The program offers a minor in computer science for students who wish to develop a strong competence in computer science while majoring in another area.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>MATH 220-1</td>
<td>Single-Variable Differential Calculus</td>
</tr>
<tr>
<td>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>

**Minor Requirements (9 units)**

**6 core courses**

- COMP_SCI 111-0: Fundamentals of Computer Programming
- COMP_SCI 150-0: Fundamentals of Computer Programming 1.5
- 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

3 breadth courses in 3 separate breadth areas (see below)

**Theory**

- COMP_SCI 335-0: Introduction to the Theory of Computation
- COMP_SCI 336-0: Design & Analysis of Algorithms

**Systems**

- 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: Computer System 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

1 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.

**Artificial Intelligence**

- 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**

- 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**

- COMP_SCI 310-0: Scalable Software Architectures
- 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

Students should begin the minor before the end of the first quarter of their junior year.