

## NUCLEAR SCIENCE AND ENGINEERING (COURSE 22)

Department of Nuclear Science and Engineering (<http://catalog.mit.edu/schools/engineering/nuclear-science-engineering/#undergraduatetext>)

### Bachelor of Science in Nuclear Science and Engineering

#### 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 [can be satisfied by 22.04[J] in the Departmental Program]; 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 [can be satisfied from among 1.00, 2.086, 6.100A/6.100B, 6.3700, 8.03, 18.03, 18.05, 18.600, and 22.01, 22.02, or 22.071 in the Departmental Program]                            | 2         |
| Laboratory Requirement (12 units) [can be satisfied by 22.09 in the Departmental Program]  | 1         |
| <b>Total GIR Subjects Required for SB Degree</b>   | <b>17</b> |

#### 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.

| Basic Requirements   | Units |
|--|-------|
| 2.005 Thermal-Fluids Engineering I                               | 12    |
| 18.03 Differential Equations <sup>1</sup>                        | 12    |
| 22.01 Introduction to Nuclear Engineering and Ionizing Radiation | 12    |

#### Computation Elective

|                                     |   |    |
|-------------------------------------|---|----|
| <i>Select one of the following:</i> |   | 12 |
| 1.000                               | Introduction to Computer Programming and Numerical Methods for Engineering Applications |    |

|                 |   |  |
|-----------------|---|--|
| 2.086           | Numerical Computation for Mechanical Engineers  |  |
| 6.100A & 6.100B | Introduction to Computer Science Programming in Python and Introduction to Computational Thinking and Data Science <sup>2</sup> |  |
| 12.010          | Computational Methods of Scientific Programming   |  |
| 22.C25[J]       | Real World Computation with Julia   |  |

#### Required Core Subjects

|          |   |    |
|----------|---|----|
| 22.02    | Introduction to Applied Nuclear Physics                           | 12 |
| 22.033   | Nuclear Systems Design Project                                    | 15 |
| 22.04[J] | Social Problems of Nuclear Energy (CI-M)                          | 12 |
| 22.05    | Neutron Science and Reactor Physics                               | 12 |
| 22.06    | Engineering of Nuclear Systems                                    | 12 |
| 22.061   | Fusion Energy   | 12 |
| 22.09    | Principles of Nuclear Radiation Measurement and Protection (CI-M) | 15 |

#### Required Thesis <sup>3</sup>

|        |                               |   |
|--------|-------------------------------|---|
| 22.THT | Undergraduate Thesis Tutorial | 3 |
| 22.THU | Undergraduate Thesis (CI-M)   | 9 |

#### Mathematics Elective

|                                     |  |    |
|-------------------------------------|--|----|
| <i>Select one of the following:</i> |  | 12 |
| 6.3700                              | Introduction to Probability                |    |
| 18.04                               | Complex Variables with Applications        |    |
| 18.05                               | Introduction to Probability and Statistics |    |
| 18.075                              | Methods for Scientists and Engineers       |    |
| 18.600                              | Probability and Random Variables           |    |

#### Materials Science and Physics Elective

|                                     |                           |    |
|-------------------------------------|---------------------------|----|
| <i>Select one of the following:</i> |                           | 12 |
| 1.050                               | Solid Mechanics           |    |
| 2.001                               | Mechanics and Materials I |    |
| 3.010                               | Structure of Materials    |    |
| 3.013                               | Mechanics of Materials    |    |
| 8.03                                | Physics III               |    |

#### Restricted Elective in NSE <sup>4</sup>

|                                     |   |    |
|-------------------------------------|---|----|
| <i>Select one of the following:</i> |   | 12 |
| 22.071                              | Analog Electronics and Analog Instrumentation Design  |    |
| 22.022                              | Quantum Technology and Devices                        |    |
| 22.039                              | Integration of Reactor Design, Operations, and Safety |    |
| 22.051                              | Systems Analysis of the Nuclear Fuel Cycle            |    |
| 22.055                              | Radiation Biophysics                                  |    |

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|   |  |            |
|---|--|------------|
| 22.072  | Corrosion: The Environmental Degradation of Materials  |            |
| 22.074  | Radiation Damage and Effects in Nuclear Materials  |            |
| 22.078  | Nuclear Waste Management   |            |
| 22.081[[]]  | Introduction to Sustainable Energy   |            |
| 22.03[[]]   | Introduction to Design Thinking and Rapid Prototyping (when paired with another 6 unit subject in NSE)   |            |
| 22.Co1 & 6.Co1  | Modeling with Machine Learning: Nuclear Science and Engineering Applications and Modeling with Machine Learning: from Algorithms to Applications |            |
| 2.006   | Thermal-Fluids Engineering II  |            |
| 3.14  | Physical Metallurgy  |            |
| <b>Units in Major</b>                                     |  | <b>186</b> |
| <b>Unrestricted Electives</b>                             |  | <b>48</b>  |
| Units in Major That Also Satisfy the GIRs                 |  | (48)       |
| <b>Total Units Beyond the GIRs Required for SB Degree</b> |  | <b>186</b> |

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

<sup>1</sup> 18.032 Differential Equations is also an acceptable option.

<sup>2</sup> CSE.C20 is permitted in place of 6.100B.

<sup>3</sup> Unit totals shown are the minimum requirements.

<sup>4</sup> Consult the NSE Academic Office, Room 24-102, regarding substitutions.