Computer Science (COSC)

The department offers a major and a minor in Computer Science. Coursework is designed to help students acquire the knowledge, experience, and skills to use a computer as an effective tool for problem solving in many areas. Students completing the major in Computer Science may qualify for either the BA degree or the BS degree, depending upon how they meet the college’s natural science requirement.

The department also offers an Emphasis in Computational Science for students pursuing a BS in Biology, Chemistry, Computer Science, Environmental Studies, Mathematics, Physics or Psychology and an Emphasis in Information Management for students majoring in Accounting, Business Economics, Economics or Finance.

Chair
David A. Sykes

Professors
Beau Christ
Aaron Garrett

Requirements for the Major in Computer Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC 235</td>
<td>Programming &amp; Problem Solving</td>
<td>30</td>
</tr>
<tr>
<td>COSC 240</td>
<td>Discrete Structures</td>
<td></td>
</tr>
<tr>
<td>or MATH 235</td>
<td>Discrete Mathematical Models</td>
<td></td>
</tr>
<tr>
<td>COSC 273</td>
<td>Computer Organization &amp; Architecture</td>
<td></td>
</tr>
<tr>
<td>COSC 340</td>
<td>Theory of Computation</td>
<td></td>
</tr>
<tr>
<td>or MATH 431</td>
<td>Abstract Algebra I</td>
<td></td>
</tr>
<tr>
<td>COSC 350</td>
<td>Data Structures &amp; Algorithms</td>
<td></td>
</tr>
<tr>
<td>COSC 351</td>
<td>Advanced Data Structures</td>
<td></td>
</tr>
<tr>
<td>COSC 360</td>
<td>Operating Systems</td>
<td></td>
</tr>
<tr>
<td>or MATH 220</td>
<td>Linear Algebra</td>
<td></td>
</tr>
<tr>
<td>COSC 410</td>
<td>Software Engineering</td>
<td></td>
</tr>
</tbody>
</table>

Select six credit hours of Computer Science (COSC) courses at the 300- or 400-level

Math Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 181</td>
<td>Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 182</td>
<td>Calculus II</td>
<td></td>
</tr>
</tbody>
</table>

Select at least one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Prerequisite</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 140</td>
<td></td>
<td>Statistics</td>
<td></td>
</tr>
<tr>
<td>MATH/COSC 201</td>
<td></td>
<td>Modeling &amp; Simulation</td>
<td></td>
</tr>
<tr>
<td>MATH 320</td>
<td></td>
<td>Mathematical Modeling</td>
<td></td>
</tr>
<tr>
<td>MATH 330</td>
<td></td>
<td>Numerical Methods</td>
<td></td>
</tr>
<tr>
<td>MATH 421</td>
<td></td>
<td>Probability and Statistics I</td>
<td></td>
</tr>
</tbody>
</table>

Ethics Course

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 210</td>
<td>Bio-Medical Ethics</td>
<td>3</td>
</tr>
</tbody>
</table>

1 Students must complete COSC 235 and 350 with a grade of ‘C’ or higher.

Requirements for the Minor in Computer Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC 235</td>
<td>Programming &amp; Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>COSC 350</td>
<td>Data Structures &amp; Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>COSC 240</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 235</td>
<td>Discrete Mathematical Models</td>
<td></td>
</tr>
</tbody>
</table>

(or one COSC course at the 300- or 400-level)

Select three additional COSC courses, one of which must be at the 300- or 400-level

Total Hours 18

1 Students must complete COSC 235 and 350 with a grade of ‘C’ or higher.

** COSC 101 may NOT be used to meet any requirement for the Computer Science minor.

Emphasis in Computational Science

Coordinator
Beau M. Christ

Computational Science, an interdisciplinary field at the intersection of science, computer science, and mathematics, combines simulation, visualization, mathematical modeling, programming, data structures, networking database design, symbolic computation, and high performance computing with various scientific disciplines. Students who complete a major in Biology, Chemistry, Computer Science, Environmental Studies, Mathematics, Physics, or Psychology and meet requirements for the B.S. degree are eligible to obtain an Emphasis in Computational Science. Computer Science majors also are required to take eight credit hours (two courses) of a laboratory science at the 200-level or above beyond the natural science requirement for a B.S.

