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

CURRICULUM. The curriculum in computer engineering 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 engineering at Texas A&M University includes specific courses in Electrical Engineering. Students can also complete a minor in Mathematics by taking one additional course. Students can complete minors in several other disciplines.

The four-year undergraduate curriculum in computer engineering 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. The department has 180 workstations available to students around the clock in instructional and open access laboratories and maintains numerous servers from Sun, Dell, and NetApp that are available to our students. All students have access to several web servers and the department's multiprocessor computational servers. These include three multiprocessor Sun servers running Solaris and a multiprocessor Linux server running Red Hat Enterprise. In addition, each student is allocated storage on the department's 10 TB file server. Wireless network access is provided throughout the department as is remote access via VPN.

UNIVERSITY AND AREA. Texas A&M University is located in the Bryan/College Station area.(pop. 137,000, 100 miles north of Houston. The Bryan/College Station area has been recognized as one of the leading growth areas in the nation. 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 44,000 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 ENGINEERING MAJORS (CS TRACK)

2006-2007 Academic year

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 Engineering. After the student completes filling out the degree plan form (available from the Web Page http://www.cs.tamu.edu/academics/undergraduate), it is to be submitted to the Computer Engineering Undergraduate Advisor for approval. When the degree plan is approved by the Undergraduate Advisor, it will be returned to the student via an email message and a copy will 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 and approved by 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 300 level and above and Electrical Engineering 200 level and above are the designated upper level courses.**

Degree audits are produced by the Registrar's Office and can be obtained for a fee of $1.00. Additionally, degree audits may be obtained at any time, without charge, at myrecord.tamu.edu. The audit 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.

Total Hours Required

The total hours on the degree plan must be at least 130.

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. 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 and a completed substitution form along with the degree plan form if credit for transferred courses is desired.

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 129 hours), the student will not graduate until the problems have been corrected.

Required Courses

Take all courses listed on the Degree Plan. **All courses inside the boxes must be passed with a grade of "C" or better.**

CE Technical Elective Courses

Ten (10) hours of CE technical electives are required and should be chosen from the following CPSC, ELEN, or ENGR 385. One of the technical electives **must be a 4 hour course including a lab.**

Computer Science Courses

Take any 300+ or 400+ courses from the Computer Science Department that are not included in the required courses list.

Students wishing to use CPSC 485, CPSC 489, or CPSC 491 must receive approval from the undergraduate advisor (CPSC dept).

Electrical Engineering Courses

Take ELEN 322, ELEN 326, ELEN 338, 370 or any 400+ course **(ELEN 449 MAY NOT BE USED)** offered by the Electrical Engineering Department. Students wishing to take ELEN 485 or ELEN 489 must receive approval from the undergraduate advisor (CPSC dept).

Engineering Courses

ENGR 385 (co-op) credits may be used to fulfill CE technical elective credits. You must complete 3 credits of ENGR 385 to use them as a CE technical elective.

Engineering Technical Elective Courses

Six (6) hours of Engineering Technical Elective Courses are required (two 3-hour courses). They must be chosen from the following list of courses: AERO 320, BIOL 113, BMEN 241, BMEN 489, CPSC 310, MATH 414, MATH 470, MEEN 221, MEEN 227, PHYS 221.

General Elective Course

Three (3) hours of general electives are required and should be chosen from the approved list from the Academic Advisors.

Humanities

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 Course

Three (3) hours of social science electives are required which must be selected from the list of College of Engineering directed electives for social science courses - please refer to the undergraduate catalog.

DIVERSITY

See the list of course choices on page 19 of the 2005-2006 Texas A&M University Undergraduate Catalog, Edition 128. These courses can also be used to satisfy the Visual and Performing Arts, Social Science, American History, or General Elective courses if approved by the advisor.

CITIZENSHIP

History Courses

Six (6) hours of American history are required (three hours of which may be in Texas State history). Students taking advanced 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 include **POLS 206-3** and **207-3**. Students taking advanced ROTC may substitute 6-hours of advanced military science courses for one of these courses.

Physical Education Courses

Two (2) hours of KINE courses are required. One (1) hour of **KINE 198 -- Health and Fitness** (these courses may be taken pass fail or for a grade); and one (1) hour of **KINE 199 -- Activity** (these courses must be taken pass/fail).

English, Speech and Writing Courses

Six (6) hours of English courses are required which include **ENGL 104-3** plus **ENGL 210** (technical writing) or **ENGL 301-3. ENGL 210 AP credit is not technical writing and may not be used to meet the technical writing requirement.**

Foreign Language Requirement

Proficiency in a foreign language is also required to graduate from Texas A&M University. This requirement can be met by:

- Completing two units (two full years) of high school course work in the same foreign language.
- Completing two semesters (one full year) of course work at the college level in the same foreign language, or
- Demonstrating proficiency in a foreign language by examination. See catalog for additional requirements under graduation requirements and Foreign Language.

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. (COSC 1317, 1417, ENGR 2304) 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 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 291. Research. Credit 1 to 4. Research conducted under the direction of faculty member in computer science. May be repeated 2 times for credit. Prerequisites: Freshman or sophomore classification and approval of instructor.

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 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 332. 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 and introduction to programming in LISP. Prerequisite: CPSC 211.

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 420. 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, planning algorithms, intelligent agents and expert systems. Prerequisite: CPSC 311.

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 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 436. Computer-Human Interaction. (3-0). Credit 3. Comprehensive study of the Computer-Human Interaction (CHI) area; includes history and importance of CHI; CHI design theories; modeling of computer users and interfaces; empirical techniques for task analysis and interface design; styles of interaction and future directions of CHI including hypermedia and computer-supported collaborative work. Prerequisites: CPSC 310, 420, 321.

CPSC 437. Engineering Software Products. (3-0). Credit 3. Links theory and practice in providing hands-on experience in development of growth-oriented new software products; student teams prepare and present a plan for a new software product; skills conducive to new software product success are developed including team building; organizing; planning: integrating and persuading. Prerequisites: Senior classification and approval of instructor.

CPSC 438. Distributed Objects Programming. (3-0). Credit 3. Principles of distributed computing and programming with current paradigms, protocols, and application programming interfaces including Sockets, RMI, CORBA, IDL, Servlets, Web Services; security issues with public/private keys, digital signatures, forms and GUI based applications with multi-tier components, database connectivity and storing/streaming data structured using XML. Prerequisites: CPSC 332 or approval of instructor; junior or senior classification.

CPSC 440. Quantum Algorithms. (3-0). Credit 3. Introduction to the design and analysis of quantum algorithms; basic principles of the quantum circuit model; gives a gentle introduction to basic quantum algorithms; reviews recent results in quantum information processing. Prerequisites: Junior or senior classification and MATH 302.

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 420.

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 469. Advanced Computer Architecture. (3-0). Credit 3. Introduction to advanced computer architectures including memory designs, pipeline techniques, and parallel structures such as vector computers and multiprocessors. Prerequisite: CPSC 321 or ELEN 350. Cross-listed with ELEN 469.

CPSC 470. Information Storage and Retrieval.. (3-0. Credit 3. Representation of, storage of and access to very large multimedia document collections; fundamental data structures and algorithms of current information storage and retrieval systems. Prerequisites: CPSC 310 and 311; junior or senior classification.

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.

CPSC 491. Research. Credit 1 to 4. Research conducted under the direction of faculty member in the computer science department. May be repeated 2 times for credit. Prerequisites: Junior or senior classification and approval of instructor.