Computer Science, B.S.

Degree Offered

• Bachelor of Science

Nature of the Program

Computer scientists are distinguished from other computer professionals, such as information technology specialists and system administrators, by the higher level of theoretical expertise, the innovation they apply to complex problems, and the extensive knowledge and experience they possess in software engineering. A computer scientist can often expect to work on multidisciplinary projects such as robotics, human-computer interaction, advanced computer graphics, and artificial intelligence based systems.

The first two years of study in the Bachelor of Science in Computer Science (BS CS) program focus on the fundamentals of computer science concepts and provide a firm foundation in mathematics. During the junior and senior years, students are introduced to advanced concepts in the science of computation and are presented the opportunity to take elective courses such as video game development, cryptology, computer graphics, artificial intelligence and image processing. The two semester senior project sequence provides the culminating experience for the Computer Science students. Students may also have the opportunity to participate in undergraduate research projects with the computer science faculty.

Educational Objectives

In three to five years after graduation, the graduates of the WVU Tech BS degree program in Computer Science will do the following:

• Demonstrate success in the professional practice of Computer Science through recognition of their contributions to an organization or entrepreneurial accomplishments.
• Alternatively or additionally, demonstrate success in the field of computing by continuing formal education through earning post graduate degrees, technical certificates, or other technical training.
• Demonstrate lifelong learning habits either as a professional or a researcher in their field.

FACULTY

CHAIR

• Don Smith - M.S. (West Virginia University); M.A. (Marshall University)

PROFESSOR

• Ranjith Munasinghe - Ph.D. (University of Wyoming)

ASSOCIATE PROFESSOR

• Afrin Naz - Ph.D. (University of North Texas)

ASSISTANT PROFESSORS

• Bhanukiran Gurijala - Ph.D. (University of Texas)
• Sanish Rai - Ph.D. (Georgia State University)

General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. (http://registrar.wvu.edu/gef/)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

General Education Foundations

<table>
<thead>
<tr>
<th>General Education Foundations</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F1</strong> - Composition &amp; Rhetoric</td>
<td>3-6</td>
</tr>
<tr>
<td>ENGL 101</td>
<td>Introduction to Composition and Rhetoric</td>
</tr>
<tr>
<td>&amp; ENGL 102</td>
<td>and Composition, Rhetoric, and Research</td>
</tr>
<tr>
<td>or ENGL 103</td>
<td>Accelerated Academic Writing</td>
</tr>
<tr>
<td><strong>F2A/F2B</strong> - Science &amp; Technology</td>
<td>4-6</td>
</tr>
<tr>
<td><strong>F3</strong> - Math &amp; Quantitative Reasoning</td>
<td>3-4</td>
</tr>
<tr>
<td><strong>F4</strong> - Society &amp; Connections</td>
<td>3</td>
</tr>
<tr>
<td><strong>F5</strong> - Human Inquiry &amp; the Past</td>
<td>3</td>
</tr>
</tbody>
</table>
### Curriculum Requirements

A minimum GPA of 2.0 is required.

**GEF Elective Requirements (2, 5, 6, 7, and 8)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 111</td>
<td>General Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 112</td>
<td>General Biology</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>Survey of Chemistry 1</td>
<td>3</td>
</tr>
<tr>
<td>&amp; 111L</td>
<td>and Survey of Chemistry 1 - Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 112</td>
<td>Survey of Chemistry 2</td>
<td>3</td>
</tr>
<tr>
<td>&amp; 112L</td>
<td>and Survey of Chemistry 2 - Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 115</td>
<td>Fundamentals of Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>&amp; 115L</td>
<td>and Fundamentals of Chemistry 1 - Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 116</td>
<td>Fundamentals of Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>&amp; 116L</td>
<td>and Fundamentals of Chemistry 2 - Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 101</td>
<td>Introductory Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 102</td>
<td>Introductory Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 111</td>
<td>General Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 112</td>
<td>General Physics</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 101</td>
<td>Introduction to Composition and Rhetoric</td>
<td>6</td>
</tr>
<tr>
<td>&amp; ENGL 102</td>
<td>and Composition, Rhetoric, and Research (GEF 1)</td>
<td>6</td>
</tr>
<tr>
<td>ENGL 305</td>
<td>Technical Writing</td>
<td>3</td>
</tr>
<tr>
<td>MATH 155</td>
<td>Calculus 1 (GEF 3)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 156</td>
<td>Calculus 2</td>
<td>4</td>
</tr>
<tr>
<td>MATH 251</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 441</td>
<td>Applied Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 448</td>
<td>Probability and Statistics</td>
<td>3</td>
</tr>
<tr>
<td>ECON 401</td>
<td>Managerial Economics (GEF 4)</td>
<td>3</td>
</tr>
<tr>
<td>WVUE 191</td>
<td>First Year Seminar</td>
<td>1</td>
</tr>
<tr>
<td>CS 121</td>
<td>Computer Science 1</td>
<td>4</td>
</tr>
<tr>
<td>CS 122</td>
<td>Computer Science 2</td>
<td>4</td>
</tr>
<tr>
<td>CS 201</td>
<td>Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>CS 220</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>CS 222</td>
<td>Intro Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CS 231</td>
<td>Introduction to Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>CS 265</td>
<td>C Programming</td>
<td>2</td>
</tr>
<tr>
<td>CS 310</td>
<td>Principles of Programming Languages</td>
<td>3</td>
</tr>
<tr>
<td>CS 320</td>
<td>Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS 321</td>
<td>Introduction to Networking</td>
<td>3</td>
</tr>
<tr>
<td>CS 324</td>
<td>Database Management</td>
<td>3</td>
</tr>
<tr>
<td>CS 355</td>
<td>Computer Concepts</td>
<td>3</td>
</tr>
<tr>
<td>CS 410</td>
<td>Compiler Construction</td>
<td>3</td>
</tr>
<tr>
<td>CS 450</td>
<td>Operating Systems Structure</td>
<td>4</td>
</tr>
<tr>
<td>CS 479</td>
<td>Advanced Computer Science Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>CS 480</td>
<td>Capstone Project - Design</td>
<td>2</td>
</tr>
</tbody>
</table>

