COMPUTER SCIENCE MAJOR

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.

Course Title
Program Courses (19 units)

6 core courses:

COMP SCI 101-0 Computer Science: Concepts, Philosophy, and Connections

Or an additional breadth course from the breadth course lists.

COMP SCI 111-0 Fundamentals of Computer Programming
COMP SCI 211-0 Fundamentals of Computer Programming II
COMP SCI 212-0 Mathematical Foundations of Comp Science
COMP SCI 213-0 Introduction to Computer Systems
COMP SCI 214-0 Data Structures & Algorithms

5 breadth courses (see below)
2 project courses (see below)
6 technical electives (see below)

Related Courses (Units depend on mathematics sequence taken.)

Mathematics (p. 2)
Probability and Statistics (p. 2)

Physics or biological sciences courses are recommended to satisfy the Weinberg College natural sciences distribution requirement.

Students without programming experience may want to first take COMP SCI 110-0 Introduction to Computer Programming, ideally in the Python programming language.

Breadth Courses

Majors must take one course from each area. Minors must take one course from each of any three areas.

Theory
Course Title
COMP SCI 335-0 Introduction to the Theory of Computation
COMP SCI 336-0 Design & Analysis of Algorithms

Systems
Course Title
COMP SCI 322-0 Compiler Construction
COMP SCI 339-0 Introduction to Database Systems
COMP SCI 340-0 Introduction to Networking
COMP SCI 343-0 Operating Systems
COMP SCI 345-0 Distributed Systems
COMP SCI 350-0 Introduction to Computer Security
COMP SCI 354-0 Network Penetration & Security
COMP SCI 440-0 Advanced Networking
COMP SCI 441-0 Resource Virtualization
COMP SCI 443-0 Advanced Operating Systems
COMP SCI 446-0 Kernel and Other Low-level Software Development
COMP SCI 450-0 Internet Security
COMP ENG 303-0 Advanced Digital Design
COMP ENG 346-0 Microprocessor System Design
COMP ENG 358-0 Introduction to Parallel Computing
COMP ENG 361-0 Computer Architecture I

Artificial Intelligence
Course Title
COMP SCI 325-1 Artificial Intelligence Programming
COMP SCI 337-0 Natural Language Processing
COMP SCI 344-0 Design of Computer Problem Solvers
COMP SCI 348-0 Introduction to Artificial Intelligence
COMP SCI 349-0 Machine Learning
COMP SCI 371-0 Knowledge Representation and Reasoning
COMP SCI 372-0 Designing & Constructing Models with Multi-Agent Language

Interfaces
Course Title
COMP SCI 313-0 Tangible Interaction Design and Learning
COMP SCI 315-0 Design, Technology, and Research
COMP SCI 330-0 Human Computer Interaction
COMP SCI 331-0 Introduction to Computational Photography
COMP SCI 351-1 Introduction to Computer Graphics
COMP SCI 352-0 Machine Perception of Music & Audio
COMP SCI 370-0 Computer Game Design
COMP SCI 376-0 Computer Game Design and Development
COMP SCI 377-0 Game Design Studio
ELEC ENG 332-0 Introduction to Computer Vision

Software Development and Programming Languages
Course Title
COMP SCI 321-0 Programming Languages
COMP SCI 338-0 Practicum in Intelligent Information Systems
COMP SCI 377-0 Game Design Studio
COMP SCI 393-0 Software Construction
COMP SCI 394-0 Agile Software Development
COMP SCI 473-1 NUvention: Web - Part 1
COMP SCI 473-2 NUvention: Web - Part 2

Project Courses

Majors must take two courses from this list.

