

**REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN  
SOFTWARE ENGINEERING 2005  
COLLEGE OF ENGINEERING  
UNIVERSITY OF TEXAS AT ARLINGTON  
General Requirements  
Total Credit Hours = 123**

<b>FRESHMAN</b>							
<b>FIRST SEMESTER</b>			<b>Hours</b>	<b>SECOND SEMESTER</b>			<b>Hours</b>
ENGL	1301	Critical Thinking, Reading and Writing I	3	ENGL	1302	Critical Thinking, Reading and Writing II	3
MATH	1426	Calculus I	4	MATH	2425	Calculus II	4
CSE	1104	Intro to Engineering	1	PHYS	1443	Technical Physics I	4
CSE	1105	Intro to CSE	1	CSE	1325	Advanced Object-Oriented Programming using C++	3
CSE	1320	Intermediate Programming	3	HIST	1312	U.S. History since 1865	3
HIST	1311	U.S. History to 1865	3				
<b>TOTAL CREDIT HOURS</b>			<b>15</b>	<b>TOTAL CREDIT HOURS</b>			<b>17</b>
<b>SOPHOMORE</b>							
<b>FIRST SEMESTER</b>			<b>Hours</b>	<b>SECOND SEMESTER</b>			<b>Hours</b>
MATH	2326	Calculus III	3	CSE	2320	Algorithms & Data Structures	3
PHYS	1444	Technical Physics II	4	CSE	2340	Introduction to Digital Logic	3
CSE	2312	Computer Org & Assembly Language Programming	3	IE	3301	Engineering Probability*	3
CSE	2315	Discrete Structures	3	MATH	3330	Introduction to Matrices & Linear Algebra	3
POLS	2311	U.S. Government	3	POLS	2312	State and Local Government	3
<b>TOTAL CREDIT HOURS</b>			<b>16</b>	<b>TOTAL CREDIT HOURS</b>			<b>15</b>
<b>JUNIOR</b>							
<b>FIRST SEMESTER</b>			<b>Hours</b>	<b>SECOND SEMESTER</b>			<b>Hours</b>
CSE	3310	Fund of Software Engr	3	CSE	3302	Programming Languages	3
CSE	3315	Theoretical Concepts in CSE	3	CSE	3320	Operating Systems	3
CSE	3322	Computer Architecture	3	CSE	4310	Software Engineering Processes	3
IE	3312	Economics for Engineers	3	CSE	4311	Object-Oriented Software Engineering	3
SPCH	3302	Professional & Technical Communication	3	■ Literature Elective			3
§ Math/Science Elective			3				
<b>TOTAL CREDIT HOURS</b>			<b>18</b>	<b>TOTAL CREDIT HOURS</b>			<b>15</b>
<b>SENIOR</b>							
<b>FIRST SEMESTER</b>			<b>Hours</b>	<b>SECOND SEMESTER</b>			<b>Hours</b>
CSE	3330	Database Systems & File Structures	3	CSE	4327	Software System Design Project II	3
CSE	4326	Software System Design Project I	3	CSE	4361	Software Design Patterns	3
CSE	4305	Compilers for Algorithmic Languages	3				
CSE	4321	Software Testing	3				
CSE	4322	Software Project Management	3				
■ Social/Cultural Elective			3	§ Math/Science Elective			3
				■ Fine Arts Elective			3
<b>TOTAL CREDIT HOURS</b>			<b>15</b>	<b>TOTAL CREDIT HOURS</b>			<b>12</b>

§ To be chosen from the approved list of technical electives available in the CSE office, 300 NH.

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(\*) Can substitute IE 3301 with MATH 3313

(\*\*) Students who do not have two units of a single foreign language in high school will be required to take two courses of a single foreign language in addition to the previously listed curriculum requirements.

(\*\*\*) Total hours for students required to take remedial mathematics courses or additional technical electives will be greater.

## COURSES IN COMPUTER SCIENCE ENGINEERING (CSE)

**CSE 1104. INTRODUCTION TO ENGINEERING (1-0) 1 hours credit.** Introduction to basic engineering concepts. Students will become familiar with engineering and its many sub-fields, ethical responsibilities, creativity and design. **Prerequisite:** Co-requisite: CSE 1105

**CSE 1105. INTRODUCTION TO COMPUTER SCIENCE AND ENGINEERING (1-0) 1 hours credit.** Introduction to basic engineering concepts. Opportunities are provided to develop skills in oral and written communication, and department-specific material. Case studies are presented and analyzed. **Prerequisite:** Co-requisite: CSE 1104.

