### CE201: Circuits Fundamentals  3 Credit Hours

Basic RLC electrical circuits; Resistors, inductors, capacitors; AC and DC analysis; Power; PN junction and NMOS and PMOS transistor operations. Laboratory experiments introducing basic instruments (power supply, multi-meters, oscilloscopes, function generators) and circuit simulation. Prerequisite: (GS 141)

### CE 202 : Digital Electronics  3 Credit Hours

Introduction to semiconductor physics and p-n junctions; Digital electronics basics and the operation of diodes and transistors; Various generations of integrated circuits (bipolar, CMOS etc); Basic digital logic gate design and physical layouts of simple digital circuits; Perquisite:(CE 301).

### CE210: Digital Design with HDL  3 Credit Hours

Introduction to digital design with a hardware description language; Field Programmable Gate Arrays and complex programmable logic devices; Finite state machine design; CAD tools for field programmable gate arrays and programmable array logic; Parallel and serial input/output techniques; Behavioral, schematic, and net list description of digital systems. Prerequisite: (IT221)

### CE220: Embedded Systems  3 Credit Hours

Introduction to real-time system, Designing real-time systems, Reliability and fault tolerance Remote Debugging, Micro Analyzer, Reliability and fault tolerance, concurrent programming, Shared variable-based synchronization and communication, message-based Synchronization and communication, atomic actions, concurrent processes and Reliability, Resource control, Scheduling, Distributed systems. Prerequisite:(IT221/CE201).

### CE201 : Signal and Systems  3 Credit Hours

Basic concepts in digitizing signal representation; Sampling and quantization; Analog signals and complex pharos representation; Unit impulse response and convolution and simple FIR filter; Time and frequency domain representation of signals; Matlab-based exercises; Prerequisites: (CE201/CE201).

### CE300: Platform Architecture and Technologies  3 Credit Hours

Modern personal computer platforms with emphasis on x86 instruction set architecture and x86 motherboard organization; Real and protected modes; x86 registers and instructions; Addressing modes; Software and hardware interrupts; Programmable interrupt controller; MMX and SSE instructions; Microcomputer bus,
memory and I/O interfaces; Wait states and platform virtualization; BIOS configuration. Laboratory assignments consist of developing x86 assembly programs and configuring the BIOS. Prerequisite: (CE201)

**CE 311 : Microcomputer**  
3 Credit Hours

race the evolution of single microchip computer architecture from x86 families to the newer generation design (RISC, VLIW architectures); Pipelined processors, instruction set parallelism, ILP, super scalar and super pipelined Memory organization design; Paging and segmentation. Prerequisite: (CE 320).

**CE312 : Microcontroller System Design**  
3 Credit Hours

The internal structure and operation of microcontrollers will be studied. The design methodology for software and hardware applications will be developed through the labs and design projects. Prerequisite: (CE311).

**CE 321 : Digital Signals Processing**  
3 Credit Hours

Discrete-time signal processing systems; Sampling and reconstruction; Difference equations and discrete transfer functions for systems; Architectures of special purpose DSP chips (e.g: Texas Instruments TMS320 family DSP); Applications to multimedia systems (audio and video processing). Prerequisite: (CE321).

**CE325: Hardware Testing and Fault Tolerance**  
3 Credit Hours

Faults and fault models; Reliability, availability, MTTF, MTBF; Reliability block diagrams; Redundancy techniques; Error detection and correction in memory, buses, networks, and execution units; Testing of digital and combinational circuits; built in self test (BIST), scan techniques and JTAG; RAS techniques in modern computer systems. (Prerequisite: IT221/CE201).

**CS451: Intelligent System**  
3 Credit Hours

Prerequisites (IT211/IT341).

**IT 499: Senior Graduation Project I and II**  
4 Credit Hours

Students will work in teams and should demonstrate through actual performance that they have attained an entry-level professional status in computer systems design. Each team will have to complete a system design based on knowledge accumulated during the 4-year program. Emphasis will be placed on a complete end-to-end design activity. (Prerequisite: 100 credit hours and STAT 210)

**CE 498: Independent Study in Computer Systems Design**  
3 Credit Hours

The independent study involves research of selected problems or topics in the domain of computer systems design. Arrangement must be made with a faculty member and approval obtained from the track chair. The independent study may be repeated once with a substantially different topic.

**CE 499: Special Topics in Computer Systems Design**  
3 Credit Hours

This course will cover emerging and novel topics in computer system design of special interest to CIT students. The course will be taken only in the final year and could be repeated once with a substantially
different topic. Prerequisites: as requested.

## CE Electives courses

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<td>CE415: Sequential Machine</td>
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<td>CE416: Image Processing</td>
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<td>CE440: Software Integration</td>
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<td>CE441: Wireless and Mobile Communications</td>
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### CE415: Sequential Machine 3 Credit Hours

Structure of sequential machines with particular emphasis on asynchronous sequential machines; covers; partitions; decompositions and synthesis of multiple machines race conditions and hazards; state identification and fault detection experiments. Presents design techniques aimed at circuit performance that will function reliably with less than ideal components. Applications include the design of controllers for robots and automated machines.

Prerequisite: (CE210).

### CE416: Image Processing 3 Credit Hours

The course will provide mathematical foundations and practical techniques for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression.

**Course contents:** Introduction to the MATLAB Image Processing Toolbox, The Image, its Representations and Properties, Data Structures for Image Analysis, Image Pre-Processing, Segmentation I, The Image, its Mathematical and Physical Background, Image Data Compression.

Prerequisite: (CE201).

### CE440: Software Integration 3 Credit Hours

Integrative programming techniques; Scripting languages such as C Shell, Bash and Perl; Programming assignments to integrate software packages and reformat input/output data.

Prerequisite: (IT322/IT212).

### CE441: Wireless and Mobile Communications 3 Credit Hours

Principles of radio communications; Introduction to terrestrial and satellite radio links; Mobile communication systems; Wireless network architectures and protocols; Mobile IP.

Prerequisite: (IT271).

### CE450: Robotics 3 Credit Hours

“Real world” applications of robotics; Building blocks of a robot and their operation;
Building robots that interact with the real world and with each other using sensors and wireless communication. Prerequisite: (CE220 / CS451).

**CE482: Computer Vision** 3 Credit Hours

Computational models of visual perception and implementation on computer systems; Neural networks; Early visual processing; Edge perception; Segmentation; Intrinsic images; Image modeling; Representation of visual knowledge; Image understanding. Prerequisite: (CE201/310).

**CE483: VLSI System Design** 3 Credit Hours

Emphasis on the design of a full custom VLSI system using contemporary CAD tools. Digital circuit design, CMOS circuit and layout principles, fabrication principles, physical and electrical design rules, control and data path design techniques, system timing, design verification, simulation and testing.

Prerequisite: (CE311).

**CE484: Simulation and Modeling** 3 Credit Hours

Principles of mathematical modeling of linear and nonlinear, continuous and discrete systems. Real-time computer-assisted simulation and identification of engineering systems (electrical, mechanical, hydraulic, acoustic, etc.). Methods of on-line and off-line system identification. Introduction to the behavior of forced and unforced nonlinear dynamic systems.

Prerequisite: (CE201).