Requirements for the Emphasis in Computational Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 181</td>
<td>Calculus I</td>
<td>3</td>
</tr>
</tbody>
</table>

Prerequisite

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC/MATH 201</td>
<td>Modeling &amp; Simulation</td>
<td>3</td>
</tr>
<tr>
<td>COSC 235</td>
<td>Programming &amp; Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>COSC 350</td>
<td>Data Structures &amp; Algorithms</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC 275</td>
<td>Introduction to Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>COSC 365</td>
<td>High Performance Computing</td>
<td>3</td>
</tr>
<tr>
<td>COSC 370</td>
<td>Computational Science: Data and Visualization</td>
<td>3</td>
</tr>
</tbody>
</table>
COSC 101. Introduction to Computers. 3 Hours.
An introduction to the uses of computers in a variety of application areas.

COSC 115. Introduction to Web Authoring. 3 Hours.
An introduction to effective communications using Web technologies. No programming background is required. This course focuses on the technologies and tools, including HTML, CSS, and JavaScript, that facilitate the construction of interesting and effective Web sites.

COSC 201. Modeling & Simulation. 3 Hours.
An introduction to modeling and simulation as part of the interdisciplinary field of computational science. Large, open-ended scientific problems often require the algorithms and techniques of discrete and continuous computational modeling and Monte Carlo simulation. Students learn fundamental concepts and implementation of algorithms in various scientific programming environments. Throughout, applications in the sciences are emphasized. Cross-listed with MATH 201.
Prerequisite: MATH 181 with a minimum grade of D.

COSC 235. Programming & Problem Solving. 3 Hours.
Students learn to develop programs using an object-oriented language. Students are introduced to problem solving and algorithm development with emphasis on good programming style. Completion of this course with a C or higher is a prerequisite for all 300- and 400- level courses in Computer Science.

COSC 240. Discrete Structures. 3 Hours.
A study of concepts foundational to computer science: sets, logic, the nature of proof, functions, algorithms, relations, lattices, and graphs. Prerequisite: COSC 235 with a minimum grade of C.

COSC 270. Independent Study in Computer Science. 1 to 3 Hours.
Independent study of selected topics in Computer Science at an intermediate level. It is intended for students who do not plan to major in Computer Science as well as for those who do. Specific topics vary from semester to semester. Permission of the instructor required.

COSC 273. Computer Organization & Architecture. 3 Hours.
An introduction to computer organization and principles of computer design. Topics include digital logic and digital systems, machine level representation of data, instruction sets, CPU implementation, memory system organization, I/O and communication, and assembly language programming. Prerequisite: COSC 235 with a minimum grade of C.

COSC 275. Introduction to Bioinformatics. 3 Hours.
An introduction to the basic computational methods used to analyze biological data with an emphasis on algorithms used in genomics. Other topics may include methods for storage, retrieval, analysis, and display of biological data. Prerequisite: BIO 212 with a minimum grade of D and COSC 235 with a minimum grade of D.

COSC 280. Selected Topics in Computer Science. 1 to 4 Hours.
A course in the study of selected topics in Computer Science at an intermediate level. It is intended for students who do not plan to major in Computer Science as well as for those who do. Specific topics vary from semester to semester. Permission of the instructor required.
COSC 285. Selected Topics COSC. 3 Hours.

COSC 310. Computer Graphics. 3 Hours.
An introduction to computer graphics. Particular emphasis is placed on the
algorithms used to produce 2D and 3D graphics with a computer. Topics include
graphics devices, polygons, drawing tools, vectors, transformations, 3D viewing, polygonal meshes, lighting, and shading
models.
Prerequisite: MATH 181 with a minimum grade of D and COSC 235 with
a minimum grade of C.

COSC 315. Computer Networks. 3 Hours.
An introduction to computer networks including network architecture,
communication protocols, algorithms, and the current state of technology
used to implement computer networks.
Prerequisite: COSC 273 with a minimum grade of C and COSC 235 with
a minimum grade of C.

COSC 320. Programming Languages. 3 Hours.
A comparative study of high-level programming languages, including
study of the design, evaluation, and implementation of such languages.
Emphasis is placed on the ways in which such languages deal with the
fundamentals of programming.
Prerequisite: (COSC 235 with a minimum grade of C and COSC 273 with
a minimum grade of C) or COSC 350 with a minimum grade of C.

COSC 330. Introduction to Databases. 3 Hours.
A study of data models, including relational, object-oriented, hierarchical,
and network models. Topics include the theory of normal forms, database
design, query languages, and implementation of databases.
Prerequisite: COSC 235 with a minimum grade of C.