**CSE 1310. INTRODUCTION TO COMPUTERS AND PROGRAMMING (2-3) 3 hours credit.** (COSC 1312). An introduction to the computer, to the algorithmic process, and to programming in C using standard control structures. Windows and UNIX operating systems are used. **Prerequisite:** MATH 1302 (or concurrently).

**CSE 1320. INTERMEDIATE PROGRAMMING (3-2) 3 hours credit.** Programming concepts beyond standard control structures in C/C++. Emphasis is given to data structures and modular design consistent with software engineering principles. Windows and UNIX operating systems are used. **Prerequisite:** CSE 1105 (or concurrently) and CSE 1310, or EE 1347, and MATH 1323

**CSE 1325. ADVANCED OBJECT-ORIENTED PROGRAMMING USING C++ (3-0) 3 hours credit.** Advanced program design and implementation in the C++ programming language. Object-oriented programming with concepts including class structure and behavior, objects, inheritance and reuse, virtual functions and polymorphism, exception handling, templates, and the Standard Template Library. Windows and UNIX operating systems are used. **Prerequisite:** CSE 1320.

**CSE 2312. COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE PROGRAMMING (3-0) 3 hours credit.** The assembly/machine language programmer's view of a digital computer including processor and memory organization, instruction sets, and addressing modes. Programming in a current generation assembly language. Assemblers and the assembly process. **Prerequisite:** CSE 1320.

**CSE 2315. DISCRETE STRUCTURES (3-0) 3 hours credit.** Propositional logic, mathematical proof techniques, sets, combinatorics, functions and relations, graphs, and graph algorithms. **Prerequisite:** CSE 1320 and MATH 1426.

**CSE 2320. ALGORITHMS AND DATA STRUCTURES (3-0) 3 hours credit.** Design and analysis of algorithms with an emphasis on data structures. Approaches to analyzing lower bounds on problems and upper bounds on algorithms. Classical algorithm design techniques including algorithms for sorting, searching, and other operations on data structures such as hash tables, trees, graphs, strings, and advanced data structures, dynamic programming and greedy approaches. **Prerequisite:** CSE 1320 and CSE 2315.

**CSE 2340. INTRODUCTION TO DIGITAL LOGIC (3-0) 3 hours credit.** The analysis and design of combinational and sequential logic circuits. Topics include Boolean algebra, logic circuit minimization techniques, synchronous sequential circuit design, algorithmic state machine design, design of arithmetic/logic and control units. Computer aided design tools are utilized throughout the course. **Prerequisite:** CSE 2312 (or concurrently) and CSE 2315

**CSE 3302. PROGRAMMING LANGUAGES (3-0) 3 hours credit.** Introduction, analysis, and evaluation of the important concepts found in a variety of programming languages. Formalisms useful in specifying language syntax and semantics; programming language paradigms such as algorithmic, functional, logic, and object-oriented. **Prerequisite:** CSE 3315.

**CSE 3310. FUNDAMENTALS OF SOFTWARE ENGINEERING (3-0) 3 hours credit.** Software engineering principles, processes, and techniques; software development approaches focusing on functional analysis and functional design methods. Configuration management, implementation strategies, and testing. Team project. **Prerequisite:** CSE 1325 and CSE 2320.

**CSE 3315. THEORETICAL CONCEPTS IN COMPUTER SCIENCE AND ENGINEERING (3-0) 3 hours credit.** Selected theoretical concepts including predicate logic, automata and formal languages, computability, proof of program correctness and complexity. **Prerequisite:** CSE 2315.

**CSE 3320. OPERATING SYSTEMS (3-0) 3 hours credit.** Functions and components of an operating system, including process synchronization, job scheduling, memory management, file systems protection, and deadlocks. Related system software, such as loaders, linkers, assemblers, and windowing systems. **Prerequisite:** CSE 2312, CSE 2320, and IE 3301 or MATH 3313.

**CSE 3322. COMPUTER ARCHITECTURE (3-0) 3 hours credit.** Hardware and software structures found in modern digital computers. Instruction set architecture, hardwired design of the processor, microprogramming, I/O and memory units, analysis of instruction usage, and hardware complexity. **Prerequisite:** CSE 2340 or CSE 2441.

**CSE 3330. DATABASE SYSTEMS AND FILE STRUCTURES (3-0) 3 hours credit.** Database system architecture; file structures for databases, including indexing hashing, and B+-trees; the relational model and algebra; the SQL database language; Entity-Relationship data modeling; functional dependencies and basic normalization. **Prerequisite:** CSE 2320.

**CSE 3442. EMBEDDED COMPUTER SYSTEMS (3-3) 4 hours credit.** Design of microcomputer based systems: microcomputer programming, component and system architectures, memory interfacing, parallel and serial I/O interfacing, A/D and D/A conversion, and typical applications. **Prerequisite:** CSE 2441, CSE 3320 (or concurrently), and 3322 (or concurrently).

