## Mathematics with Computer Science (Course 18-C)

Department of Mathematics (http://catalog.mit.edu/schools/science/mathematics/#undergraduate_text)

### Bachelor of Science in Mathematics with Computer Science

#### General Institute Requirements (GIRs)

The General Institute Requirements include a Communication Requirement that is integrated into both the HASS Requirement and the requirements of each major; see details below.

<table>
<thead>
<tr>
<th>Summary of Subject Requirements</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science Requirement</td>
<td>6</td>
</tr>
<tr>
<td>Humanities, Arts, and Social Sciences (HASS) Requirement; at least two of these subjects must be designated as communication-intensive (CI-H) to fulfill the Communication Requirement.</td>
<td>8</td>
</tr>
<tr>
<td>Restricted Electives in Science and Technology (REST) Requirement [can be satisfied by 18.03 or 18.06 and 18.062[J] (if taken under joint number 6.042[J]) in the Departmental Program]</td>
<td>2</td>
</tr>
<tr>
<td>Laboratory Requirement (12 units) [can be satisfied by 6.009 in the Departmental Program]</td>
<td>1</td>
</tr>
<tr>
<td>Total GIR Subjects Required for SB Degree</td>
<td>17</td>
</tr>
</tbody>
</table>

#### Physical Education Requirement

Swimming requirement, plus four physical education courses for eight points.

#### Departmental Program

Choose at least two subjects in the major that are designated as communication-intensive (CI-M) to fulfill the Communication Requirement.

<table>
<thead>
<tr>
<th>Required Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundational Subjects</td>
<td></td>
</tr>
<tr>
<td>18.03 Differential Equations $^1$</td>
<td>12</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>12</td>
</tr>
<tr>
<td>18.06 Linear Algebra $^2$</td>
<td></td>
</tr>
<tr>
<td>18.061 Linear Algebra and Optimization</td>
<td></td>
</tr>
<tr>
<td>Discrete Mathematics</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>12-15</td>
</tr>
<tr>
<td>18.062[J] Mathematics for Computer Science</td>
<td></td>
</tr>
<tr>
<td>18.200 Principles of Discrete Applied Mathematics (15 units, CI-M)</td>
<td></td>
</tr>
<tr>
<td>18.200A Principles of Discrete Applied Mathematics</td>
<td></td>
</tr>
</tbody>
</table>

#### Computation and Algorithms

<table>
<thead>
<tr>
<th>Course</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.001</td>
<td>Introduction to Computer Science Programming in Python</td>
<td>6</td>
</tr>
<tr>
<td>6.006</td>
<td>Introduction to Algorithms</td>
<td>12</td>
</tr>
<tr>
<td>6.009</td>
<td>Fundamentals of Programming</td>
<td>12</td>
</tr>
<tr>
<td>18.400[J]</td>
<td>Computability and Complexity Theory</td>
<td>12</td>
</tr>
<tr>
<td>or 18.404</td>
<td>Theory of Computation</td>
<td></td>
</tr>
<tr>
<td>18.410[J]</td>
<td>Design and Analysis of Algorithms</td>
<td>12</td>
</tr>
<tr>
<td>Select one of the following: $^3$</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6.031</td>
<td>Elements of Software Construction</td>
<td></td>
</tr>
<tr>
<td>6.034</td>
<td>Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>6.036</td>
<td>Introduction to Machine Learning</td>
<td></td>
</tr>
</tbody>
</table>

#### Restricted Electives

Select four additional 12-unit subjects from Course 18 | 48    |

Select one additional subject of at least 12 units from Course 6 $^5$ | 12-15  |

#### Units in Major

162-168

#### Unrestricted Electives

48-54

#### Units in Major That Also Satisfy the GIRs

(24-36)

#### Total Units Beyond the GIRs Required for SB Degree

180-192

The units for any subject that counts as one of the 17 GIR subjects cannot also be counted as units required beyond the GIRs.

1. Students may substitute one of the more advanced subjects, 18.152 Introduction to Partial Differential Equations or 18.303 Linear Partial Differential Equations: Analysis and Numerics, for 18.03. 18.032 Differential Equations, which places more emphasis on theory, is also an acceptable option.

2. Students may substitute 18.700 Linear Algebra, which places more emphasis on theory and proofs, or the more advanced subject, 18.701 Algebra I.

3. Students may substitute 6.033.

4. The overall program must consist of subjects of essentially different content, and must include at least five Course 18 subjects with a first decimal digit of 1 or higher.

5. The additional Course 6 subject may be 6.01, 6.02, 6.03, 6.170, 6.172, a Foundation or Header subject or, with the permission of the Department of Mathematics, an advanced Course 6 subject with sufficient mathematical content.

#### Communication-Intensive Subjects in the Major

To satisfy the requirements that students take two CI-M subjects, students must select one of the following options:

**Option A**

Select two subjects from the list below:

<table>
<thead>
<tr>
<th>Course</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.104</td>
<td>Seminar in Analysis</td>
</tr>
<tr>
<td>18.204</td>
<td>Undergraduate Seminar in Discrete Mathematics</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>18.384</td>
<td>Undergraduate Seminar in Physical Mathematics</td>
</tr>
<tr>
<td>18.424</td>
<td>Seminar in Information Theory</td>
</tr>
<tr>
<td>18.434</td>
<td>Seminar in Theoretical Computer Science</td>
</tr>
<tr>
<td>18.504</td>
<td>Seminar in Logic</td>
</tr>
<tr>
<td>18.704</td>
<td>Seminar in Algebra</td>
</tr>
<tr>
<td>18.784</td>
<td>Seminar in Number Theory</td>
</tr>
<tr>
<td>18.821</td>
<td>Project Laboratory in Mathematics</td>
</tr>
<tr>
<td>18.904</td>
<td>Seminar in Topology</td>
</tr>
<tr>
<td>18.994</td>
<td>Seminar in Geometry</td>
</tr>
<tr>
<td><strong>Option B</strong></td>
<td></td>
</tr>
<tr>
<td>Select one subject from Option A and one of the following:</td>
<td></td>
</tr>
<tr>
<td>6.033</td>
<td>Computer Systems Engineering</td>
</tr>
<tr>
<td>8.06</td>
<td>Quantum Physics III</td>
</tr>
<tr>
<td>14.33</td>
<td>Research and Communication in Economics: Topics, Methods, and Implementation</td>
</tr>
<tr>
<td>18.100P</td>
<td>Real Analysis</td>
</tr>
<tr>
<td>18.100Q</td>
<td>Real Analysis</td>
</tr>
<tr>
<td>18.200</td>
<td>Principles of Discrete Applied Mathematics</td>
</tr>
</tbody>
</table>