# Computer Engineering

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1. University Requirements (23-24)
   - Writing, Rhetoric and American Cultures (WRA) 4
   - Integrative Studies in Humanities (IAH) 8
   - Integrative Studies in Social Sciences (ISS) 8
   - Bioscience (one of the following):
     - BS 161, ENT 205, IBIO 150, MMG 141, MMG 201, PLB 105, PSL 250 3-4

2. College Requirements: (28)
   - CEM 141 General Chemistry 4  
   - EGR 100 Introduction to Engineering Design 2  
   - MTH 132 Calculus I 3  
   - MTH 133 Calculus II 4  
   - MTH 234 Multivariable Calculus 4  
   - MTH 235 Differential Equations 3  
   - PHY 183 Physics for Scientists & Engineers I 4  
   - PHY 184 Physics for Scientists & Engineers II 4

3. Major Requirements: (69)
   a. Complete one of the following courses: (1)
      - CEM 161 Chemistry Laboratory I 1  
      - PHY 191 Physics Laboratory for Scientists I 1
   b. All of the following courses: (44)
      - CSE 231 Introduction to Programming I 4  
      - CSE 232 Introduction to Programming II 4  
      - CSE 260 Discrete Structures in Computer Sci 4  
      - CSE 331 Algorithms and Data Structures 3  
      - CSE 410 Operating Systems 3  
      - ECE 201 Circuits and Systems I 3  
      - ECE 202 Circuits and Systems II 3  
      - ECE 203 Electronic Circuits and Systems Lab 1  
      - ECE 230 Digital Logic Fundamentals 3  
      - ECE 280 Electrical Engineering Analysis 3  
      - ECE 302 Electronic Circuits 3  
      - ECE 303 Electromagnetic Laboratory 1  
      - ECE 331 Microprocessors & Digital Systems 4  
      - ECE 390 Ethics, Professions and Cont. Issues 1  
      - ECE 480 Senior Design (W) 4

   c. Major Electives: (24)
      Complete 24 credits of electives as specified below. At least 18 credits must be from core and focus track electives combined, with at least one course with a laboratory. Additional credits to meet the 24 credit requirement may be taken from other courses listed below, any 400-level Computer Science and Engineering (CSE) or Electrical and Computer Engineering (ECE) courses, or by completing an approved 3 or 4 credit experiential, out-of-classroom education experience obtained through engineering cooperative education or independent study.

   Core Electives: (6)
   - At least 6 credits from the following:
     - CSE 420 Computer Architecture 3  
     - ECE 410 VLSI Design (L) 4  
     - CSE 422* Computer Networks 3  
     - ECE 442* Introduction to Communication Networks 3  
     - *CSE 422 or ECE 442 can count towards your total Core Electives

   Focus Track Electives: (12)
   - At least 12 credits from the following:
     - Hardware
       - ECE 402 Appl of Analog Integrated Circuits (L) 4  
       - ECE 411 Electronic Design Automation (L) 4  
       - ECE 412 Intro to Mixed-Signal Circuits Design (L) 4  
       - ECE 445 Biomedical Instrumentation 3
     - Software
       - CSE 335 Object-oriented Software Design 4  
       - CSE 450 Translation of Programming Languages 3  
       - CSE 471 Media Processing & Multimedia 3  
       - CSE 475 Computing 3  
       - ECE 366 Introduction to Signal Processing 3

   Recommended Electives:
   - ECE 305 Electromagnetic Fields & Waves I 4  
   - ECE 313 Control Systems 3  
   - ECE 404 Radio Frequency Electronic Circuits 4  
   - ECE 415 Computer Aided Manufacturing 3  
   - ECE 416 Digital Control 3  
   - ECE 457 Communication Systems 3  
   - ECE 458 Communication Systems Laboratory 1  
   - ECE 466 Digital Signal Processing & Filter Design 3  
   - ECE 474 Principles of Electronics Devices 3

   Other Electives (Variable)

Total Credits Required for Degree 128

The requirements listed above apply to students admitted to the major of Computer Engineering beginning Fall, 2013. The Department of Electrical and Computer Engineering (ECE) constantly reviews program requirements and reserves the right to make changes as necessary. Students are encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule. Students who have questions about Computer Engineering should contact the Electrical and Computer Engineering Department Advising Office, 2212 Engineering Building, phone (517) 355-5242.

