

# 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)

### Core Courses (27 units)<sup>1</sup>

Course Title  
4 mathematics courses (<https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext>)

4 units of basic science:<sup>2</sup>

PHYSICS 135-2 & PHYSICS 136-2	General Physics and General Physics Laboratory
PHYSICS 135-3 & PHYSICS 136-3	General Physics and General Physics Laboratory

1.33 units chosen from McCormick-approved basic science categories of Chemistry, Physics, Biological Science, Earth & Planetary Science or Astronomy (<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>)

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>)

### Major Program (21 units)

Course Title

10 required courses

COMP_ENG 203-0	Introduction to Computer Engineering
COMP_SCI 211-0 or COMP_SCI 150-0	Fundamentals of Computer Programming II Fundamentals of Computer Programming 1.5
ELEC_ENG 202-0	Introduction to Electrical Engineering
ELEC_ENG 221-0	Fundamentals of Circuits
ELEC_ENG 222-0	Fundamentals of Signals & Systems
ELEC_ENG 223-0	Fundamentals of Solid State Engineering
ELEC_ENG 224-0	Fund of Electromagnetics & Photonics
ELEC_ENG 225-0	Fundamentals of Electronics
ELEC_ENG 302-0	Probabilistic Systems

1 additional McCormick course at 200-level or higher comprised of 100% Engineering Topics based on ABET Course Partitioning Table

10 technical elective courses<sup>3</sup>

6 courses chosen from the technical elective tracks below

Biomedical engineering track (p. 1)

Circuits and electronics track (p. 1)

Communications systems track (p. 2)

Control systems track (p. 2)

Signal processing and machine learning track (p. 2)

Electromagnetics and optics track (p. 2)

Solid-state engineering track (p. 2)

2 courses at the 300- or 400-level in COMP\_SCI, ELEC\_ENG, or COMP\_ENG technical electives (which may include COMP\_ENG 205-0 and the courses above)

2 courses chosen from the options below

300-level technical courses in science, mathematics, computer science, or engineering or the courses above	
BIOL_SCI 201-0	Molecular Biology
BIOL_SCI 202-0	Cell Biology
BIOL_SCI 203-0	Genetics and Evolution
CHEM 215-1	Organic Chemistry I
& CHEM 215-2	and Organic Chemistry II
& CHEM 215-3	and Organic Chemistry III

1 design course from the options below<sup>4</sup>

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

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

<sup>2</sup> PHYSICS 125-2 General Physics for ISP or PHYSICS 140-3 Fundamentals of Physics may be substituted for PHYSICS 135-2 General Physics. PHYSICS 125-3 General Physics for ISP or PHYSICS 140-3 Fundamentals of Physics may be substituted for PHYSICS 135-3 General Physics. Associated labs are PHYSICS 126-2 Physics for ISP Laboratory or PHYSICS 136-2 General Physics Laboratory and PHYSICS 126-3 Physics for ISP Laboratory or PHYSICS 136-3 General Physics Laboratory.

<sup>3</sup> 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.

<sup>4</sup> When ELEC\_ENG 399-0 Projects is a design project and the student has senior standing

### Technical Elective Tracks

#### Biomedical Engineering Track

Course	Title
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	Title
COMP_ENG 303-0	Advanced Digital Design
COMP_ENG 346-0	Microcontroller System Design
COMP_ENG 347-2	Microprocessor Systems Project II
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
ELEC_ENG 326-0	Electronic System Design I
ELEC_ENG 327-0	Electronic System Design II: Project
ELEC_ENG 353-0	Digital Microelectronics

## Communications Systems Track

Course	Title
ELEC_ENG 307-0	Communications Systems
ELEC_ENG 328-0	Information Theory & Learning
ELEC_ENG 333-0	Introduction to Communication Networks
ELEC_ENG 334-0	Fundamentals of Blockchains and Decentralization
ELEC_ENG 378-0	Digital Communications
ELEC_ENG 380-0	Wireless Communications

## Control Systems Track

Course	Title
ELEC_ENG 360-0	Introduction to Feedback Systems
ELEC_ENG 374-0	Introduction to Digital Control
ELEC_ENG 390-0	Introduction to Robotics
MECH_ENG 333-0	Introduction to Mechatronics

## Signal Processing and Machine Learning Track

Course	Title
ELEC_ENG 332-0	Introduction to Computer Vision
ELEC_ENG 335-0	Deep Learning Foundations from Scratch
ELEC_ENG 359-0	Digital Signal Processing
ELEC_ENG 363-0	Digital Filtering
ELEC_ENG 373-0	Deep Reinforcement Learning
ELEC_ENG 375-0	Machine Learning: Foundations, Applications, and Algorithms

## Electromagnetics Engineering Track

Course	Title
ELEC_ENG 308-0	Applied Electromagnetics and Photonics
ELEC_ENG 379-0	Lasers and Coherent Optics
ELEC_ENG 382-0	Photonic Information Processing
ELEC_ENG 383-0	Fiber-Optic Communications

## Solid-State Engineering Track

Course	Title
ELEC_ENG 250-0	Physical Electronics and Devices
ELEC_ENG 381-0	Electronic Properties of Materials
ELEC_ENG 384-0	Solid State Electronic Devices
ELEC_ENG 385-0	Optoelectronics
ELEC_ENG 388-0	Nanotechnology
MECH_ENG 381-0	Introduction to Micro-electro-mechanical Systems