Requirements - Bachelor of Science Degree  
(Courses Highlighted are the ones for Cyber Operations)

Units required for Major: 87-90  
Minimum total units required for BS: 129  
Grade of "C-" or better required in all courses applied to the Computer Science major.  
**Note:** Students graduating with a Bachelor of Science Computer Science (including all concentrations) will not be subject to the University’s Foreign Language Graduation Requirement. Students who change major may be subject to the University’s Foreign Language Graduation Requirement.  

*Courses in parentheses are prerequisites.*

### A. Required Lower Division Courses (15 units)

1. **CSC 15** Programming Concepts and Methodology I (*CSC 10* or programming experience in a high-level programming language)
2. **CSC 20** Programming Concepts and Methodology II (*CSC 15*)
3. **CSC 28** Discrete Structures for Computer Science (*MATH 29* and *CSC 20*; *CSC 20* may be taken concurrently)
4. **CSC 35** Introduction to Computer Architecture (*CSC 15*)
5. **CSC 60** Introduction to Systems Programming in UNIX (*CSC 20, CSC 35*)

### B. Required Mathematics Courses (15-16 units)

1. **MATH 30** Calculus I (*MATH 29* or four years of high school mathematics which includes two years of algebra, one year of geometry, and one year of mathematical analysis; completion of ELM requirement and Pre-Calculus Diagnostic Test)
2. **MATH 31** Calculus II (*MATH 30* or appropriate high school based AP credit)
3. **STAT 50** Introduction to Probability and Statistics (*MATH 26A, MATH 30*, or appropriate high school based AP credit)

Select one of the following:

- **MATH32** Calculus III (*MATH 31*)
- **MATH 45** Differential Equations for Science and Engineering (*MATH 31*)
- **MATH 100** Applied Linear Algebra (*MATH 26B* or *MATH 31*)
- **MATH 102** Number Theory (*MATH 31*)
- **STAT 155** Introduction to Techniques of Operations Research (*MATH 31; STAT 50, STAT 103*, or *STAT 115A; MATH 31* may be taken concurrently) **OR** another advanced math course with prior Computer Science department approval.

### C. Required Science Courses (11-13 units)
(4) **PHYS 11A** General Physics: Mechanics *(MATH 30, MATH 31 or equivalent certificated high school courses; MATH 31 may be taken concurrently)*

(4) **PHYS 11C** General Physics: Electricity and Magnetism, Modern Physics *(MATH 31, PHYS 11A)*

(3-5) Select one of the following (the course cannot be used to satisfy the General Education B2 requirement):

- **BIO 10** Basic Biological Concepts
- **BIO 22** Introductory Human Anatomy *(BIO 1, BIO 2 or BIO 10)*
- **BIO 102** The Natural History of Plants (A college biology course or instructor permission)
- **BIO 103** Plants and Civilization *(BIO 10 or equivalent)*
- **BIO 104** Physiology of Human Reproduction *(BIO 1, BIO 2 or BIO 10)*
- **BIO/PSYC 115** Introduction to Neuroscience *(PSYC 2, PSYC 101, physiology and chemistry background strongly recommended)*
- **BIO 120** Biology of Aging *(BIO 1, BIO 2, BIO 10 or BIO 20)*
- **CHEM 1A** General Chemistry I (High school chemistry and college algebra; sufficient performance on the college algebra diagnostic test, or equivalent, or minimum grade of "C" in CHEM 4)
- **CSC 148** Modeling and Experimental Design *(MATH 31, STAT 50, proficiency in a programming language)*
- **ECON 141** Introduction to Econometrics *(ECON 1A, ECON 1B, ECON 140; ECON 100A or ECON 100B recommended)*
- **ENGR 17** Introductory Circuit Analysis *(MATH 45, PHYS 11C; either may be taken concurrently but not both)*
- **ENGR 45** Engineering Materials *(CHEM 1A and MATH 30)*
- **PHYS 11B** General Physics: Heat, Light, Sound *(MATH 31, PHYS 11A)*
- **PHYS 115** Electronics and Instrumentation *(PHYS 11C or PHYS 5B, with instructor permission)*

**Note:** To satisfy the requirements of CAC, the Computing Accreditation Commission of ABET, Inc. which accredits Computer Science programs, students must have taken a total of four courses in a scientific discipline and/or quantitative science. The courses in a scientific discipline must be those typically taken by the majors in that discipline. As part of this requirement a two-semester sequence in a laboratory science must be included *(PHYS 11A and PHYS 11C satisfies this requirement)*. Students ordinarily complete one of the remaining two courses by choosing an appropriate course in General Education Category B2 *(BIO 10 is recommended)*. The second course is expected to be chosen from the list above. Hence, students must have taken a total of four courses in this category.
D. Required Upper Division Courses (34 units)

(3) **CSC 130** Data Structures and Algorithm Analysis (CSC 20, CSC 28; CSC 28 may be taken concurrently)

(3) **CSC 131** Computer Software Engineering (CSC 130; may be taken concurrently)

(3) **CSC 133** Object-Oriented Computer Graphics Programming (CSC 130, CSC 131)

(3) **CSC 134** Database Management and File Organization (CSC 130)

(3) **CSC 135** Computing Theory and Programming Languages (CSC 28, CSC 35 and CSC 130)

(4) **CSC 137** Computer Organization (CSC 28, CSC 35, CSC 130)

(3) **CSC/CPE 138** Computer Networks and Internets (CSC 35, CSC 60, CSC 130)

(3) **CSC 139** Operating System Principles (CSC 60, CSC 137; or equivalents)

(2) **CSC 190** Senior Project: Part I (Senior status; GWAR Certification before Fall 09, or WPJ score of 80+; or 3-unit placement in ENGL 109M/W; or 4-unit placement in ENGL 109M/W and co-enrollment in ENGL 109X; or WPJ score 70/71 and co-enrollment in ENGL 109X; CSC 130, CSC 131, and four additional 3-unit CSC upper division courses that fulfill the major requirements excluding CSC 192-195, CSC 198, CSC 199)

(2) **CSC 191** Senior Project: Part II (CSC 190)

(3) **PHIL 103** Business and Computer Ethics

(2) Select two units from the following:

(1) **CSC 192** Career Planning (1 unit maximum) (CSC 130 and three additional upper-division courses that fulfill major requirements with a C- grade or better (excluding CSC 190-195, CSC 198, and CSC 199)

(1) **CSC 194** Computer Science Seminar (Upper division or graduate status in CSC)

(1-4) **CSC 195** Fieldwork in Computer Science (Instructor permission)

1-12 **CSC 195A** Professional Practice (Instructor permission)

(1-3) **CSC 198** Co-curricular Activities in Computer Science

(1-3) **CSC 199** Special Problems

E. Electives (12 units)

Requirements - Cyber Defense and Operations - Certificate

Total units required for certificate: 12

Courses in parentheses are prerequisites

The Cyber Defense and Operations certificate includes the same courses as the Information Assurance and Security certificate, but additionally requires advanced study in operating systems. An understanding of operating system pragmatics better prepares students for the technical work needed
in defending and hardening networked computer systems. Students will not be awarded the Information Assurance and Security certificate if they complete the requirements for the Cyber Defense and Operations certificate.

(3) CSC 152 Cryptography (CSC 60, CSC 130, STAT 50)
(3) CSC 153 Computer Forensics Principles and Practices (CSC 138 or CPE 138)
(3) CSC 154 Computer System Attacks and Countermeasures (CSC 138 or CPE 138)
(3) CSC/CPE 159 Operating System Pragmatics (CSC 139)