Computer Engineering

WHAT IS COMPUTER ENGINEERING?

Computer engineers research, design, develop, test and oversee the installation and supervise the manufacture of computer hardware. Hardware refers to computer chips, circuit boards, computer systems, and related equipment such as keyboards, modems, and printers. The work of computer engineers is very similar to that of electrical engineers, but, unlike electrical engineers, computer engineers work exclusively with computers and computer-related equipment. The rapid advances in computer technology are largely a result of the research, development, and design efforts of computer engineers.*

NEEDED SKILLS:
- Computer skills, including familiarity with both software and hardware
- Complex problem solving
- Listening and communication skills
- Active learning - always seeking information about new technologies/techniques
- Reading comprehension
- Mathematical and logical reasoning**

INDUSTRIES AND OCCUPATIONS
- Computer systems design
- Computer equipment manufacturing
- Navigational, measuring, medical, and control instrument manufacturing
- Scientific research
- Federal Government
- Data processing & software industries
- Wireless telecommunications industry
- Business management & consulting**

JOB TITLES
- Computer Architect
- Automation Engineer
- Hardware Engineer
- Computer Designer
- Systems Integration Engineer
- Microchip Specialist
- Information Technology Consultant
- Configuration Manager
- Network Engineer
- Computer Layout Specialist
- Computer Installation Engineer
- Telecommunications Engineer**

SALARIES
$111,730.*
The nationwide average salary for employees with a bachelor’s degree in Computer Engineering

$85,390
UM graduates average starting salaries

*Information from http://www.bls.gov/ooh/
**Information from: www.myplan.com

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JOB OUTLOOK
Employment of computer engineers is expected to grow 3% from 2014 to 2024, slower than the average for all occupations. A limited number of engineers will be needed to meet the demand for new computer hardware because more innovation takes place with software than with hardware. Although declining employment in manufacturing industries that employ many of these workers will negatively affect the growth of this occupation, computer hardware engineers should be less affected than production occupations because firms are less likely to outsource their type of work.*

MORE INFORMATION
- www.myplan.com
- stats.bls.gov/ooh
- http://www.acm.org/ (Association for Computing Machinery)
- Engineering Career Resource Center, 230 Chrysler
WHICH CLASSES SHOULD YOU START WITH?

To begin the CE major, a good option is to first take EECS 203 and EECS 270, followed by EECS 215 and EECS 280. Note that it is recommended you finish your Chemistry and Physics requirements by the end of your first semester, sophomore year. Read more about the CE major and EECS Department at: https://www.eecs.umich.edu/

COURSE DESCRIPTIONS

EECS 203 – 4 credits
Discrete Mathematics

Prerequisite: Math (MATH 115 or 116 or 119 or 120 or 121 or 156 or 175 or 176 or 185 or 186 or 214 or 215 or 216 or 217 or 255 or 256 or 285 or 286 or 295 or 296 or 417 or 419.) Minimum grade of C required for enforced prerequisites.

Introduction to the mathematical foundations of computer science. Topics covered include: propositional and predicate logic, set theory, function and relations, growth of functions and asymptotic notation, introduction to algorithms, elementary combinatorics and graph theory, and discrete probability.

EECS 270 – 4 credits
Introduction to Logic Design

Prerequisite: EECS 180 or EECS 183 or ENGR 101 or ENGR 151. Minimum grade of “C” required for enforced prerequisites.

Boolean algebra, digital design techniques, logic gates, logic and state minimization, standard combinational circuits, latches and flip-flops, sequential circuits, synthesis of synchronous sequential circuits, state machines, FPGAs, memories, arithmetic circuits, and computer-aided design. Laboratory involves CAD-based design implemented on an FPGA including elementary interfacing experiments.

EECS 215 – 4 credits
Introduction to Electronic Circuits

Prerequisite: (MATH 116 or 121 or 156) and (ENGR 101 or 151 or EECS 183 or 280) and Co-requisite: PHYSICS 240 or 260.

Introduction to electronic circuits. Basic concepts of voltage and current; Kirchhoff’s voltage and current laws, Ohm’s law, voltage and current sources, Thevenin and Norton equivalent circuits, DC and low frequency active circuits using operational amplifiers, diodes and transistors, small signal analysis, energy and power. Time- and frequency-domain analysis of RLC circuits. Basic passive and active electronic filters. Laboratory experience with electrical signals and circuits.

EECS 280 – 4 credits
Programming and Introductory Data Structures

Prerequisite: ENGR 101 or ENGR 151 or EECS 180 or EECS 183. Minimum grade of “C” required for enforced prerequisites. (4 credits) [Fewer than two previous elections of EECS 280 (incl. grades of W, I, VI, and AUD)]

Algorithm development and effective programming, top-down analysis, structured programming, testing and program correctness. Program language syntax and static and runtime semantics. Scope, procedure instantiation, recursion, abstract data types, and parameter passing methods. Structured data types, pointers, linked data structures, stacks, queues, arrays, records, and trees.