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### Biomedical Engineering Concentration

The department offers a concentration for students who plan to pursue graduate work in biomedical areas or seek employment in selected medical-related areas. The concentration is available to, but not required of, any student enrolled in the Bachelor of Science degree program in Computer Engineering. Courses completed to satisfy requirement 3. above may also be used to satisfy the requirements of the concentration. The concentration will be noted on the student’s transcript.

#### Biomedical Engineering

To earn a Bachelor of Science degree in Computer Engineering with a biomedical engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

1. **Complete 6 credits from the following courses:**
   - ANTR 350 Human Gross Anatomy for Pre-Health Professionals 3
   - BS 161 Cell and Molecular Biology 3
   - PSL 250 Introductory Physiology 4
   - PSL 310 Physiology for Pre-Health Professionals 4

2. **Complete 6 credits from the following courses:**
   - ECE 445 Biomedical Instrumentation 3
   - ECE 446 Biomedical Signal Processing 3
   - ECE 447 Introduction to Biomedical Imaging 3
   - ECE 448 Modeling and Analysis of Bioelectrical Systems 3

3. **Complete 3 credits from the following courses:**
   - BE 444 Biosensors for Medical Diagnostics 3
   - ME 494 Biofluid Mechanics and Heat Transfer 3
   - ME 495 Tissue Mechanics 3
   - MSE 425 Biomaterials and Biocompatibility 3

A 400-level listed above or other approved Electrical and Computer Engineering (ECE) courses with biomedical engineering content as approved by the student’s advisor. The course used to fulfill this requirement may not be used to fulfill concentration requirement 1. or 2.

### Program Objectives

The bachelor's degree in electrical/computer engineering provides its graduates with a solid foundation on which they can build successful and sustainable careers in the ever-changing global work environment. The program prepares its graduates for a variety of career paths including engineering positions directly after program completion, entry to engineering graduate school, and entry to other professional graduate-level schools, and eventual leadership in technical, organizational, and entrepreneurial arenas.

Specifically, the electrical/computer engineering program prepares its graduates to become successful in:

- maintaining and increasing their technical and/or broad expertise through lifelong learning;
- using/applying their continual improving expertise in the practice of electrical/computer engineering or a related career; and
- sharing their expertise to the benefit of the larger community.

### Computer Engineering Sample Program

**Fall Credits**
- Bioscience 3/4
- CEM 141 4
- EGR 100 2
- MTH 132 3
- WRA XXX 4

**Spring Credits**
- CSE 231 4
- MTH 133 4
- PHY 183 4
- ISS 2XX 4
- PHY 184 4

**Total Credits**
16/17

**Fall Credits**
- CSE 232 4
- CEM 161 1
- ECE 201 3
- MTH 234 4
- ECE 480 4

**Spring Credits**
- CSE 260 4
- ECE 202 & 203 3
- ECE 280 3
- MTH 235 3

**Total Credits**
16

**Fall Credits**
- ECE 331 4
- ECE 302 & 303 4
- Major Elective 3/4
- IAH 201-210 4

**Spring Credits**
- CSE 410 3
- CSE 331 3
- Core Elective 3/4
- Major Elective 3/4

**Total Credits**
15/16

**Fall Credits**
- Core Elect 3/4
- ECE 390 1
- Major Elective 3/4
- IAH 211 or higher 4

**Spring Credits**
- Elective 3/4
- ECE 480 4
- Major Elective 3/4
- Major Elective 0/6

**Total Credits**
14/17

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