grade of at least "C".

Engineering Courses

Four hours are required: ELEN 220-4. **Students who choose electrical engineering as a supporting field take ELEN 248-4 instead of ELEN 220-4.**

Supporting Fields

- (A) Complete an official university recognized minor in an area approved by a CS Advisor. The student will be required to complete the courses mandated by the department offering the **MINOR** which will likely require **15+ credits** to complete.
- (B) Complete the 12 hour supporting area requirement on your degree plan. The CS Advisor must approve the subject area and the courses selected. The minor must include 300 and 400 level courses and may be selected from the physical sciences, engineering, mathematics, business or liberal arts.

Note: An official minor (A) will be noted on your **Transcript**, the 12 hour supporting area (B) will not. Taking the first 12 credits of an official minor does not automatically satisfy the 12 hour requirement in (B).

The following are guidelines for satisfying the supporting area (B) for the most frequently selected departments:

ELEN

Physics 208 is a prerequisite. ELEN 214-4, 248-4, plus at least 8 hours from ELEN courses 300 level and above, excluding ELEN 306 and ELEN 350.

MATH

Complete the required MATH sequence shown on the degree plan with MATH 308 as the elective. Select one of the following: (MATH 304--MATH 311--MATH 222). Nine (9) hours to be selected from (MATH 312, CPSC 442, or any 400 level MATH class (NO MATH 417 if choosing CPSC 442)).

INEN

INEN 303, INEN 314, INEN 315, INEN 420.

BUSINESS

Business courses will be selected after consultation with an advisor.

Mathematics and Statistics

Seventeen hours of Mathematics and three hours of Statistics are required. The courses listed inside the box must each be passed with a grade of at least "C". The elective mathematics course must be either MATH 304 or 308. The choice of a supporting area often dictates this elective.

NOTE: MATH 151 has a prerequisite of algebra, trigonometry and analytical geometry. If MATH 150, 102, 103, or 104 are taken to meet these requirements, they may not be used for credit on the degree plan's requirement of 132 hours.

Science Courses

16 hours of science coursework are required; choose from any two of the following four options:

1. Chemistry: CHEM 101/111 and 102/112
2. Physics: PHYS 218 and 208
3. Life Sciences: BIOL 113/123 and BIOL 114/124
 OR any two of: BIOL 113/123, BOTN 101, ZOOL 107
4. Earth Sciences: GEOL 101 and GEOL 106
 OR any two of: GEOG 203/213, METR 201/202, RENR 205/215

Computer Science Electives

Nine (9) hours are required, to be chosen from: CPSC 434-3, 435-3, 436-3, 441-3, 442-3, 452-3, 456-4, 462-3, 463-3, 464-3, 485*, 489*

***NOTE: Use of CPSC 485 or 489 hours must be approved by undergraduate advisor.**

DIRECTED ELECTIVES

Humanities Elective Course

ENGR 482 (PHIL 482) is a required course.

Visual and Performing Arts

Three (3) hours of visual and performing arts electives must be selected from the list of College of Engineering directed electives for visual and performing arts - please refer to the undergraduate catalog.

Social Science Elective Courses

Six (6) hours of social science elective are required which should be selected from the list of College of Engineering directed electives - please refer to the undergraduate catalog. If only one course is above 299, both courses must be in the same subject area or if both courses are above 299, they may be from different subject areas.

CITIZENSHIP

History Courses

Six (6) hours of American history are required of which three hours may be in Texas history and three semester hours in American history, or the entire six hours may be in American history. Students in ROTC may substitute 6-hours of advanced military science courses for 3-hours of American history.

Political Science Courses

Six (6) credit hours of political science are required which should include **POLS 206-3** and **207-3**. Students in ROTC may substitute 6-hours of advanced military science courses for POLS 207.

Physical Education Courses

Four (4) hours of **KINE 199** are required.

