Mathematics and Computer Science

http://mathcs.slu.edu
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Anneke Bart, Ph. D., Associate Chair

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Jacob Sukhodolsky, Ph.D.
Michael Tsau, Ph.D.
Dennis Wacker, D.Sc.

Mathematics and Computer Science courses meet the needs of students with a wide variety of interests. We offer several introductory courses to satisfy the core curriculum requirements, as well as courses that provide students in other disciplines with the mathematical and computational background that they need for their chosen fields of study. Students who major in Mathematics and Computer Science are prepared for careers in business, industry, government, and education, or for further study at the graduate level. With their emphasis on careful reasoning and the analysis and solution of problems, Mathematics and Computer Science are also appropriate majors for students planning careers in law or medicine.

Programs

In Mathematics, the department offers a Bachelor of Arts (B.A.), M.A. and Ph. D. in Mathematics, as well as a minor in mathematics and a minor in engineering mathematics. In Computer Science, the department offers a Bachelor of Arts (B.A.) and a Bachelor of Science (B.S.) as well as a minor.

Mathematics (BA)

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 142</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 244</td>
<td>Calculus III‡</td>
<td>4</td>
</tr>
<tr>
<td>MATH 266</td>
<td>Principles of Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 315</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
</tbody>
</table>

‡ Calculus III Must be taken at Saint Louis University with minimum grade of “C-”

Students then choose one of the following three options. A 2.00 or “C” GPA is required in upper division mathematics courses counting toward the major.

Pure Mathematics

1. A sequence in Abstract Algebra:
   - MATH 411 Introduction to Abstract Algebra 3 and
   - MATH 412 Linear Algebra 3 or
   - MATH 415 Number Theory 3

2. A sequence in Real Analysis
   - MATH 421 Introduction to Analysis 3 and
   - MATH 422 Metric Spaces 3 or
   - MATH 423 Multivariable Analysis 3

3. At least one additional upper division MATH course

Applied Mathematics

Any two of the year-long (2, 3 credit courses) sequences

1. MATH 355 Differential equations I 3 and
   - MATH 455 Nonlinear Dynamics & Chaos 3 or
   - MATH 457 Partial Differential Equations 3

2. MATH 401 Elem Theory of Probability 3 and
   - MATH 402 Intro Mathematical Statistics 3

3. MATH 411 Intro Abstract Algebra 3 and
   - MATH 412 Linear Algebra 3 or
   - MATH 415 Number Theory 3

4. MATH 421 Intro to Analysis 3 and
   - MATH 422 Metric Spaces 3 or
   - MATH 423 Multivariable Analysis 3

5. MATH 451 Intro to Complex Variables 3 and
   - MATH 452 Complex Variables II 3 or
   - MATH 453 Geometric Topology 3

At least one additional upper division MATH course
### Teachers Option

1. MATH 401 Elementary Theory of Probability 3
2. MATH 405 History of Mathematics 3
3. A course in pure math:
   - MATH 411 Introduction to Abstract Algebra 3 or
   - MATH 421 Intro to Analysis 3
4. A course in Geometry:
   - MATH 441 Foundations of Geometry 3 or
   - MATH 447 Non-Euclidean Geometry 3
5. One additional course chosen from the following:
   - MATH 355 Differential Equations 3
   - MATH 402 Introductory Mathematical Statistics 3
   - MATH 415 Number Theory 3
   An upper-division mathematics elective approved by the student’s mathematics advisor

### Mathematics Minor

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 142</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 244</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 266</td>
<td>Principles of Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 315</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>One further course in upper division mathematics, chosen with attention to prerequisites</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Engineering Mathematics Minor

Students seeking a Minor in Engineering Mathematics must complete four upper-division courses in subjects traditionally of importance to engineers:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 311</td>
<td>Linear Algebra for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>MATH 315</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 355</td>
<td>Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 455</td>
<td>Nonlinear Dynamics and Chaos</td>
<td>3</td>
</tr>
<tr>
<td>MATH 457</td>
<td>Partial Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 401</td>
<td>Elementary Theory of Probability</td>
<td>3</td>
</tr>
<tr>
<td>MATH 402</td>
<td>Intro Mathematical Statistics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 403</td>
<td>Probability &amp; Statistics for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>MATH 451</td>
<td>Intro to Complex Variables</td>
<td>3</td>
</tr>
<tr>
<td>MATH 452</td>
<td>Complex Variables II</td>
<td>3</td>
</tr>
</tbody>
</table>

Students may not earn both the minor in mathematics and the minor in engineering mathematics.