Project course list
Course Title
COMP SCI 315-0 Design, Technology, and Research
COMP SCI 322-0 Compiler Construction
COMP SCI 330-0 Human Computer Interaction
COMP SCI 331-0 Introduction to Computational Photography
COMP SCI 337-0 Natural Language Processing
COMP SCI 338-0 Practicum in Intelligent Information Systems
COMP SCI 339-0 Introduction to Database Systems
COMP SCI 340-0 Introduction to Networking
COMP SCI 343-0 Operating Systems
COMP SCI 344-0 Design of Computer Problem Solvers
COMP SCI 345-0 Distributed Systems
COMP SCI 351-1 Introduction to Computer Graphics
COMP SCI 351-2 Intermediate Computer Graphics
COMP SCI 354-0 Network Penetration & Security
COMP SCI 367-0 Wireless and Mobile Health: Passive Sensing Data Analytics
COMP SCI 370-0 Computer Game Design
COMP SCI 371-0 Knowledge Representation and Reasoning
COMP SCI 377-0 Game Design Studio
Technical electives
Majors must take six technical electives. **Any 300- or 400-level COMP_SCI course** may be taken as a technical elective. In addition the following courses may also be taken as technical electives:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP_ENG 303-0</td>
<td>Advanced Digital Design</td>
</tr>
<tr>
<td>COMP_ENG 346-0</td>
<td>Microprocessor System Design</td>
</tr>
<tr>
<td>COMP_ENG 358-0</td>
<td>Introduction to Parallel Computing</td>
</tr>
<tr>
<td>COMP_ENG 361-0</td>
<td>Computer Architecture I</td>
</tr>
<tr>
<td>COMP_ENG 366-0</td>
<td>Embedded Systems</td>
</tr>
<tr>
<td>COMP_ENG 368-0</td>
<td>Programming Massively Parallel Processors with CUDA</td>
</tr>
<tr>
<td>COMP_ENG 466-0</td>
<td>Embedded Systems</td>
</tr>
<tr>
<td>COMP_ENG 468-0</td>
<td>Programming Massively Parallel Processors with CUDA</td>
</tr>
<tr>
<td>ELEC_ENG 332-0</td>
<td>Introduction to Computer Vision</td>
</tr>
<tr>
<td>ELEC_ENG 375-0</td>
<td>Machine Learning: Foundations, Applications, and Algorithms</td>
</tr>
<tr>
<td>ELEC_ENG 433-0</td>
<td>Statistical Pattern Recognition</td>
</tr>
<tr>
<td>ELEC_ENG 435-0</td>
<td>Deep Learning: FAA</td>
</tr>
</tbody>
</table>

Related Courses

Mathematics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 220-1</td>
<td>Single-Variable Differential Calculus</td>
</tr>
<tr>
<td>&amp; MATH 220-2</td>
<td>and Single-Variable Integral Calculus</td>
</tr>
<tr>
<td>or MATH 218-1</td>
<td>Single-Variable Calculus with Precalculus</td>
</tr>
<tr>
<td>&amp; MATH 218-2</td>
<td>and Single-Variable Calculus with Precalculus</td>
</tr>
<tr>
<td>&amp; MATH 218-3</td>
<td>and Single-Variable Calculus with Precalculus</td>
</tr>
<tr>
<td>MATH 230-1</td>
<td>Multivariable Differential Calculus</td>
</tr>
<tr>
<td>or MATH 228-1</td>
<td>Multivariable Differential Calculus for Engineering</td>
</tr>
<tr>
<td>MATH 240-0</td>
<td>Linear Algebra</td>
</tr>
</tbody>
</table>

Probability and Statistics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEMS 201-0</td>
<td>Introduction to Statistics</td>
</tr>
<tr>
<td>or STAT 210-0</td>
<td>Introductory Statistics for the Social Sciences</td>
</tr>
<tr>
<td>or MATH 310-1</td>
<td>Probability and Stochastic Processes</td>
</tr>
</tbody>
</table>

1 Or a score of 5 on the AP Statistics Exam

1 **STAT 202-0** Introduction to Statistics is not accepted.

NOTE

Many courses are eligible to count toward more than one requirement for the major; for example, all breadth courses are also technical elective courses. A student who completes such a course must choose which requirement area to apply that course. A single course does not satisfy more than one requirement at a time.

Honors in Computer Science

Outstanding students majoring in computer science may be considered for program honors. For information on criteria and procedures, contact the program director and see Honors in the Major (https://catalogs.northwestern.edu/undergraduate/arts-sciences/#academicoptionstext).