# COMPUTER ENGINEERING (CR)

**CR 0245 Digital Design I** **3 Credits**
**Corequisite:** CR 0245L.
An introduction to computer hardware design. Topics include: digital design principles, Boolean algebra, combinational logic design, sequential logic design, registers, counters, memory, multiplexers, finite state machines, radix conversion, and programmable logic devices. Students learn to write, implement, and simulate elementary digital design.

**CR 0245L Digital Design I Lab** **1 Credit**
**Fee:** $80 Engineering Lab Fee
**Corequisite:** CR 0245.
This lab course covers the practical aspects of digital logic design. Students design and implement logic circuits using techniques taught in CR 0245. Students gain experience using state of the art design software and development boards, which use modern field programmable gate array (FPGA) technology.

**CR 0246 Digital Electronics Design II** **3 Credits**
**Prerequisite:** CR 0245.
This course examines computer architecture implemented using a hardware design language and programmable logic devices. Students learn the VHDL hardware description language, and learn to use modern design, simulation, and synthesis software. Students design, verify, build and test digital logic circuits using industry standard development boards, and field programmable gate array (FPGA) technology.

**CR 0320 Computer Networks** **3 Credits**
**Prerequisites:** CS 0131, MA 0351.
This course covers principles of networking and network programming. Topics include OSI layers, elementary queuing theory, protocol analysis, multi-threading, command-line interpreters, and monitors. Students write a distributed computing system and check their performance predictions with experiments.

**CR 0325 Computer Graphics** **3 Credits**
**Prerequisite:** CS 0131.
This course supports the visualization and computer systems domain, offering an introductory treatment to two-dimensional and three-dimensional computer graphics concepts. Students write computer games and employ their knowledge to imbue them with realism. High performance rendering uses the latest in cutting edge hardware-accelerated graphics processors.

**CR 0331 Biomedical Signal Processing** **3 Credits**
**Prerequisites:** CS 0131 or CS 0142 or SW 0407; MA 0146.
This course presents an overview of different methods used in biomedical signal processing. Signals with bioelectric origin are given special attention and their properties and clinical significance are reviewed. In many cases, the methods used for processing and analyzing biomedical signals are derived from a modeling perspective based on statistical signal descriptions. The purpose of the signal processing methods ranges from reduction of noise and artifacts to extraction of clinically significant features. The course gives each participant the opportunity to study the performance of a method on real, biomedical signals.

**CR 0332 Biomedical Imaging** **3 Credits**
**Prerequisite:** CR 0331.
The course presents the fundamentals and applications of common medical imaging techniques, for example: x-ray imaging and computed tomography, nuclear medicine, magnetic resonance imaging, ultrasound, and optical imaging. In addition, as a basis for biomedical imaging, introductory material on general image formation concepts and characteristics are presented, including human visual perception and psychophysics.

**CR 0333 Biomedical Visualization** **3 Credits**
**Prerequisite:** CS 0131.
This course is an introduction to 3-D biomedical visualization. Various technologies are introduced, including UltraSound, MRI, CAT scans, PET scans, etc. Students will learn about spatial data structures, computational geometry and solid modeling with applications in 3-D molecular and anatomical modeling.

**CR 0346 Computer System Architecture** **3 Credits**
**Prerequisite:** CR 0245.
This course introduces the machine language and various components of a computer hardware in modern computer systems. The course focuses on CPU, memory, bus, cache, I/O module, internal data representation, and instruction set design. It also covers pipelining, superscalar architecture, reduced instruction set computers, parallel architectures, and interconnection networks.

**CR 0382 Independent Study** **3 Credits**
This course includes supervised reading and research. Available only by pre-arrangement with the instructor.