## B.S. IN COMPUTER SCIENCE

### Overview

The major in Computer Science for BS students consists of a core of 23 credits of Computer Science courses, 17 credits of Mathematics courses (which may apply towards a mathematics minor), 17 credits from a chosen track, and 12-14 credits of required science and ethics courses.

### Curriculum Requirements for B.S. in Computer Science and for Additional Major in Computer Science with Tracks

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core Computer Science Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSC 120</td>
<td>Computer Programming I</td>
<td>4</td>
</tr>
<tr>
<td>CSC 220</td>
<td>Computer Programming II</td>
<td>4</td>
</tr>
<tr>
<td>CSC 314</td>
<td>Computer Organization and Architecture</td>
<td>3</td>
</tr>
<tr>
<td>CSC 317</td>
<td>Data Structures and Algorithm Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CSC 322</td>
<td>System Programming</td>
<td>3</td>
</tr>
<tr>
<td>CSC 427</td>
<td>Theory of Computing</td>
<td>3</td>
</tr>
<tr>
<td>CSC 431</td>
<td>Introduction to Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td><strong>Core Mathematics Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTH 161</td>
<td>Calculus I (or equivalent - MTH 140 and MTH 141, MTH 151, or MTH 171)</td>
<td>4</td>
</tr>
<tr>
<td>MTH 162</td>
<td>Calculus II (or equivalent - MTH 172)</td>
<td>4</td>
</tr>
<tr>
<td>MTH 210</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MTH 224</td>
<td>Introduction to Probability and Statistics</td>
<td>3</td>
</tr>
<tr>
<td>MTH 309</td>
<td>Discrete Mathematics I</td>
<td>3</td>
</tr>
</tbody>
</table>

### Tracks

Select one of the following Tracks: 17

#### Comprehensive Track: 2,3

- CSC 419 or CSC 546: Programming Languages
- CSC 421: Introduction to Machine Learning with Applications
- CSC 423: Principles of Computer Operating Systems
- CSC 424: Database Systems
- CSC 420: Computer Networks

Select a minimum of 5 credit hours of approved electives

#### Flexible Track: 2

Select a minimum of 17 credit hours of approved electives

#### Computational Science Track: 4

- CSC 210: Computing for Scientists
- CSC 528: Introduction to Parallel Computing
- CSC 547: Computational Geometry
- CSC 548: Problem Solving for Bioinformatics
- CSC 410 or CSC 411: Computer Science Project Planning
- CSC 410 or MTH 520 or MTH 320: Computer Science Project Implementation
- MTH 320: Introduction to Numerical Analysis
- MTH 520: Numerical Linear Algebra
- BIL 150: General Biology
- BIL 151: General Biology Laboratory

#### Cryptography and Security Track: 4

- CSC 421: Principles of Computer Operating Systems
- CSC 424: Computer Networks
- CSC 507: Data Security and Cryptography
- CSC 410: Computer Science Project Planning
or CSC 411
MTH 461
or MTH 505
or MTH 561
Select a minimum of 2 credit hours of approved electives

Graphics and Games Track: 4
CSC 329
CSC 529
CSC 545
CSC 410
or CSC 411
Select a minimum of 5 credit hours of approved electives 5
PHY 201
or PHY 221

Data Science Track: 4
CSC 315
MTH 542
CSC 546
CSC 410
or CSC 411
Select a minimum of 6 credit hours of approved electives 7

Science & Ethics Requirement
An approved two semester sequence of courses with laboratory in Biology, Chemistry, Physics, or Geological Sciences

Approved Electives
Any CSC 2XX, CSC 3XX, CSC 4XX, CSC 5XX 8, 9
CSC 115
BTE 535
BTE 565
ECE 414
ECE 514
ECE 548
ECE 553
ECE 570
ECE 572
ECE 574
ECE 576
ECE 577
ECE 481
ECE 482
MTH 320
MTH 505
MTH 520
MTH 521
MTH 524
MTH 525
MTH 542

General Education Requirements
Written Communication Skills:
WRS 105
WRS 106
or ENG 106
B.S. in Computer Science

Quantitative Skills:

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>MTH 161</td>
<td>Calculus I (fulfilled through the major)</td>
</tr>
<tr>
<td>or MTH 140</td>
<td>Calculus Concepts with Foundations A</td>
</tr>
<tr>
<td>or MTH 151</td>
<td>Calculus I for Engineers</td>
</tr>
<tr>
<td>or MTH 171</td>
<td>Calculus I</td>
</tr>
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</table>

Areas of Knowledge:

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts and Humanities Cognate</td>
<td>9</td>
</tr>
<tr>
<td>People and Society Cognate</td>
<td>9</td>
</tr>
<tr>
<td>STEM Cognate (9 credits) (fulfilled through the major)</td>
<td>9</td>
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</tbody>
</table>

Additional Requirements for the B.S. 12

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Requirement</td>
<td>3-9</td>
</tr>
<tr>
<td>Electives</td>
<td>25-16</td>
</tr>
</tbody>
</table>

