4450:101. Tools for Computer Engineering. (3 Credits)
Corequisite: 3450:221 or 3450:149. Orientation to degree programs and design practice in electrical and computer engineering. Introduction to computer applications and resources for engineering studies.

4450:208. Programming for Engineers. (3 Credits)
Prerequisite: 4400:101 or permission. Introduction to programming. Environment and tools. C programming language. Machine level data forms and organization.

4450:220. Digital Logic Design. (4 Credits)

4450:301. Undergraduate Research I: Computer Engineering. (1 Credit)
Prerequisites: completion of [4400:101 or 4450:101], 4400:230, 4400:231, 4400:330, 4400:332 and 4450:220 with a combined average grade of 3.0 or higher, admission to the College of Engineering and permission. Research project, supervised by faculty member of the department; requires oral research presentation and written report.

4450:302. Undergraduate Research II: Computer Engineering. (1 Credit)
Prerequisites: [4400:301 or 4450:301], admission to the College of Engineering and permission. Research project, supervised by faculty member of the department; requires oral research presentation and written report.

4450:303. Undergraduate Research III: Computer Engineering. (1 Credit)
Prerequisites: [4400:302 or 4450:302], admission to the College of Engineering and permission. Research project, supervised by faculty member of the department; requires oral research presentation and written report.

4450:304. Undergraduate Research IV: Computer Engineering. (1 Credit)
(May be repeated. May not be applied to degree requirements.) Prerequisite: 4450:303 or 4400:303, and permission. Research project, supervised by faculty member of the department; requires oral research presentation and written report.

4450:309. Design Project Seminar - Computer Engineering. (1 Credit)
Prerequisites: Junior standing, admission to the College of Engineering and permission. Project selection and proposal. Project specifications and alternative design. Professional ethics. Intellectual property. Societal impact issues in engineering design. Senior Design Project II presentations.

4450:320. Computer Systems. (3 Credits)
Prerequisite: 3460:209 or 4450:208, 4450:220 or 3450:208. Introduces the design and architecture of modern computer systems. Data and instruction representation. Conventional computer organization. Hardware and software design processes. The hardware/software interface.

4450:325. Operating Systems Concepts. (3 Credits)

4450:367. VLSI Design. (3 Credits)

4450:401. Senior Design Project I - Computer Engineering. (2 Credits)
Prerequisites: 4450:309, senior standing, admission to the College of Engineering, and completion of 4450:325, 4450:367, 4450:420, 4450:427 and 4450:440 with a combined average grade of 2.0 or higher. Design and preparation phase of an engineering project. Requires project presentation, approval of a written proposal, and ordering of required parts.

4450:402. Senior Design Project II - Computer Engineering. (3 Credits)
Prerequisites: 4450:401 and admission to the College of Engineering. Implementation and evaluation phases of an engineering design project. Requires a project presentation and report.

4450:410. Embedded Scientific Computing. (3 Credits)

4450:415. System Simulation. (3 Credits)

4450:420. Computer Systems Design. (3 Credits)

4450:422. Embedded Systems Interfacing. (3 Credits)
Prerequisites: [3460:209 or 4450:208] and admission to the College of Engineering. Corequisite: 4400:360. Microcontroller structures and embedded peripherals. Interfaces to physical environments. Software access to peripherals including timers, ADCs and DACs. Synchronous and asynchronous communications. Interrupts. Real-time operating systems.

4450:427. Computer Networks. (3 Credits)
Prerequisite: 4450:320; 4450:325 or 3460:426. Network architecture and protocol layering. Network design principles, communication protocols, and performance measures. Socket programming, routing, error detection and correction, access control, multimedia networking.

4450:440. Digital Signal Processing. (3 Credits)
Prerequisites: 4400:340 and admission to the College of Engineering. Signal sampling and reconstruction; data-converter models. Unilateral and bilateral z transforms. Discrete Fourier Transform (DFT); Fast Fourier Transform (FFT). Digital filter structures and design methods.

4450:462. Analog Integrated Circuit Design. (3 Credits)
Prerequisite: 4400:360. CMOS processes and layout; amplifiers, current mirrors, and comparators; current, voltage, and bandgap references; switched capacitor circuits. Frequency and noise analysis techniques.

4450:465. Programmable Logic. (3 Credits)
Prerequisite: 4450:220, 3460:209 or 4450:208. Digital design with programmable devices. PLD and FPGA architectures. Logic design and technology mapping tools.
4450:467. VLSI Circuits & Systems. (3 Credits)
Prerequisite: 4450:367. High performance adders and multipliers for very large scale integration (VLSI) systems. Architectural synthesis. Design for high performance, low power, and testability.

4450:498. Special Topics: Computer Engineering. (1-3 Credits)
(May be taken more than once) Prerequisite: Permission of department chair. Special topics in computer engineering.