English, Speech and Writing Courses

Nine (9) hours of English, Speech and Writing courses are required which include **ENGL 104-3**, **ENGL 210-3** or **301-3** and **SCOM 203-3**. Students transferring into the program having already taken other English courses may be allowed to use them as approved by the Undergraduate Advisor. English 104 must be passed with a grade of at least "C".

CATALOG DESCRIPTIONS OF COMPUTER SCIENCE COURSES

CPSC 110. Programming I. (3-2). Credit 4. I, II, S Basic concepts, nomenclature and historical perspective of computers and computing; internal representation of data; software design principles and practices; structured programming in a high-level language; use of terminals, operation of editors and execution of student-written programs. Prerequisite: None.

CPSC 111. Introduction to Computer Science Concepts and Programming. (3-2). Credit 4. I, II Introduction to computer science concepts including principles of program design, plus practice in object-oriented programming. Prerequisite: CPSC 110 or passing grade on qualifying exam.

CPSC 203. Introduction to Computing. (3-0). Credit 3. I, II, S Algorithms, programs and computers; basic programming and program structure; data representation; computer solution of numerical and non-numerical problems using a high-level programming language, FORTRAN.

CPSC 206. Structured Programming in C. (3-0). Credit 3. I, II, S Basic concepts, nomenclature and historical perspective of computers and computing; internal representation of data; software design principles and practices; structured programming in C; use of terminals, operation of editors and execution of student-written programs.

CPSC 210. Data Structures. (2-2). Credit 3. I, II, S Methods for organizing data; design of algorithms for efficient implementation and manipulation of data structures. Prerequisite: CPSC 120.

CPSC 211. Data Structures and Their Implementations. (3-2). Credit 4. I, II Specification and implementation of basic data structures, performance tradeoffs of different implementations. Analyses of run time and space usage. Compares and contrasts object-oriented vs. structured programming. Prerequisite: CPSC 111 or instructor's permission.

CPSC 310. Database Systems. (3-0). Credit 3. I, II, S File structures and access methods; database modelling, design and user interface; components of database management systems; information storage and retrieval, query languages, high level language interface with database systems. Prerequisite: CPSC 210 or CPSC 211.

CPSC 311. Analysis of Algorithms. (3-0). Credit 3. I, II, S Design of computer algorithms for numeric and non-numeric problems; relation of data structures to algorithms; analysis of time and space requirements of algorithms; complexity and correctness of algorithms. Prerequisites: CPSC 210 or CPSC 211, MATH 302.

CPSC 320. Artificial Intelligence. (3-0). Credit 3. I, II, S Fundamental concepts and techniques of intelligent systems; representation and interpretation of knowledge on a computer; search strategies and control; active research areas and applications such as notational systems; natural language understanding, vision systems and expert systems. Prerequisite: CPSC 311.

CPSC 321. Computer Architecture. (3-2). Credit 4. I, II, S Basic hardware/software components, assembly language, and functional architecture of computers; syntax and semantics of a typical microprocessor assembly language; instruction sets, construction and execution of an assembly program; the design of I/O modules, memory, control unit and arithmetic unit. Prerequisites: ELEN 220 or 248.

CPSC 410. Operating Systems. (3-0). Credit 3. I, II, S Hardware/software evolution leading to contemporary operating systems; basic operating systems concepts; methods of operating systems design and construction; algorithms for CPU scheduling, memory and general resource allocation; process coordination and management; case studies of several operating systems. Prerequisite: CPSC 321.

CPSC 431. Software Engineering. (2-2). Credit 3. I, II, S Application of engineering approach to computer software design and development; life cycle models software requirements and specification; conceptual model design; detailed design; validation and verification; design quality assurance; software design/development environments and project management. Prerequisite: Junior classification.

CPSC 432. Programming Language Design. (3-0). Credit 3. I, II Design of high level languages; criteria for language selection; specification techniques for syntax and semantics; trends in high level language design. Prerequisite: Junior classification.

