**Computer Engineering**

**CE 1100** Introduction to Computer Engineering (1 semester credit hour) Introduction to discipline and practice of Electrical and Computer Engineering; overview of the Electrical Engineering (EE) and Computer Engineering (CE) curricula. Basic study, problem solving and other skills needed to succeed as an EE or CE major. Introduction to professional ethics, EE and CE engineering design and quantitative methods; team projects designed to replicate decision process in real-world applications of the EE and CE engineering process. BMEN 1100 or CS 1200 or EE 1100 or MECH 1100 can substitute for this course. Credit cannot be received for more than one of the following: BMEN 1100 or CE 1100 or CS 1200 or EE 1100 or MECH 1100. (1-1) Y

**CE 1202** Introduction to Electrical Engineering II (2 semester credit hours) CE 1202 introduces the discipline of engineering. It includes a 1.5-hour lecture per week plus a 3-hour fundamentals laboratory that stresses learning about laboratory procedures and equipment. Topics include: Learning the use of common laboratory electronic equipment; understanding the assembly of electronic circuits; and making various measurements. Students also learn how to work together with a partner and how to write a laboratory report. The lecture introduces general engineering practices, engineering research at UT Dallas, engineering activities at selected local companies, and concepts such as innovation and invention. The course also includes lectures and projects on communication, understanding the importance of lifelong learning, ethics, and a knowledge of contemporary issues. CE 1202 may be taken by students outside of engineering in order to learn about the engineering profession. (Same as EE 1202 and TE 1202) (1.5-3) S

**CE 1337 (COSC 1337)** Computer Science I (3 semester credit hours) Review of control structures and data types with emphasis on structured data types. Applies the object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design. Includes basic analysis of algorithms, searching and sorting techniques, and an introduction to software engineering. Programming language of choice is C/C++. Students will also be registered for an exam section. Prerequisite: CS 1336 with a grade of C or better or equivalent. (Same as CS 1337 and TE 1337) (3-0) S

**CE 2305 (MATH 2305)** Discrete Mathematics for Computing I (3 semester credit hours) Principles of counting. Boolean operations. Logic and proof methods. Recurrence relations. Sets, relations, functions. Elementary graph theory. Elementary number theory. Prerequisite: ALEKS score required or MATH 2312 with a grade of C or better. (Same as CS 2305 and TE 2305) (3-0) S

**CE 2310** Introduction to Digital Systems (3 semester credit hours) Introduction to digital circuits, hardware structures, and assembly-language concepts that underlie the design of modern computer systems. Topics include: Internal data representation and arithmetic operations in a computer, basic logic circuits, MIPS assembly language and an overview of computer architecture. Some knowledge of a high-level language such as C++ or Java is expected. This class also has a laboratory component. Exercises will be assigned in class for completion in the laboratory. This class may be offered as either regular or honors sections (H). (Same as EE 2310) (3-1) S

**CE 2336 (COSC 2336)** Computer Science II (3 semester credit hours) Further applications of programming techniques, introducing the fundamental concepts of data structures and algorithms. Topics include recursion, fundamental data structures (including stacks, queues, linked lists, hash tables, trees, and graphs), and algorithmic analysis. Includes comprehensive programming projects. Programming language of choice is Java. Credit cannot be received for
both CS 2337 and (CS 2336 or CE 2336 or TE 2336). Prerequisite: AP score of at least 4. Prerequisite or Corequisite: CS 2305 or CS 2305 or TE 2305 with a grade of C or better. (Same as CS 2336 and TE 2336) (3-0) S

CE 2V99 Topics in Computer Engineering (1-4 semester credit hours) May be repeated as topics vary (9 semester credit hours maximum). ([1-4]-0) R

CE 3101 Electrical Network Analysis Laboratory (1 semester credit hour) Laboratory to accompany CE 3301. Design, assembly and testing of linear electrical networks and systems. Use of computers to control electrical equipment and acquire data. Prerequisites: (CE 1202 or EE 1202 or TE 1202) and RHET 1302. Corequisite: CE 3301. (Same as EE 3101 and TE 3101) (0-3) S