COSC 335. Web Application Development. 3 Hours.
A study of the design and programming of web applications. Topics
include client-side scripting, website organization, responsive web design,
server-side scripting, content management systems, web application
frameworks, and security.
Prerequisite: COSC 330 with a minimum grade of C and COSC 350 with
a minimum grade of C.

COSC 340. Theory of Computation. 3 Hours.
A study of formal models of computation such as finite state automata,
push-down automata, and Turing machines, along with the corresponding
elements of formal languages. These models are used to provide a
mathematical basis for the study of computability and to provide an
introduction to the formal theory behind compiler construction.
Prerequisite: COSC 350 with a minimum grade of C and MATH 181 with
a minimum grade of D and (COSC 235 with a minimum grade of D or
MATH 235 with a minimum grade of D).

COSC 350. Data Structures & Algorithms. 3 Hours.
An introduction to the formal study of data structures, such as arrays,
stacks, queues, lists, and trees, along with algorithm design and analysis
of efficiency.
Prerequisite: COSC 235 with a minimum grade of C.

COSC 351. Advanced Data Structures. 3 Hours.
Advanced data structures, advanced object-oriented programming
concepts, and advanced program design principles.
Prerequisite: COSC 350 with a minimum grade of C and (COSC 235 with
a minimum grade of D or MATH 235 with a minimum grade of D).

COSC 355. Cryptology. 3 Hours.
An introduction to cryptology and modern applications. Students will
study various historical and modern ciphers and implement select
schemes using mathematical software. Cross-listed with MATH 435.
Prerequisite: MATH 220 with a minimum grade of D and (COSC 235 with
a minimum grade of D or MATH 235 with a minimum grade of D or
MATH 260 with a minimum grade of D).

COSC 360. Operating Systems. 3 Hours.
A study of fundamental concepts that are applicable to a variety of
operating systems. Such concepts include processes and threads, process
coordination and synchronization, scheduling, physical and virtual
memory organization, device management, file systems, security
and protection, communications and networking.
Prerequisite: COSC 350 with a minimum grade of C.

COSC 365. High Performance Computing. 3 Hours.
An introduction to the concepts, tools, languages, and algorithms for
solving problems on massively parallel and distributed computers.
Advanced computer architectures; performance and optimization; and
the design, analysis, and implementation of applications in parallel are
studied.
Prerequisite: COSC 350 with a minimum grade of C.

COSC 370. Computational Science: Data and Visualization. 3 Hours.
An introduction to data and visualization, part of the interdisciplinary
field of computational science. The course contains a brief introduction
to the network environment and the UNIX operating system. Because
large Web-accessible databases are becoming prevalent for storing
scientific information, the course covers the concepts and development
distributed relational databases. Effective visualization of data helps
scientists extract information and communicate results. Students will
learn fundamental concepts, tools, and algorithms of computer graphics
and scientific visualization in three dimensions. Throughout, applications
in the sciences are emphasized.
Prerequisite: COSC 235 with a minimum grade of C.

COSC 380. Introduction to Databases. 3 Hours.
A study of data models, including relational, object-oriented, hierarchical,
and network models. Topics include the theory of normal forms, database
design, query languages, and implementation of databases.
Prerequisite: COSC 235 with a minimum grade of C.

COSC 390. Artificial Intelligence. 3 Hours.
This course provides an overview of the underlying theory,
principles, and techniques in artificial intelligence and an in-depth
examination of one or more specific topics in artificial intelligence such
as approaches to AI, symbolic programming, heuristic search, neural
networks, or robotics.
Prerequisite: COSC 350 with a minimum grade of D.
COSC 460. Computer & Network Security. 3 Hours.
An introduction to computer security in a networked environment. Topics will include ethical and social issues; type of attacks on computers and defenses; physical security and systems administration; authentication, access controls, and biometrics; encryption and network security; and the underlying formalisms and technologies relating to security.
Prerequisite: COSC 350 with a minimum grade of D.

COSC 470. Advanced Independent Study in Computer Science. 1 to 4 Hours.
Independent study of selected topics in Computer Science at an advanced level. Specific topics vary from semester to semester. Permission of the instructor required.

COSC 480. Advanced Topics in Computer Science. 1 to 4 Hours.
A study of selected topics in Computer Science at an advanced level. Specific topics vary from semester to semester. Permission of the instructor required.