## ELECTRICAL ENGINEERING DEGREE

Students must also complete the Undergraduate Registration Requirement (https://catalogs.northwestern.edu/undergraduate/requirements-policies/undergraduate-registration-requirement) and the degree requirements of their home school.

### Requirements (48 units total)

#### Course Title

**Core Courses (32 units)**
- 4 mathematics courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)
- 4 engineering analysis and computer proficiency courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)

**4 units of basic science:**
- PHYSICS 135-2 General Physics
- PHYSICS 135-3 General Physics
- 1.33 units chosen from McCormick-approved basic science courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)

**Maximum of 3 basic science units may come from any one area**

**5 basic engineering courses:**
- ELEC_ENG 202-0 Introduction to Electrical Engineering
- COMP_ENG 203-0 Introduction to Computer Engineering
- ELEC_ENG 302-0 Probabilistic Systems
- COMP_ENG 211-0 Fundamentals of Computer Programming II
- ELEC_ENG 302-0Basics of Electrical Engineering

**1 course from one of the following basic engineering categories: fluids and solids, materials science and engineering, systems engineering and analysis, thermodynamics**

- PHYSICS 140-2 Fundamentals of Physics
- PHYSICS 140-3 General Physics Laboratory
- 1 required design course from:
  - ELEC_ENG 399-0 Projects
  - COMP_ENG 399-0 Microprocessor Systems Design Projects

**3 design and communications courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)**

**7 social sciences/humanities courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)**

**5 unrestricted electives (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)**

1. See general requirements (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext) for details.

2. PHYSICS 140-2 Fundamentals of Physics may be substituted for PHYSICS 135-2 General Physics. PHYSICS 140-3 Fundamentals of Physics may be substituted for PHYSICS 135-3 General Physics. Associated labs are PHYSICS 136-2 General Physics Laboratory and PHYSICS 136-3 General Physics Laboratory.

3. 10 technical electives:
   - At least 6 courses from the following tracks:
     - Biomedical engineering track (p. 1)
     - Circuits and electronics track (p. 1)
     - Communications systems track (p. 2)
     - Control systems track (p. 2)
     - Digital signal processing and machine learning track (p. 2)
     - Electromagnetics and optics track (p. 2)
     - Solid-state engineering track (p. 2)
   - 2 courses from 300-level COMP_SCi, ELEC_ENG, or COMP_ENG technical electives (which may include COMP_ENG 205-0 and the courses above)
   - 2 courses may be chosen from:
     - 300-level technical courses in science, mathematics, computer science, or engineering or the courses above
     - BIOL_SCI 215-0 Genetics and Molecular Biology
     - BIOL_SCI 217-0 Physiology
     - BIOL_SCI 219-0 Cell Biology
     - CHEM 210-1 Organic Chemistry
     - CHEM 210-2 and Organic Chemistry
     - CHEM 210-3 and Organic Chemistry

**1 required design course from:**
- ELEC_ENG 327-0 Electronic System Design II: Project
- COMP_ENG 347-1 Microprocessor Systems Project I
- COMP_ENG 392-0 VLSI Systems Design Projects
- ELEC_ENG 398-0 Electrical Engineering Design
- ELEC_ENG 399-0 Projects

1. See general requirements (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext) for details.

2. No more than 2 units of ELEC_ENG 399-0 Projects will be counted as technical electives. Additional units of ELEC_ENG 399-0 Projects may be taken but will be counted as unrestricted electives.

3. When ELEC_ENG 399-0 Projects is a design project and the student has senior standing.

### Technical Elective Tracks

#### Biomedical Engineering Track

**Course**
- BMD_ENG 317-0 Biochemical Sensors
- BMD_ENG 325-0 Introduction to Medical Imaging
- BMD_ENG 327-0 Magnetic Resonance Imaging
- BMD_ENG 333-0 Modern Optical Microscopy & Imaging

#### Circuits and Electronics Track

**Course**
- COMP_ENG 303-0 Advanced Digital Design
- COMP_ENG 346-0 Microprocessor System Design
- COMP_ENG 347-2 Microprocessor Systems Project II
- ELEC_ENG 353-0 Digital Microelectronics
- COMP_ENG 355-0 ASIC and FPGA Design
- COMP_ENG 391-0 CMOS VLSI Circuit Design
- COMP_ENG 393-0 Advanced Low Power VLSI and Mixed-signal IC Design
### Communications Systems Track

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>ELEC_ENG 307-0</td>
<td>Communications Systems</td>
</tr>
<tr>
<td>ELEC_ENG 333-0</td>
<td>Introduction to Communication Networks</td>
</tr>
<tr>
<td>ELEC_ENG 378-0</td>
<td>Digital Communications</td>
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<tr>
<td>ELEC_ENG 380-0</td>
<td>Wireless Communications</td>
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### Control Systems Track

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ELEC_ENG 360-0</td>
<td>Introduction to Feedback Systems</td>
</tr>
<tr>
<td>ELEC_ENG 374-0</td>
<td>Introduction to Digital Control</td>
</tr>
<tr>
<td>ELEC_ENG 390-0</td>
<td>Introduction to Robotics</td>
</tr>
<tr>
<td>MECH_ENG 333-0</td>
<td>Introduction to Mechatronics</td>
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### Digital Signal Processing Track

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ELEC_ENG 332-0</td>
<td>Introduction to Computer Vision</td>
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<tr>
<td>ELEC_ENG 359-0</td>
<td>Digital Signal Processing</td>
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<tr>
<td>ELEC_ENG 363-0</td>
<td>Digital Filtering</td>
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### Electromagnetics Engineering Track

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ELEC_ENG 308-0</td>
<td>Advanced Electromagnetics and Photonics</td>
</tr>
<tr>
<td>ELEC_ENG 379-0</td>
<td>Lasers and Coherent Optics</td>
</tr>
<tr>
<td>ELEC_ENG 382-0</td>
<td>Photonic Information Processing</td>
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<tr>
<td>ELEC_ENG 383-0</td>
<td>Fiber-Optic Communications</td>
</tr>
<tr>
<td>ELEC_ENG 386-0</td>
<td>Computational Electromagnetics and Photonics</td>
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### Solid-State Engineering Track

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ELEC_ENG 250-0</td>
<td>Physical Electronics and Devices</td>
</tr>
<tr>
<td>ELEC_ENG 381-0</td>
<td>Electronic Properties of Materials</td>
</tr>
<tr>
<td>ELEC_ENG 384-0</td>
<td>Solid State Electronic Devices</td>
</tr>
<tr>
<td>ELEC_ENG 385-0</td>
<td>Optoelectronics</td>
</tr>
<tr>
<td>ELEC_ENG 388-0</td>
<td>Nanotechnology</td>
</tr>
<tr>
<td>MECH_ENG 381-0</td>
<td>Introduction to Micro-electro-mechanical Systems</td>
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</tbody>
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