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.
Computer Science, B.S.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 481</td>
<td>Capstone Project - Implementation</td>
<td>3</td>
</tr>
</tbody>
</table>

**Computer Science Electives (Students may select from 300-400 Level Computer Science (CS) courses except CS 491)**

6

**Computer Science/Cybersecurity Elective (Students may select from 300-400 Level Computer Science (CS) courses except CS 491, CYBE 366, CYBE 466, or CYBE 467)**

3

**Technical Electives (See approved list)**

6

**General Electives (Students are free to choose any college level course to fulfill this requirement)**

3

**Total Hours**

121

---

### Approved Technical Electives

#### Accounting

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT 201</td>
<td>Principles of Accounting 1</td>
</tr>
<tr>
<td>ACCT 202</td>
<td>Principles of Accounting 2</td>
</tr>
</tbody>
</table>

#### Biology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 111</td>
<td>General Biology **</td>
</tr>
<tr>
<td>BIOL 112</td>
<td>General Biology **</td>
</tr>
</tbody>
</table>

#### Chemistry

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 111 &amp; 111L</td>
<td>Survey of Chemistry 1 and Survey of Chemistry 1 - Laboratory **</td>
</tr>
<tr>
<td>CHEM 112 &amp; 112L</td>
<td>Survey of Chemistry 2 and Survey of Chemistry 2 - Laboratory **</td>
</tr>
<tr>
<td>CHEM 115 &amp; 115L</td>
<td>Fundamentals of Chemistry and Fundamentals of Chemistry 1 - Laboratory **</td>
</tr>
<tr>
<td>CHEM 116 &amp; 116L</td>
<td>Fundamentals of Chemistry and Fundamentals of Chemistry 2 - Laboratory **</td>
</tr>
</tbody>
</table>

#### Computer Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPE 271</td>
<td>Introduction to Digital Logic Design</td>
</tr>
</tbody>
</table>

#### Computer Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 300+ or 400+ (Except CS 491)</td>
<td></td>
</tr>
</tbody>
</table>

#### Cybersecurity

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYBE 266</td>
<td>Foundations of Cybersecurity</td>
</tr>
<tr>
<td>CYBE 366</td>
<td>Secure Software Development</td>
</tr>
<tr>
<td>CYBE 466</td>
<td>Host Based Cyber Defense</td>
</tr>
<tr>
<td>CYBE 467</td>
<td>Practicing Cybersecurity: Attacks &amp; Countermeasures</td>
</tr>
</tbody>
</table>

#### Electrical Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 221</td>
<td>Introduction to Electrical Engineering</td>
</tr>
<tr>
<td>EE 223</td>
<td>Electrical Circuits</td>
</tr>
</tbody>
</table>

#### Mechanical Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAE 241</td>
<td>Statics</td>
</tr>
<tr>
<td>MAE 242</td>
<td>Dynamics</td>
</tr>
<tr>
<td>MAE 243</td>
<td>Mechanics of Materials</td>
</tr>
<tr>
<td>MAE 331</td>
<td>Fluid Mechanics</td>
</tr>
</tbody>
</table>