CPSC 433. Formal Languages and Automata. (3-0). Credit 3. I Basic types of abstract languages and their acceptors, the Chomsky hierarchy; solvability and recursive function theory; application of theoretical results to practical problems. Prerequisite: CPSC 311.

CPSC 434. Compiler Design. (3-0). Credit 3. II Programming language translation: functions and general organization of compiler design and interpreters; theoretical and implementation aspects of lexical scanners; parsing of context free languages; code generation and optimization; error recovery. Prerequisite: CPSC 311.

CPSC 435. Structured Programming in Ada. (3-0). Credit 3. The Ada programming language; history and motivation; scalar and composite types; type and object attributes; control constructs; subprograms; packages and abstract types; numeric types; I/O; program structure; overloading and visibility; tasking; generics; programming style using Ada, Ada Programming Support

Environments; bindings to common utilities, including GKS, SQL. Prerequisite: CPSC 210 or CPSC 211 or approval of instructor.

CPSC 441. Computer Graphics. (3-0). Credit 3. I, II, S Principles of interactive computer graphics; systems organization and device technologies for raster and vector displays; 2D and 3D viewing, clipping, segmentation and interaction handling. 3D geometrical transformations, projections and hierarchical data structures for graphics modeling. Prerequisite: CPSC 210 or CPSC 211; Junior classification.

CPSC 442. Scientific Programming. (3-0). Credit 3. II Introduction to numerical algorithms fundamental to scientific and engineering applications of computers; elementary discussion of error; algorithms, efficiency; polynomial approximations, quadrature and systems of algebraic and differential equations. Prerequisites: CPSC 120, MATH 308.

CPSC 452. Robotics and Spatial Intelligence. (3-0). Credit 3. II Algorithms for executing spatial tasks; path planning and obstacle avoidance in two and three dimensional robots--configuration space, potential field, free-space decomposition methods; stable grasping and manipulation; dealing with uncertainty; knowledge representation for planning--geometric and symbolic models of the environment; task-level programming; learning. Prerequisite: CPSC 320.

CPSC 456. Real-Time Computing. (3-3). Credit 4. Introduction to principles and applications of real-time computing; system architecture; D/A and A/D conversion; synchronous data acquisition and analysis; computers in real-time control; asynchronous monitoring and control; resource scheduling; interfacing issues; lectures and laboratory. Prerequisites; MATH 251; ELEN 220 or 248; knowledge of C or Ada, or approval of instructor.

CPSC 462. Microcomputer Systems. (2-2). Credit 3. II Microcomputers as components of systems; VLSI processor and co-processor architectures, addressing and instruction sets; I/O interfaces and supervisory control; VLSI architectures for signal processing; integrating special purpose processors into a system. Prerequisite: CPSC 410 or concurrent enrollment.

CPSC 463. Networks and Distributed Processing. (3-0). Credit 3. I, II Basic hardware/software, architectural components for computer communications; computer networks, switching, routing, protocols and security; multiprocessing and distributed processing; interfacing operating systems and networks; case studies of existing networks and network architectures. Prerequisite: CPSC 410.

CPSC 481. Seminar. (0-2). Credit 1. I, II, S Investigation and report by students on topics of current interest in computer science. Prerequisite: Senior classification.

CPSC 483. Computer Systems Design. (1-6). Credit 3. Engineering design; working as a design-team member, conceptual design methodology, design evaluations, total project planning and management techniques, design optimization, systems manufacturing costs considerations; emphasis placed upon students' activities as design professionals. Prerequisites: CPSC 431 and CPSC 462 and senior classification.

CPSC 485. Problems. Credit 1 to 6. I, II, S Permits work on special project in computer science. Project must be approved by the department. Prerequisite: Senior classification.

CPSC 489. Special Topics in ... Credit 1 to 4. Special topics in computer science that are new or unique that are not covered in existing courses.