CE 3102 Signals and Systems Laboratory (1 semester credit hour) In this laboratory course, students will acquire hands on experience in the implementation of the theory and concepts covered in the Signals and Systems lecture course CE 3302. The software tools that are utilized include MATLAB and smartphone programming environments. The labs consist of introduction to the software tools utilized, linear time-invariant systems and convolution, Fourier series, continuous-time Fourier transform, sampling and discrete Fourier transform. Corequisite: CE 3302. (Same as EE 3102 and TE 3102) (0-3) S

CE 3110 Electronic Devices Laboratory (1 semester credit hour) Laboratory to accompany CE 3310. Experimental determination and illustration of properties of carriers in semiconductors including carrier drift, carrier diffusion; p-n junctions including forward and reverse bias effects and transient effects; bipolar transistors including the Ebers-Moll model and secondary effects; field effect transistors including biasing effects, MOS capacitance and threshold voltage. Corequisite: CE 3310 or EE 3310. Prerequisite: RHET 1302. (Same as EE 3110) (0-3) S

CE 3111 Electronic Circuits Laboratory (1 semester credit hour) Laboratory to accompany CE 3311. Design, assembly and testing of electronic circuits that use diodes, transistors and operational amplifiers in configurations typically encountered in practical applications. Corequisite: CE 3311 or EE 3311. Prerequisite: RHET 1302. (Same as EE 3111) (0-3) S

CE 3201 Electrical and Computer Engineering Fundamentals-I Laboratory (2 semester credit hours) Introduction to the fundamental building blocks of laboratory measurements and data analysis in Electrical and Computer Engineering. Prerequisites: (CE 1202 or EE 1202) and RHET 1301. Prerequisite or Corequisite: (EE 3301 or CE 3301) and (EE 3320 or CE 3320). (Same as EE 3201) (1-3) S

CE 3202 Electrical and Computer Engineering Fundamentals-II Laboratory (2 semester credit hours) Introduction to more advanced building blocks of laboratory measurements and data analysis in Electrical and Computer Engineering. Prerequisite: CE 3201 or EE 3201. Corequisite: ECS 3390. Prerequisite or Corequisite: EE 3310 or CE 3310. (Same as EE 3202) (1-3) S

CE 3301 Electrical Network Analysis (3 semester credit hours) Analysis and design of RC, RL, and RLC electrical networks. Sinusoidal steady state analysis using phasor representation; mesh and nodal analyses. Introduction to the concept of impulse response and frequency analysis using the Laplace transform. Prerequisites: MATH 2420 and PHYS 2326. (Same as EE 3301 and TE 3301) (3-0) S

CE 3302 Signals and Systems (3 semester credit hours) Introduces the fundamentals of continuous and discrete-time signal processing. Linear system analysis including convolution and impulse response, Fourier series, Fourier transform and applications, discrete-time signal analysis, sampling and z-transform. Prerequisite: ENGR 3300. (Same as EE 3302 and TE 3302) (3-0) S

CE 3310 Electronic Devices (3 semester credit hours) Theory and application of solid state electronic devices. Physical principles of carrier motion in semiconductors leading to operating principles and circuit models for diodes, bipolar transistors, and field effect transistors. Introduction to integrated circuits. Prerequisite: CE 3301 or EE 3301 or TE 3301. (Same as EE 3310) (3-0) S
CE 3311 Electronic Circuits (3 semester credit hours) Large-signal and small-signal characteristics of diodes, BJT and MOSFET transistors. Analysis of circuits containing diodes. Analysis of the DC and small-signal characteristics of single-stage BJT and MOSFET amplifiers. Analysis of circuits with an operational amplifier as a black box. Introduction of high-frequency models of BJT and MOSFET transistors and methods to analyze amplifier frequency response. Prerequisite: CE 3310 or EE 3310. (Same as EE 3311) (3-0) S

CE 3320 Digital Circuits (3 semester credit hours) Design and analysis of combinational logic circuits using basic logic gates and other building blocks like multiplexers and ROMs. Design and analysis of latches and flip-flops. Design and analysis of synchronous state machines. State minimization and introduction to state assignment. Design of datapath components: adders, multipliers, registers, shifters, and counters. Electrical properties of logic gates. Credit cannot be received for both courses, CS 4341 and CE 3320. Prerequisite: CE 2310 or EE 2310. (Same as EE 3320) (3-0) S

