COMPUTER SCIENCE, BS

Natural Sciences, Mathematics, and Engineering (nsme) (https://catalog.csub.edu/general-information/csub-information/school-natural-sciences-mathematics-engineering/

Department of Computer and Electrical Engineering and Computer Science (https://catalog.csub.edu/general-information/csub-information/school-natural-sciences-mathematics-engineering/department-computer-electrical-engineering-computer-science/)

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www.cs.csubak.edu (http://www.cs.csubak.edu)

Program Maps for Natural Sciences, Mathematics, and Engineering (https://programmap.csub.edu/academics/interest-clusters/4e942a6e-b8e4-4b60-a1ae-334235acc581/)

Program Requirements
This program follows the guidelines of the Association for Computing Machinery (ACM). Students in this program will take advanced courses of their choice.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CMPS 2010</td>
<td>Programming I: Programming Fundamentals</td>
<td>4</td>
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<tr>
<td>CMPS 2020</td>
<td>Programming II: Data Structures and Algorithms</td>
<td>4</td>
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<tr>
<td>CMPS 2120</td>
<td>Discrete Structures</td>
<td>4</td>
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<tr>
<td>CMPS 2240</td>
<td>Computer Architecture I: Assembly Language</td>
<td>4</td>
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<tr>
<td>CMPS 3120</td>
<td>Algorithm Analysis</td>
<td>3</td>
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<tr>
<td>CMPS 3140</td>
<td>Theory of Computation</td>
<td>3</td>
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<tr>
<td>CMPS 3240</td>
<td>Computer Architecture II: Organization</td>
<td>4</td>
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<tr>
<td>CMPS 3350</td>
<td>Software Engineering</td>
<td>4</td>
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<tr>
<td>CMPS 3420</td>
<td>Database Systems</td>
<td>4</td>
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<tr>
<td>CMPS 3500</td>
<td>Programming Languages</td>
<td>3</td>
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<tr>
<td>CMPS 3560</td>
<td>Artificial Intelligence</td>
<td>3</td>
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<tr>
<td>CMPS 3600</td>
<td>Operating Systems</td>
<td>4</td>
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<tr>
<td>CMPS 3620</td>
<td>Computer Networks</td>
<td>4</td>
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<tr>
<td>CMPS 3640</td>
<td>Distributed and Parallel Computation</td>
<td>3</td>
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<tr>
<td>CMPS 4910</td>
<td>Senior Project I</td>
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<tr>
<td>CMPS 4928</td>
<td>Senior Project II</td>
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**Upper Division Elective Courses**
Select 8 units from the following:

- Algorithms, Complexity, Theory, and Programming Theory:
  - MATH/CMPS 3300 Numerical Analysis
  - MATH 3310 Discrete Mathematical Modeling
- Architecture and Organization:
  - CMPS 4210 Advanced Computer Architecture
  - ECE 3200 Digital Circuits
  - ECE 4240 Microprocessor System Design
- Software Engineering and Visual Computing:
  - CMPS 3390 Application Development
  - CMPS 3480 Computer Graphics
  - CMPS 4350 Advanced Software Engineering
  - CMPS 4480 Computer Animation
  - CMPS 4490 Game Development
  - ECE 4460 Image Processing
- ECE 4470 Computer Vision
- Database Systems and Intelligent Systems:
  - CMPS 4420 Advanced Database Systems
  - CMPS 4430 Introduction to Data Science
  - CMPS 4450 Data Mining and Visualization
  - CMPS 4560 Advanced Artificial Intelligence
  - CMPS/ECE 4550 Applied Machine Learning
- ECE 4570 Robotics
- Operating Systems, Networking, and Security:
  - CMPS 4510 Vulnerability Analysis
  - CMPS 4620 Network and Computer Security
  - MATH/CMPS 4300 Applied Cryptography
- Special Topics and Independent Study in Computer Science:
  - CMPS 3770 Special Topics
  - CMPS 3771 Special Topics Laboratory
  - CMPS 4770 Special Topics
  - CMPS 4771 Special Topics Laboratory
  - CMPS 4800 Undergraduate Research
  - CMPS 4860 Internship in Computer Science
  - CMPS 4870 Cooperative Education
  - CMPS 4890 Experiential Prior Learning

**Required Cognate Courses**
- MATH 2510 Single Variable Calculus I
  or MATH 2310 Single Variable Calculus I for Engineers
- MATH 2520 Single Variable Calculus II
  or MATH 2320 Single Variable Calculus II for Engineers
MATH 3200 Probability Theory 4
PHYS 2210 Physics for Scientists and Engineers I 4
PHYS 2220 Physics for Scientists and Engineers II 4
PHIL 3318 Professional Ethics 3

Select one of the following: 3-4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOL 1009</td>
<td>Perspectives in Biology</td>
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<tr>
<td>BIOL 1039</td>
<td>Principles of Ecology</td>
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<tr>
<td>BIOL 2010</td>
<td>Introductory Biology - Cells</td>
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<tr>
<td>CHEM 1000</td>
<td>Foundations of Chemistry</td>
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<tr>
<td>GEOL 2010</td>
<td>Physical Geology</td>
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<tr>
<td>MATH 2200</td>
<td>Introduction to Statistical Concepts and Methods</td>
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<tr>
<td>MATH 2533</td>
<td>Multivariable and Vector Calculus</td>
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<tr>
<td>MATH 2540</td>
<td>Ordinary Differential Equations</td>
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<tr>
<td>MATH 2610</td>
<td>Linear Algebra I</td>
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<tr>
<td>MATH 3500</td>
<td>Complex Variables</td>
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<tr>
<td>PHYS 2230</td>
<td>Physics for Scientists and Engineers III</td>
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<tr>
<td>SCI 1409</td>
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**Major Subtotal** 89-90
**Additional Units Needed Towards Graduation** 6 1-5

**Total Units** 116-124

1. At least one course must be at the 4000-level.
2. Only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit.
3. SCI 1409 (A3) is recommended but NOT required
4. Some of the courses required for the Computer Science major also satisfy General Education requirements. Students who complete each of these courses with the appropriate grade will also satisfy the GE requirement, even if they were to change majors:
   - CMPS 4928 Senior Project II satisfies the Capstone requirement.
   - PHIL 3318 Professional Ethics satisfies UD Thematic Area C and the Computer Science Ethics requirement.
   - PHYS 2210 Physics for Scientists and Engineers I satisfies LD Area B1.
   - MATH 2510 Single Variable Calculus I or MATH 2310 Single Variable Calculus I for Engineers with a grade of C- or better satisfies Foundational Skills B4.
   - PHIL 3318 Professional Ethics satisfies GWA

5. Computer Science majors have the following General Education Modifications (GEMs), which means they do not have to take courses to satisfy these GE requirements. These GEMs are specific to the Computer Science major and students who change to another major will not keep the modifications:
   - LD Area B2 is embedded throughout the curriculum.
   - 3 units of LD Area D is met through Computer Science outcomes 2 and 4.
   - UD Thematic Area D is met through Computer Science outcomes 2 and 4.

6. Additional Units are required to meet the 120-unit requirement for graduation. Any accepted university units may be used to meet this requirement, including stand-alone courses for SELF.