MATHEMATICS (COURSE 18)

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

Bachelor of Science in Mathematics (General Mathematics Option)

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.

Summary of Subject Requirements

<table>
<thead>
<tr>
<th>Subjects</th>
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</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 [one subject can be satisfied by 18.03 in the Departmental Program]</td>
<td>2</td>
</tr>
<tr>
<td>Laboratory Requirement (12 units)</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.

Required Subjects

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.03</td>
<td>12</td>
</tr>
</tbody>
</table>

Restricted Electives

Select eight 12-unit subjects of essentially different content, including at least six advanced subjects (first decimal digit one or higher) that are distributed over at least three distinct areas (at least three distinct first decimal digits). One of these eight subjects must be one of the following:

| Units in Major | 108 |
| Unrestricted Electives | 84 |

Units in Major That Also Satisfy the GIRs (12)

Total Units Beyond the GIRs Required for SB Degree 180

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 also fulfill this requirement by completing 18.032 Differential Equations (which places more emphasis on theory), 18.152 Introduction to Partial Differential Equations, or 18.303 Linear Partial Differential Equations: Analysis and Numerics. Any subject substituted for 18.03 cannot also count towards the eight-subject Restricted Elective requirement.

Communication-Intensive Subjects in the Major

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

Option A

Select two of the following:

<table>
<thead>
<tr>
<th>Option A</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.104 Seminar in Analysis</td>
<td></td>
</tr>
<tr>
<td>18.204 Undergraduate Seminar in Discrete Mathematics</td>
<td></td>
</tr>
<tr>
<td>18.384 Undergraduate Seminar in Physical Mathematics</td>
<td></td>
</tr>
<tr>
<td>18.424 Seminar in Information Theory</td>
<td></td>
</tr>
<tr>
<td>18.434 Seminar in Theoretical Computer Science</td>
<td></td>
</tr>
<tr>
<td>18.504 Seminar in Logic</td>
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</tr>
<tr>
<td>18.704 Seminar in Algebra</td>
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</tr>
<tr>
<td>18.784 Seminar in Number Theory</td>
<td></td>
</tr>
<tr>
<td>18.821 Project Laboratory in Mathematics</td>
<td></td>
</tr>
<tr>
<td>18.904 Seminar in Topology</td>
<td></td>
</tr>
<tr>
<td>18.994 Seminar in Geometry</td>
<td></td>
</tr>
</tbody>
</table>

Option B

Select one subject from Option A and one of the following:

<table>
<thead>
<tr>
<th>Option B</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.06 Quantum Physics III</td>
<td></td>
</tr>
<tr>
<td>14.33 Research and Communication in Economics: Topics, Methods, and Implementation</td>
<td></td>
</tr>
<tr>
<td>18.100P Real Analysis</td>
<td></td>
</tr>
<tr>
<td>18.100Q Real Analysis</td>
<td></td>
</tr>
<tr>
<td>18.200 Principles of Discrete Applied Mathematics</td>
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Bachelor of Science in Mathematics  
(Applied Mathematics Option)

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.

Summary of Subject Requirements | Subjects
---|---
Science Requirement | 6
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. | 8
Restricted Electives in Science and Technology (REST) Requirement [one subject can be satisfied by 18.03 in the Departmental Program] | 2
Laboratory Requirement (12 units) | 1
Total GIR Subjects Required for SB Degree | 17

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.

Required Subjects | Units
---|---
18.03 | Differential Equations
18.04 | Complex Variables with Applications
or 18.112 | Functions of a Complex Variable
18.06 | Linear Algebra
18.300 | Principles of Continuum Applied Mathematics
Select one of the following: | 12-15
18.200 | Principles of Discrete Applied Mathematics (15 units, CI-M)
18.200A | Principles of Discrete Applied Mathematics (12 units)

Restricted Electives
Select four additional 12-unit Course 18 subjects from the following two groups with at least one subject from each group: 3

Group I—Probability and statistics, combinatorics, computer science
Group II—Numerical analysis, physical mathematics, nonlinear dynamics

Units in Major | 108-111

Unrestricted Electives | 81-84
Units in Major That Also Satisfy the GIRs | (12)
Total Units Beyond the GIRs Required for SB Degree | 180

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 A list of acceptable subjects is available from Math Academic Services and on the department’s website (http://math.mit.edu).

Communication-Intensive Subjects in the Major
To satisfy the requirement that students take two CI-M subjects, students must select one of the following options:

Option A
Select two of the following:

- 18.104 Seminar in Analysis
- 18.204 Undergraduate Seminar in Discrete Mathematics
- 18.384 Undergraduate Seminar in Physical Mathematics
- 18.424 Seminar in Information Theory
- 18.434 Seminar in Theoretical Computer Science
- 18.504 Seminar in Logic
- 18.704 Seminar in Algebra
- 18.784 Seminar in Number Theory
- 18.821 Project Laboratory in Mathematics
- 18.904 Seminar in Topology
- 18.994 Seminar in Geometry

Option B
Select one subject from Option A and one of the following:

- 8.06 Quantum Physics III
- 14.33 Research and Communication in Economics: Topics, Methods, and Implementation
- 18.100P Real Analysis
- 18.100Q Real Analysis
- 18.200 Principles of Discrete Applied Mathematics
Bachelor of Science in Mathematics  
(Pure Mathematics Option)

General Institute Requirements (GIRs)
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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.

Required Subjects

<table>
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<tr>
<th>Subject</th>
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<td>Differential Equations&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>18.100B</td>
<td>Real Analysis&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>18.701</td>
<td>Algebra I</td>
</tr>
<tr>
<td>18.702</td>
<td>Algebra II</td>
</tr>
<tr>
<td>18.901</td>
<td>Introduction to Topology</td>
</tr>
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</table>

Restricted Electives

Select one of the following:

- 18.101 Analysis and Manifolds
- 18.102 Introduction to Functional Analysis
- 18.103 Fourier Analysis: Theory and Applications

Select one undergraduate seminar from the following:

- 18.104 Seminar in Analysis (CI-M)
- 18.504 Seminar in Logic (CI-M)
- 18.704 Seminar in Algebra (CI-M)
- 18.784 Seminar in Number Theory (CI-M)
- 18.904 Seminar in Topology (CI-M)
- 18.994 Seminar in Geometry (CI-M)

Select two additional 12-unit Course 18 subjects of essentially different content, with the first decimal digit one or higher

Units in Major | 108
Unrestricted Electives | 84
Units in Major That Also Satisfy the GIRs | (12)
Total Units Beyond the GIRs Required for SB Degree | 180

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

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.

Alternate versions of this subject, 18.100A, 18.100P and 18.100Q, also satisfy this requirement.

Communication-Intensive Subjects in the Major

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

Option A

Select two of the following:

- 18.104 Seminar in Analysis
- 18.204 Undergraduate Seminar in Discrete Mathematics
- 18.384 Undergraduate Seminar in Physical Mathematics
- 18.424 Seminar in Information Theory
- 18.434 Seminar in Theoretical Computer Science
- 18.504 Seminar in Logic
- 18.704 Seminar in Algebra
- 18.784 Seminar in Number Theory
- 18.821 Project Laboratory in Mathematics
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Option B

Select one subject from Option A and one of the following:

- 8.06 Quantum Physics III
- 14.33 Research and Communication in Economics: Topics, Methods, and Implementation
- 18.100P Real Analysis
- 18.100Q Real Analysis
- 18.200 Principles of Discrete Applied Mathematics

Mathematics (Course 18) | 5