#### Information Systems

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISYS 270</td>
<td>Linux</td>
</tr>
<tr>
<td>ISYS 325</td>
<td>C#</td>
</tr>
<tr>
<td>ISYS 366</td>
<td>e-Commerce</td>
</tr>
</tbody>
</table>

#### Mathematics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 261</td>
<td>Elementary Differential Equations</td>
</tr>
</tbody>
</table>

#### Physics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 101</td>
<td>Introductory Physics **</td>
</tr>
<tr>
<td>PHYS 102</td>
<td>Introductory Physics **</td>
</tr>
<tr>
<td>PHYS 111</td>
<td>General Physics **</td>
</tr>
<tr>
<td>PHYS 112</td>
<td>General Physics **</td>
</tr>
</tbody>
</table>

**Unless taken as a science requirement**
Other courses are accepted as technical electives only with advance approval from the department. Most of the 300-400 level ACCT, BIOL, CHEE, CHEM, CPE, CE, EE, MAE, MATH, and PHYS courses are considered acceptable.

## Suggested Plan of Study

### First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 101 (GEF 1)</td>
<td>3</td>
<td>ENGL 102 (GEF 1)</td>
<td>3</td>
</tr>
<tr>
<td>CS 121</td>
<td>4</td>
<td>CS 122</td>
<td>4</td>
</tr>
<tr>
<td>WVUE 191</td>
<td>1</td>
<td>GEF 6</td>
<td>3</td>
</tr>
<tr>
<td>General Elective</td>
<td>3</td>
<td>GEF 7</td>
<td>3</td>
</tr>
<tr>
<td>GEF 5</td>
<td>3</td>
<td>GEF 8</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14</td>
<td><strong>Total</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

### Second Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 155 (GEF 3)</td>
<td>4</td>
<td>MATH 156</td>
<td>4</td>
</tr>
<tr>
<td>CS 201</td>
<td>3</td>
<td>CS 220</td>
<td>3</td>
</tr>
<tr>
<td>CS 231</td>
<td>3</td>
<td>CS 222</td>
<td>3</td>
</tr>
<tr>
<td>CS 265</td>
<td>2</td>
<td>CS 310</td>
<td>3</td>
</tr>
<tr>
<td>GEF 2 (Laboratory Science)</td>
<td>4</td>
<td>GEF 8 (Laboratory Science)</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td><strong>Total</strong></td>
<td>17</td>
</tr>
</tbody>
</table>

### Third Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 401 (GEF 4)</td>
<td>3</td>
<td>ENGL 305</td>
<td>3</td>
</tr>
<tr>
<td>MATH 251</td>
<td>4</td>
<td>MATH 441</td>
<td>3</td>
</tr>
<tr>
<td>CS 320</td>
<td>3</td>
<td>CS 324</td>
<td>3</td>
</tr>
<tr>
<td>CS 321</td>
<td>3</td>
<td>CS 355</td>
<td>3</td>
</tr>
<tr>
<td>Computer Science Elective</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>13</td>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

### Fourth Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 448</td>
<td>3</td>
<td>CS 410</td>
<td>3</td>
</tr>
<tr>
<td>CS 450</td>
<td>4</td>
<td>CS 479</td>
<td>3</td>
</tr>
<tr>
<td>CS 480</td>
<td>2</td>
<td>CS 481</td>
<td>3</td>
</tr>
<tr>
<td>Computer Science Elective</td>
<td>3</td>
<td>CS/CYBE Elective</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>3</td>
<td>Technical Elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

Total credit hours: 121

## Area of Emphasis Offered:

- Cybersecurity (p. 4)

### Cybersecurity Area of Emphasis

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYBE 266</td>
<td>Foundations of Cybersecurity</td>
<td>3</td>
</tr>
<tr>
<td>CYBE 366</td>
<td>Secure Software Development</td>
<td>3</td>
</tr>
<tr>
<td>CS 465</td>
<td>Cybersecurity Principles and Practice</td>
<td>3</td>
</tr>
<tr>
<td>MATH 373</td>
<td>Introduction to Cryptography</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CYBE 466</td>
<td>Host Based Cyber Defense</td>
<td>3</td>
</tr>
<tr>
<td>CYBE 467</td>
<td>Practicing Cybersecurity: Attacks &amp; Countermeasures</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Hours 15
Major Learning Outcomes

COMPUTER SCIENCE

Graduates with a BS degree in Computer Science at WVU Tech will have an ability to:

• Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
• Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
• Communicate effectively in a variety of professional contexts.
• Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
• Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
• Apply computer science theory and software development fundamentals to produce computing-based solutions.