CE 3345 Data Structures and Introduction to Algorithmic Analysis (3 semester credit hours) Analysis of algorithms including time complexity and Big-O notation. Analysis of stacks, queues, and trees, including B-trees. Heaps, hashing, and advanced sorting techniques. Disjoint sets and graphs. Course emphasizes design and implementation. Prerequisites: (CE 2305 or CS 2305 or TE 2305 with a grade of C or better) and (CE 2336 or CS 2336 or TE 2336 with a grade of C or better). Prerequisite or Corequisite: (CS 3341 or SE 3341 or ENGR 3341). (Same as CS 3345 and SE 3345 and TE 3345) (3-0) S

CE 3354 Software Engineering (3 semester credit hours) Introduction to software life cycle models. Software requirements engineering, formal specification and validation. Techniques for software design and testing. Cost estimation models. Issues in software quality assurance and software maintenance. Prerequisites: (CE 2336 or CS 2336 or TE 2336 with a grade of C or better or CS 3333) and (CE 2305 or CS 2305 or TE 2305 with a grade of C or better or equivalent). Prerequisite or Corequisite: ECS 3390. (Same as CS 3354 and SE 3354) (3-0) S

CE 4201 Electrical and Computer Engineering Laboratory in Computing Systems and Computer Engineering (2 semester credit hours) Laboratory topics in Computing Systems and Computer Engineering. Prerequisite: CE 3202 or EE 3202. (Same as EE 4201) (1-3) S

CE 4202 Electrical and Computer Engineering Laboratory in Circuits (2 semester credit hours) Laboratory topics in Circuits. Prerequisite: CE 3202 or EE 3202. (Same as EE 4202) (1-3) S

CE 4203 Electrical and Computer Engineering Laboratory in Signals and Systems (2 semester credit hours) Laboratory topics in Signals and Systems. Prerequisite: CE 3202 or EE 3202. (Same as EE 4203) (1-3) S

CE 4204 Electrical and Computer Engineering Laboratory in Devices (2 semester credit hours) Laboratory topics in Devices. Prerequisite: CE 3202 or EE 3202. (Same as EE 4204) (1-3) S

CE 4205 Electrical and Computer Engineering Laboratory in Power Electronics and Energy Systems (2 semester credit hours) Laboratory topics in Power Electronics and Energy Systems. Prerequisite: CE 3202 or EE 3202. (Same as EE 4205) (1-3) S

CE 4304 Computer Architecture (3 semester credit hours) Introduction to computer organization and design, including the following topics: CPU performance analysis. Instruction set design, illustrated by the MIPS instruction set architecture. Systems-level view of computer arithmetic. Design of the datapath and control for a simple processor. Pipelining. Hierarchical memory. I/O systems. I/O performance analysis. Multiprocessing. Credit cannot be received for both courses, (CS 3340 or SE 3340 or TE 3340) and (CE 4304 or EE 4304). Prerequisite: CE 3320 or EE 3320. (Same as EE 4304) (3-0) S

CE 4337 Organization of Programming Languages (3 semester credit hours) Principles of design and implementation of contemporary programming languages. Formal description including specification of syntax and semantics of programming languages. Language definition structures including binding, scoping, data types, control structures, parameter passing,
abstraction mechanism, and run-time considerations. Design issues of imperative languages, object-oriented languages, functional languages and logic languages. Design, implement, and debug programs in various programming language paradigms. Prerequisites: (CE 2336 or CS 2336 or TE 2336) with a grade of C or better or CS 3333 and (CE 2305 or CS 2305 or TE 2305) with a grade of C or better and (CS 3340 or SE 3340 or TE 3340 or CE 4304 or EE 4304). (Same as CS 4337) (3-0) S

CE 4348 Operating Systems Concepts (3 semester credit hours) An introduction to fundamental concepts in operating systems and how they are realized in a practical operating system such as UNIX. Topics include process management, main memory management, virtual memory, I/O and device drivers, file systems, secondary storage management, and an introduction to critical sections and deadlocks. Prerequisites: (CS 3340 or SE 3340 or TE 3340 or equivalent), and (CE 3345 or CS 3345 or SE 3345 or TE 3345), and a working knowledge of C and UNIX. (Same as TE 4348) (3-0) S