**CSE 4308. ARTIFICIAL INTELLIGENCE (3-0) 3 hours credit.** An introduction to the field of artificial intelligence studying basic techniques such as heuristic search, deduction, learning, problem solving, knowledge representation, uncertainty reasoning and symbolic programming languages such as LISP. Application areas may include intelligent agents, data mining, natural language, machine vision, planning and expert systems. **Prerequisite:** CSE 3302.

**CSE 4311. OBJECT-ORIENTED SOFTWARE ENGINEERING (3-0) 3 hours credit.** General classification and comparison of structured, object-oriented software development including analysis, design, programming, and testing. Team project. **Prerequisite:** CSE 3310 and CSE 3315

**CSE 4312. FORMAL METHODS IN SOFTWARE ENGINEERING (3-0) 3 hours credit.** Study of mathematical models as applied to software requirements specification, software design, verification and validation, program correctness proof, software testing and software maintenance. **Prerequisite:** CSE 4311.

**CSE 4319. MODELING AND SIMULATION (3-0) 3 hours credit.** Techniques for system modeling and simulation of stochastic and knowledge-based systems. Modeling methods, model validation and verification procedures, and steady state solution techniques. **Prerequisite:** CSE 3310 and IE 3301.

**CSE 4320. FUNDAMENTALS OF TELECOMMUNICATIONS SOFTWARE DEVELOPMENT (2-3) 3 hours credit.** General understanding and classification of telecommunications systems and applications. Issues relating to the analysis, design, implementation, and testing of telecommunications software. Interface to hardware. A team project is required. **Prerequisite:** CSE 3310 and CSE 3320, or EE 3310 and EE 4330

**CSE 4321. SOFTWARE TESTING (3-0) 3 hours credit.** Introduction to software quality assurance, study of software testing process, methods, techniques, and tools. Topics include formal review techniques, verification and validation, black box testing, white box testing, integration testing, regression testing, performance testing, stress testings and testing of object-oriented software. **Prerequisite:** CSE 3310.

**CSE 4322. SOFTWARE PROJECT MANAGEMENT (3-0) 3 hours credit.** Introduction to software project management. Issues include effort estimation and costing, project planning and scheduling, option analysis, software quality assurance, and formal technical reviews. **Prerequisite:** CSE 3310.

**CSE 4323. COMPUTER ARCHITECTURE II (3-0) 3 hours credit.** Pipelined control and ALU designs, parallel processor organizations including SIMD and shared memory MIMD, message passing MIMD, dataflow processing, cache memory design, and processor-memory interconnections. **Prerequisite:** CSE 3322.

**CSE 4326. SOFTWARE SYSTEM DESIGN PROJECT I (2-3) 3 hours credit.** Apply the knowledge and skills gained in previous courses to synthesize a solution to a significant and realistic problem. Participate in team project activities, including: problem analysis, software requirements specification,

software project planning, and software design. Software design documentation and oral presentation are an integral part of the course. **Prerequisite:** CSE 3310, CSE 3320, CSE 3322, IE 3312, and SPCH 3302

**CSE 4327. SOFTWARE SYSTEM DESIGN PROJECT II (2-3) 3 hours credit.** A continuation of CSE 4326. Team project activities include: software design reviews, implementation, software quality assurance,

software testing, integration, project documentation, presentations and demonstration. Also covers social and ethical implications of the computing profession. **Prerequisite:** CSE 4326 in the previous semester.

**CSE 4331. DATABASE IMPLEMENTATION AND THEORY (3-0) 3 hours credit.** Review of the relational model and algebra; relational calculus; relational database design theory; advanced data modeling concepts; object-oriented and object-relational databases; database system implementation techniques, including concurrency control, recovery, atomic commitment, and query processing and optimization,

database security; introduction to advanced concepts, such as active, deductive, spatial, temporal, multimedia and distributed databases. **Prerequisite:** CSE 3330

**CSE 4342. REAL-TIME DATA ACQUISITION AND CONTROL SYSTEMS (2-3) 3 hours credit.** Advanced course in design of microcomputer-based systems. Emphasis is on the application of state-of-the-art microprocessors, microcomputers, and other LSI and VLSI components to real-time, interactive, and online problems. **Prerequisite:** CSE 3442.

**CSE 4344. COMPUTER NETWORK ORGANIZATION (3-0) 3 hours credit.** Design and analysis of computer networks. Emphasis on the OSI architecture but discusses other schemes (e.g., ARPAnet). Data link control, local networks, protocols/architectures, network access protocols, transport protocols, internetworking, and ISDN. **Prerequisite:** CSE 3320.

