COMPUTER ENGINEERING (4450)

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)
Corequisites: 4400:101 or 4450:101 or 4800:101. Boolean algebra
and simplification of logic functions. Combinational and synchronous
sequential circuits. Laboratory projects include design of digital systems
with hardware description language and simulation.

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)
communication and resource sharing. Deadlock resolution. Memory
management. File systems. Introduction to network operating systems.

4450:367. VLSI Design. (3 Credits)
Prerequisites: 4400:360 and admission to the College of Engineering.
Digital logic circuits. Very large scale integration (VLSI) fabrication
processes and layout design. Delay and power of digital circuits. Latches
and flip-flops in VLSI. Memory design. System-level design issues. Design
project.

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)
Prerequisites: 4450:208 or 3460:209 and 4400:340. Fixed point, floating
point representation and coding. Processor/DSP implementations.
Assemblers, C language semantics. Adapting scientific library routines
for embedded use. Minimizing complexity. Ill-conditioned problems.

4450:415. System Simulation. (3 Credits)
Prerequisite: 4400:371 or 4450:440. Computer simulation of dynamic
systems. Discrete system stability, linear multistep and Runge-Kutta
methods, nonlinear systems, stiff systems, distributed systems and real-
time computing.

4450:420. Computer Systems Design. (3 Credits)
Prerequisite: 4450:320. Design of advanced processors at the
microarchitecture level. Pipelining. Superscalar, vector and VLIW
architectures. Instruction-level parallelism. Compiler support.
Multiprocessor architectures.

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.