COMPUTER 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)

Course | Title
--- | ---
4 mathematics 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
PHYSICS 136-2 | General Physics Laboratory
& PHYSICS 136-3 | 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) 2
4 engineering analysis and computer proficiency courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)
3 design and communication 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_ENG 205-0 | Fundamentals of Computer System Software
COMP_ENG 303-0 | Advanced Digital Design
COMP_ENG 361-0 | Computer Architecture I
COMP_SCI 111-0 | Fundamentals of Computer Programming
COMP_SCI 211-0 | Fundamentals of Computer Programming II
ELEC_ENG 202-0 | Introduction to Electrical Engineering
ELEC_ENG 302-0 | Probabilistic Systems
ELEC_ENG 221-0 | Fundamentals of Circuits
1 additional course from a McCormick department at 200-level or higher comprised of 100% Engineering Topics based on ABET Course Partitioning Table 1
10 technical elective courses
2 courses chosen from the options below
COMP_SCI 213-0 | Introduction to Computer Systems
ELEC_ENG 222-0 | Fundamentals of Signals & Systems
ELEC_ENG 223-0 | Fundamentals of Solid State Engineering
ELEC_ENG 224-0 | Fundamentals of Electromagnetics & Photonics
ELEC_ENG 225-0 | Fundamentals of Electronics
5 courses from the areas below
Architecture and high-performance computing (see below)
VLSI and CAD (see below)
Embedded systems (see below)

Area Electives

Architecture and High-Performance Computing

Course | Title
--- | ---
COMP_ENG 329-0 | The Art of Multicore Concurrent Programming
COMP_ENG 358-0 | Introduction to Parallel Computing
COMP_ENG 362-0 | Computer Architecture Projects
COMP_ENG 368-0 | Programming Massively Parallel Processors with CUDA
COMP_ENG 452-0 | Adv Computer Architecture
COMP_ENG 453-0 | Parallel Architectures
COMP_ENG 468-0 | Programming Massively Parallel Processors with CUDA

VLSI and CAD

Course | Title
--- | ---
COMP_ENG 355-0 | ASIC and FPGA Design
COMP_ENG 357-0 | Design Automation in VLSI
COMP_ENG 391-0 | CMOS VLSI Circuit Design
COMP_ENG 392-0 | VLSI Systems Design Projects
COMP_ENG 459-0 | VLSI Algorithmics
ELEC_ENG 353-0 | Digital Microelectronics
COMP_ENG 393-0 | Advanced Low Power VLSI and Mixed-signal IC Design
COMP_ENG 493-0 | Advanced Low Power VLSI and Mixed-signal IC Design

Software systems (see below)
Networks and security (see below)
3 elective courses chosen from the options below
300-level technical courses in science, mathematics, computer science, or engineering 3
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 Advanced Organic Chemistry
1 design course chosen from the options below
COMP_ENG 347-1 | Microprocessor Systems Projects I
COMP_ENG 362-0 | Computer Architecture Projects
COMP_ENG 392-0 | VLSI Systems Design Projects

1 See general requirements (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext) for details.
2 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.
3 No more than 2 units of COMP_ENG 399-0 Projects will be counted as technical electives. Additional units of COMP_ENG 399-0 Projects may be taken but will be counted as unrestricted electives.

Software systems (see below)
Networks and security (see below)
3 elective courses chosen from the options below
300-level technical courses in science, mathematics, computer science, or engineering 3
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 Advanced Organic Chemistry
1 design course chosen from the options below
COMP_ENG 347-1 | Microprocessor Systems Projects I
COMP_ENG 362-0 | Computer Architecture Projects
COMP_ENG 392-0 | VLSI Systems Design Projects

1 See general requirements (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext) for details.
2 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.
3 No more than 2 units of COMP_ENG 399-0 Projects will be counted as technical electives. Additional units of COMP_ENG 399-0 Projects may be taken but will be counted as unrestricted electives.
## Embedded Systems

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>COMP_SCI 301-0</td>
<td>Introduction to Robotics Laboratory</td>
</tr>
<tr>
<td>COMP_ENG 346-0</td>
<td>Microprocessor System Design</td>
</tr>
<tr>
<td>COMP_ENG 347-1</td>
<td>Microprocessor Systems Project I</td>
</tr>
<tr>
<td>COMP_ENG 347-2</td>
<td>Microprocessor Systems Project II</td>
</tr>
<tr>
<td>COMP_ENG 364-0</td>
<td>CyberPhysical Systems Design and Application</td>
</tr>
<tr>
<td>COMP_ENG 365-0</td>
<td>Internet-of-things Sensors, Systems, And Applications</td>
</tr>
<tr>
<td>COMP_ENG 366-0</td>
<td>Embedded Systems</td>
</tr>
<tr>
<td>COMP_ENG 369-0</td>
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</tr>
<tr>
<td>COMP_ENG 366-0</td>
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<tr>
<td>COMP_ENG 366-0</td>
<td>Embedded Systems</td>
</tr>
<tr>
<td>ELEC_ENG 326-0</td>
<td>Electronic System Design I</td>
</tr>
<tr>
<td>ELEC_ENG 327-0</td>
<td>Electronic System Design II: Project</td>
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<tr>
<td>ELEC_ENG 332-0</td>
<td>Introduction to Computer Vision</td>
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<tr>
<td>ELEC_ENG 360-0</td>
<td>Introduction to Feedback Systems</td>
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<tr>
<td>ELEC_ENG 390-0</td>
<td>Introduction to Robotics</td>
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<tr>
<td>ELEC_ENG 432-0</td>
<td>Advanced Computer Vision</td>
</tr>
<tr>
<td>MECH_ENG 333-0</td>
<td>Introduction to Mechatronics</td>
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<tr>
<td>MECH_ENG 433-0</td>
<td>Advanced Mechatronics</td>
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</tbody>
</table>

## Software Systems

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>COMP_SCI 150-0</td>
<td>Fundamentals of Computer Programming 1.5</td>
</tr>
<tr>
<td>COMP_SCI 212-0</td>
<td>Mathematical Foundations of Comp Science</td>
</tr>
<tr>
<td>COMP_SCI 214-0</td>
<td>Data Structures &amp; Algorithms</td>
</tr>
<tr>
<td>COMP_SCI 321-0</td>
<td>Programming Languages</td>
</tr>
<tr>
<td>COMP_SCI 322-0</td>
<td>Compiler Construction</td>
</tr>
<tr>
<td>COMP_SCI 336-0</td>
<td>Design &amp; Analysis of Algorithms</td>
</tr>
<tr>
<td>COMP_SCI 339-0</td>
<td>Introduction to Database Systems</td>
</tr>
<tr>
<td>COMP_SCI 343-0</td>
<td>Operating Systems</td>
</tr>
<tr>
<td>COMP_SCI 394-0</td>
<td>Agile Software Development</td>
</tr>
</tbody>
</table>

## Networks and Security

<table>
<thead>
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<th>Course</th>
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<tbody>
<tr>
<td>COMP_SCI 340-0</td>
<td>Introduction to Networking</td>
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<tr>
<td>COMP_SCI 350-0</td>
<td>Introduction to Computer Security</td>
</tr>
<tr>
<td>COMP_SCI 354-0</td>
<td>Computer System Security</td>
</tr>
<tr>
<td>ELEC_ENG 333-0</td>
<td>Introduction to Communication Networks</td>
</tr>
<tr>
<td>COMP_SCI 334-0</td>
<td>Fundamentals of Blockchains and Decentralization</td>
</tr>
</tbody>
</table>