### Computer Science

**Michael Goldwasser, Director of Computer Science**

Students completing the Bachelor of Arts curriculum in Computer Science obtain a rigorous, comprehensive background in the discipline. With this curriculum they are afforded time to delve into other academic interests, including pre-professional studies, or a minor or major in another discipline. Graduates with a BA in Computer Science have gone on to interesting jobs in software and hardware development and support, and obtained advanced degrees in a diversity of fields including medicine, law, and computer science. Students should consult with their advisor to tailor their CS electives to their individual goals.

Students completing the Bachelor of Science curriculum in Computer Science obtain a technically rigorous and comprehensive degree, modeled upon recommendations of the ABET Computing Accreditation Commission. They take two additional mathematics and two additional computer science courses than are required for the BA. The BS degree also requires twelve hours of science, including one sequence of two lab courses. Graduates have obtained interesting jobs in the field and earned advanced degrees.

The two curricula follow very similar paths the first two years, thus students can choose between the variants of the degree after completing the introductory sequence.

### Computer Science (B.A.)

#### Required courses in Computer Science:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 140</td>
<td>Introduction to Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 150</td>
<td>Intro to Object-Oriented Programming*</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 180</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 224</td>
<td>Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 290</td>
<td>Object-Oriented Software Design</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 324</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>One course chosen from list of Applications Courses†</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>One course chosen from list of Theory Courses‡</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Two additional 300-400 level CSCI elective courses</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>CSCI 496</td>
<td>Capstone Project I</td>
<td>2</td>
</tr>
<tr>
<td>CSCI 497</td>
<td>Capstone Project II</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Required courses in Mathematics:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 135</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 142</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>One additional MATH course at 200+ level</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

#### Additional requirement

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 341</td>
<td>Computer Ethics</td>
<td>3</td>
</tr>
</tbody>
</table>
### Computer Science (B.S.)

**Required courses in Computer Science:** 42
- CSCI 140 Introduction to Computer Science 3
- CSCI 150 Intro to Object-Oriented Programming* 4
- CSCI 180 Data Structures 4
- CSCI 224 Computer Architecture 3
- CSCI 290 Object-Oriented Software Design 3
- CSCI 314 Algorithms 3
- CSCI 324 Operating Systems 3
- CSCI 344 Programming Languages 3
- CSCI 390 Software Engineering 3
- One course chosen from list of Applications Courses† 3
- Two additional 300-400 level CSCI elective courses 6
- CSCI 496 Capstone Project I 2
- CSCI 497 Capstone Project II 2

**Required courses in Mathematics:** 20
- MATH 135 Discrete Mathematics 3
- MATH 142 Calculus I 4
- MATH 143 Calculus II 4
- Three additional MATH courses at 200+ level 9

**Science Requirements:** 12
- Two course sequence in a lab science 8
- Additional hours of science 4

**Additional requirement:** 3
- PHIL 341 Computer Ethics 3

### Required courses:

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<tr>
<td>CSCI 180</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>MATH 135</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>Two CSCI courses at the 200-level or above</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

### Notes

* When completing a major or minor in Computer Science, CSCI 150 may be replaced by the following two-course sequence:
  - CSCI 145 Scientific Programming 3
  - CSCI 146 Object-Oriented Practicum 1

† Applications Courses
- CSCI 334 Network Programming I 3
- CSCI 357 Computer Graphics I 3
- CSCI 371 Databases 3
- CSCI 425 Advanced Operating Systems 3

§ Theory Courses
- CSCI 314 Algorithms 3
- CSCI 327 Compilers 3
- CSCI 344 Programming Languages 3
- CSCI 413 Automata 3

### Secondary Computer Science Major

Students completing a primary major in another field may complete a secondary major in Computer Science by fulfilling the version of these requirements that is commensurate with the credentials of their primary degree (i.e., the B.A. requirements if doing a primary B.A., the B.S. requirements if doing a primary B.S.). This includes not only the CSCI coursework, but all stated Math, Science, and Ethics requirements.

Students whose primary majors are outside of the College of Arts & Sciences are not required to complete the formal A&S Core. However, students who are receiving a B.S. degree with a secondary major in Computer Science are required, for breadth, to complete at least 27 credit hours of coursework outside of science, technology, engineering, and math.

### Computer Science Minor

Students from any College may complete a Minor in Computer Science by fulfilling the following requirements.