**CSE 4346. ADVANCED COMPUTER NETWORKS (3-0) 3 hours credit.** Design and engineering issues in networking. Topics include congestion control, scheduling, multicast routing, connection-oriented switching, DNS, bind, domain name space issues, flow control, traffic management, and admission control. **Prerequisite:** CSE 4344

**CSE 4348. MULTIMEDIA SYSTEMS (3-0) 3 hours credit.** A hands-on approach to the study of principles underlying multimedia systems. Topics include multimedia systems design, multimedia hardware and software, issues in effective representation, processing, and communication of multimedia data such as text, graphics, audio, images, and video. **Prerequisite:** CSE 3320.

**CSE 4351. PARALLEL PROCESSING (3-0) 3 hours credit.** Theory and practice of parallel processing, including characterization of parallel processors, models for memory, algorithms, and interprocess synchronization. Issues in parallelizing serial computations, efficiency and speedup analysis. Programming exercises using one or more concurrent programming languages, on one or more parallel computers. **Prerequisite:** CSE 3302 and CSE 3322, or consent of instructor.

**CSE 4353. DISTRIBUTED COMPUTING (3-0) 3 hours credit.** Theory and practice of distributed computing. Topics include parallel versus distributed processing, message passing systems, shared memory, distributed objects, processing and coordination, the World Wide Web, broadcast and mobile computing. **Prerequisite:** CSE 3320

**CSE 4360. AUTONOMOUS ROBOT DESIGN AND PROGRAMMING (2-3) 3 hours credit.** An introduction to robotics and the design and programming of autonomous robot systems. Topics include basic kinematics, dynamics, and control, as well as sensors, knowledge representation, and programming techniques. Course work includes individual and group projects involving the building and programming of simulated and real robots. **Prerequisite:** CSE 2320 and CSE 3320

**CSE 4361. SOFTWARE DESIGN PATTERNS (3-0) 3 hours credit.** Introduction to and applications of object-oriented software design patterns, including the GRASP and Gang of Four design patterns, to software development in the object-oriented paradigm. **Prerequisite:** CSE 4311 (or concurrently).

## COURSES IN INDUSTRIAL ENGINEERING (IE)

**IE 3301. ENGINEERING PROBABILITY (3-0) 3 hours credit.** Topics in industrial engineering that involve random processes. Applications and backgrounds for topics in reliability, inventory systems, and queuing problems, including absolute and conditional probabilities, discrete and continuous random variables, parameter estimation and hypothesis testing. **Prerequisite:** MATH 2326 or concurrent enrollment.

**IE 3312. ECONOMICS FOR ENGINEERS (3-0) 3 hours credit.** Tools and methods used for determining the comparative financial desirability of engineering alternatives. **Prerequisite:** MATH 1426 or concurrent enrollment.

## COURSES IN MATHEMATICS (MATH)

**MATH 1426. CALCULUS I (3-2) 4 hours credit.** (MATH 2413). Concepts of limit, continuity, differentiation and integration; applications of these concepts. **Prerequisite:** MATH 1323 or MATH 1325.

**MATH 2326. CALCULUS III (3-0) 3 hours credit.** (MATH 2315). Partial differentiation, multiple integrals (with applications), line integrals, Green's Theorem, surface integrals, Stokes' Theorem, divergence theorem. **Prerequisite:** MATH 2425.

**MATH 2425. CALCULUS II (3-2) 4 hours credit.** (MATH 2314). Applications of integration, techniques of integration, parametric equations, polar coordinates, sequences and series. **Prerequisite:** MATH 1426.

**MATH 3330. INTRODUCTION TO MATRICES AND LINEAR ALGEBRA (3-0) 3 hours credit.** Solving systems of linear equations, matrix operations, determinants, vector spaces, linear transformation, orthogonality, Gram-Schmidt process, projections, and eigenvalues and eigenvectors. **Prerequisite:** MATH 1426.

## COURSES IN PHYSICS (PHYS)

**PHYS 1443. GENERAL TECHNICAL PHYSICS I (3-3) 4 hours credit.** (PHYS 2425). The first half of a one-year technical course. Required for many science and engineering majors, exceeds premedical requirement. The study of physical phenomena in the fields of mechanics, heat, and waves. **Prerequisite:** MATH 1426 or concurrent enrollment.

**PHYS 1444. GENERAL TECHNICAL PHYSICS II (3-3) 4 hours credit.** (PHYS 2426). The second half of a one-year technical course. The study of physical phenomena including electricity, magnetism, circuit theory, light, and optics. **Prerequisite:** PHYS 1443 and MATH 2325 or concurrent enrollment.