# 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 | 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 | 12 |
| **Restricted Electives** | | |
| Select eight 12-unit subjects of essentially different content, including at least six advanced subjects (first decimal digit one or higher). One of these eight subjects must be one of the following: | | 96 |
| 18.06 | Linear Algebra | |
| 18.700 | Linear Algebra | |
| 18.701 | Algebra I | |
| **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 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.

### 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 |
| 18.642 | Topics in Mathematics with Applications in Finance |

## 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 [1] | 12 |
| 18.04 | Complex Variables with Applications | 12 |
| or 18.112 | Functions of a Complex Variable | |
| 18.06 | Linear Algebra [2] | 12 |
| 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) | |
| 18.300 | Principles of Continuum 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] | | 48 |
| Group I—Probability and statistics, combinatorics, computer science | | |
| Group II—Numerical analysis, physical mathematics, nonlinear dynamics | | |
| **Units in Major** | | **96-99** |

| Unrestricted Electives | 81-84 |
|---|---|
| Units in Major That Also Satisfy the GIRs | (12) |
| Total Units Beyond the GIRs Required for SB Degree | 168 |

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 |

| 18.642 | Topics in Mathematics with Applications in Finance |

## Bachelor of Science in Mathematics (Pure 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 [1] | 12 |
| 18.100B | Real Analysis [2] | 12 |
| 18.701 | Algebra I | 12 |
| 18.702 | Algebra II | 12 |
| 18.901 | Introduction to Topology | 12 |
| **Restricted Electives** | | |
| *Select one of the following:* | | 12 |
| 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:* | | 12 |
| 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 | | 24 |
| **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 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] 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 |
| 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 |

| 18.642 | Topics in Mathematics with Applications in Finance |
|--------|----------------------------------------------------|