CE 4370 Embedded Microprocessor Systems (3 semester credit hours) An introduction to microprocessors and their uses. Features commonly found in a CPU are discussed, such as: The Program Counter, Stack, Status Register, General Purpose Registers, ALU, Instruction Set and peripheral devices. Memory (SRAM, DRAM, EPROM, EEPROM) and Memory Mapped I/O Peripheral Devices. Assembly language is used to create the binary machine code necessary to program a Microprocessor system. The special features of microprocessors: the stack, interrupts, input ports, out ports, and display. Prerequisite: CE 3320 or EE 3320. Corequisite: CE 4304 or EE 4304. (Same as EE 4370) (3-1) Y

CE 4372 Contemporary Systems Design (3 semester credit hours) Design and analysis based system level design concepts, develop working projects using traditional and emerging technologies. Emphasis on specifying requirements, tracking projects and building test and validation strategies. Prerequisites: (CE 3320 or EE 3320) and (CE 3345 or CS 3345 or SE 3345 or TE 3345) and (CE 3354 or CS 3354 or SE 3354). (3-0) Y

CE 4388 Senior Design Project I (3 semester credit hours) First of two sequential semesters devoted to a team project that engages students in the full engineering design process. The goal of senior design projects is to prepare the student to run/participate in engineering projects related to an appropriate industry. Thus, all project teams are to follow standard industrial practices and methods. Teams must carry the engineering project to completion, examining real world and multiple design constraints, following applicable industrial and business standards. Such constraints may include but are not limited to: economic, environmental, industrial standards, team time/resource management and cross-disciplinary/departmental result integration. Students are required to work in teams that include collaborative design interaction. Additionally, cross-disciplinary teams are encouraged but not required. In Senior Design I, project proposals will be written, reviewed and approved. Initial designs will be completed and corresponding constraints will be determined. All students will participate in a public oral and poster presentation following departmental approved guidelines at a departmental approved time and location. Teams will also submit a written end of semester progress report and documented team communication (complete sets of weekly reports and/or log books) following guidelines approved by the faculty. Prerequisites: ECS 3390 and one of the following prerequisite sequences: (CE 3311 or EE 3311), and (CE 3320 or EE 3320), and (CE 3345 or CS 3345 or SE 3345 or TE 3345), and (CE 3354 or CS 3354 or SE 3354), or (ENGR 3300 and CE 3302 or EE 3302 or TE 3302), and (CE 3311 or EE 3311), and (CE 3320 or EE 3320)), or (ENGR 3300 and CE 3302 or EE 3302 or TE 3302), and (CE 3345 or CS 3345 or SE 3345 or TE 3345)); prerequisite or corequisite: EE 3350 or TE 3350.] (Same as EE 4388 and TE 4388) (3-0) S

CE 4389 Senior Design Project II (3 semester credit hours) Continuation of the Senior Design project begun in the previous semester. In Senior Design II, projects based on approved project
proposals will be completed. All limitations of the design will be determined and addressed. All students will participate in a public oral presentation following faculty-approved guidelines at a faculty-approved time and location. Teams will also submit a written final report and documented team communication (complete sets of weekly reports and/or log books) following faculty-approved guidelines. Prerequisite: CE 4388 or EE 4388 or TE 4388. (Same as EE 4389 and TE 4389) (3-0) S

CE 4390 Computer Networks (3 semester credit hours) The design and analysis of computer networks. Topics include the ISO reference model, transmission media, medium-access protocols, LANs, data link protocols, routing, congestion control, internetworking, and connection management. Credit cannot be received for both courses, (CE 4390 or CS 4390 or TE 4390) and EE 4390. Prerequisite: CE 3345 or CS 3345 or SE 3345 or TE 3345 or equivalent. (Same as CS 4390 and TE 4390) (3-0) S

CE 4399 Senior Honors in Computer Engineering (3 semester credit hours) For students conducting independent research for honors theses or projects. (0-3) R

CE 4V95 Undergraduate Topics in Computer Engineering (1-9 semester credit hours) Subject matter will vary from semester to semester. May be repeated for credit as topics vary (9 semester credit hours maximum). ([1-9]-0) R

CE 4V97 Independent Study in Computer Engineering (1-9 semester credit hours) Independent study under a faculty member's direction. May be repeated for credit as topics vary (9 semester credit hours maximum). Instructor consent required. ([1-9]-0) R

CE 4V98 Undergraduate Research in Computer Engineering (1-9 semester credit hours) Topics will vary from semester to semester. May be repeated for credit as topics vary (9 semester credit hours maximum). Instructor consent required. ([1-9]-0) R