Total Credit Hours 120

1. These mathematics courses can also fulfill the requirements for a Minor in Mathematics (see here [http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/mathematics/mathematics-minor/] for details).
2. Available to all students.
3. The Comprehensive Track provides coverage of the topics in Computer Science prescribed by the Association of Computing Machinery curriculum and the ABET Computing Accreditation Commission.
4. Requires permission of the Director of Undergraduate Studies.
5. In addition to the generally approved electives, CIM 423, CIM 433, MMI 504, and MMI 505 are approved for the Graphics and Games track.
6. This course may also be applied towards the Science requirement.
7. In addition to the generally approved electives, JMM 331 and JMM 429 are approved for the Data Science track.
8. CSC 40X - Computer Science Practicum must be taken at the same time as host course.
9. Maximally 6 credit hours from CSC 481 - Computer Science Teaching Assistant.
10. CSC115 can be used as an elective towards the major only if taken before CSC120.
11. ECE 481 and ECE 482 may be used to replace any requirement for CSC 410 and CSC411.
12. For the Additional Major in Computer Science, with Tracks, students not in the College of Arts and Sciences should use the requirements of their school or college's degree in place of the additional requirements listed here.

Suggested Plan of Study

<table>
<thead>
<tr>
<th>Year One</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>Fall</td>
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</tr>
<tr>
<td>CSC 120</td>
<td>Computer Programming I 1</td>
</tr>
<tr>
<td>MTH 161</td>
<td>Calculus I</td>
</tr>
<tr>
<td>WRS 105</td>
<td>First-Year Writing I</td>
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<tr>
<td>Language Course</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
<td></td>
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<tr>
<td>Credit Hours</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>CSC 220</td>
<td>Computer Programming II</td>
</tr>
<tr>
<td>MTH 162</td>
<td>Calculus II</td>
</tr>
<tr>
<td>WRS 106 or ENG 106</td>
<td>First-Year Writing II or Writing About Literature and Culture</td>
</tr>
<tr>
<td>Language Course</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
<td></td>
</tr>
<tr>
<td>Credit Hours</td>
<td></td>
</tr>
<tr>
<td>Year Two</td>
<td></td>
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<tr>
<td>Fall</td>
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<td>BIL or CHM or PHY Course I</td>
<td>4</td>
</tr>
<tr>
<td>BIL or CHM or PHY Associated Lab I</td>
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</tbody>
</table>
### Year Two

**Spring**
- CSC 322: System Programming (3 hours)
- MTH 210: Introduction to Linear Algebra (3 hours)
- BIL or CHM or PHY Course II (4 hours)
- BIL or CHM or PHY Associated Lab Course II (1 hour)
- PHI 115: Social and Ethical Issues in Computing (3 hours)

**Credit Hours:** 14

**Year Three**

**Fall**
- CSC 317: Data Structures and Algorithm Analysis (3 hours)
- CSC 401: Computer Science Practicum I (1 hour)
- CSC 423: Database Systems (3 hours)
- MTH 224: Introduction to Probability and Statistics (3 hours)
- People and Society Cognate Course (3 hours)
- Writing Intensive Course (3 hours)

**Credit Hours:** 16

**Spring**
- CSC 424: Computer Networks (3 hours)
- CSC 427: Theory of Computing (3 hours)
- WRS 233: Advanced Writing for STEM (3 hours)
- Arts and Humanities Cognate Course (3 hours)
- People and Society Cognate Course (3 hours)

**Credit Hours:** 15

### Year Four

**Fall**
- CSC 421: Principles of Computer Operating Systems (3 hours)
- Computer Science Elective (3 hours)
- CSC 405: Computer Science Seminars (1 hour)
- Arts and Humanities Cognate Course (3 hours)
- People and Society Cognate Course (3 hours)

**Credit Hours:** 15

**Spring**
- CSC 419: Programming Languages (3 hours)
- CSC 431: Introduction to Software Engineering (3 hours)
- Arts and Humanities Cognate Course (3 hours)
- Elective (3 hours)
- Elective (3 hours)

**Credit Hours:** 15

**Total Credit Hours:** 121

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1 The prerequisites for CSC 120 are CSC 115 or MTH 141 or MTH 151 or MTH 161 or MTH 171 or MAS 110 or a score of 4 or 5 in AP Computer Science Principles (UM equivalency CSC 119).

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**Mission**

The Department’s mission is to educate and perform scholarly activities in the discipline of Computer Science, in order to meet national and international demand for trained computer scientists who are capable of building the robust computation structures upon which society is becoming increasingly dependent.
Goals

Students will acquire understanding and capability for the structure and developmental processes of software systems, from the translation of domain problems to forms amenable to software solution, through the production of efficient and robust computer programs, to the supporting systems and hardware components.

Students will acquire these abilities through a combination of classroom instruction, laboratory work, independent project work, and group project work.

Graduates will be prepared to work in industries that are directly involved in the development of fundamental computing resources (e.g., Microsoft, Apple, IBM, Intel, etc.), and in industries that rely on computation in support of their core businesses (e.g., banking, transport, manufacturing, medical, etc.).

Faculty and students will engage in activities that support and achieve the development of new techniques and software that can contribute to the science, and where appropriate contribute to the teaching objectives. Examples of such activities include academic research, development of novel techniques and software products, consulting and internship activities in local industries, and maintaining awareness of cutting edge approaches to Computer Science.

Student Learning Outcomes

• Students must be able to translate domain problems to forms amenable to software solution.
• Students must be able to produce efficient and robust computer programs.
• Students must be able to build and deploy a completed, integrated, and documented (Advanced Writing and Communication Skills) software solution to a domain problem.
• Students must have understanding and competence in the mathematical foundations of Computer Science.