

## DOCTOR OF PHILOSOPHY IN NUCLEAR SCIENCE AND ENGINEERING

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

### Program Requirements

#### Core Modules <sup>1</sup>

22.11	Applied Nuclear Physics	6
22.12	Radiation Interactions, Control, and Measurement	6
22.13	Nuclear Energy Systems	6
22.14	Materials in Nuclear Engineering	6
22.15	Essential Numerical Methods	6
22.16	Nuclear Technology and Society	6

#### Field of Specialization (choose one) <sup>2</sup> 36

##### Nuclear Reactor Engineering

22.211	Nuclear Reactor Physics I
22.312	Engineering of Nuclear Reactors

Plus one of the following subjects:

22.313[[]]	Thermal Hydraulics in Power Technology
22.315	Applied Computational Fluid Dynamics and Heat Transfer
22.39	Integration of Reactor Design, Operations, and Safety

##### Nuclear Reactor Physics

22.211	Nuclear Reactor Physics I
22.312	Engineering of Nuclear Reactors

Plus one of the following subjects:

22.212	Nuclear Reactor Analysis II
22.213	Nuclear Reactor Physics III
22.251	Systems Analysis of the Nuclear Fuel Cycle

##### Nuclear Materials

3.20	Materials at Equilibrium
22.71[[]]	Modern Physical Metallurgy

Plus one of the following subjects:

3.21	Kinetic Processes in Materials
22.72	Corrosion: The Environmental Degradation of Materials
22.73[[]]	Defects in Materials
22.74[[]]	Radiation Damage and Effects in Nuclear Materials
22.76[[]]	Ionics and Its Applications

##### Fusion

22.611[[]] Introduction to Plasma Physics I

22.62 Fusion Energy

Plus one of the following subjects:

22.63 Engineering Principles for Fusion Reactors

2.612 Marine Power and Propulsion

22.615 MHD Theory of Fusion Systems

22.67[[]] Principles of Plasma Diagnostics

##### Nuclear Science and Technology

8.511 Theory of Solids I

22.51[[]] Quantum Technology and Devices

Plus one of the following subjects:

22.90 Nuclear Science and Engineering Laboratory

8.333 Statistical Mechanics I

8.421 Atomic and Optical Physics I

##### Nuclear Security and Policy

6.3702 Introduction to Probability

22.90 Nuclear Science and Engineering Laboratory

Plus one specialist subject by petition

#### Advanced Subjects 24

Two advanced subjects closely related to the doctoral thesis topic. May not overlap with the student's field of specialization but can be from a different field of specialization.

#### Minor Subjects 24

Two coordinated graduate subjects, or three undergraduate subjects taken while a graduate student in the department, outside the field of specialization and area of thesis research.

22.94 Research in Nuclear Science and Engineering <sup>3</sup> 24

22.THG Graduate Thesis <sup>3</sup> 36

22.911 Seminar in Nuclear Science and Engineering <sup>4</sup> 3

#### Total Units 183

Note: Students in this program can choose to receive the Doctor of Philosophy or the Doctor of Science in Nuclear Science and Engineering or in another departmental field of specialization. Students receiving veterans benefits must select the degree they wish to receive prior to program certification with the Veterans Administration.

- <sup>1</sup> *Students may take the Core Module coursework or register as a Listener and take only the final exam. Students must complete all core module final exams by the end of the fourth term and are allowed one retake. A final exam GPA of 4.5 is needed to clearly pass the written qualifier. A final exam GPA of 4.0–4.5 will require faculty review prior to the student embarking on doctoral research. Students earning a final exam GPA below 4.0 will not be permitted to progress further in the doctoral program.*
- <sup>2</sup> *Students may also petition for a unique field of specialization.*
- <sup>3</sup> *Students must register for research or thesis until they complete appropriate milestones, including passing the doctoral qualifying process, submitting an approved thesis prospectus, defending the thesis, and submission of a final, approved thesis document. The units here represent a minimum, not a typical or maximum number of units.*
- <sup>4</sup> *Students must register for 22.911 each term that they register for thesis, except the final semester in which they plan to defend their thesis.*