

# MIT Engineering Majors Guide

## Nuclear Engineering (Course 22)

### Why Nuclear Engineering

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**N**uclear Engineering is a dynamic field accounting for 20% of the electricity in the US. It is also responsible for helping to develop life saving cutting edge medical technology such as positron emission tomography, an imaging method for the brain, and boron neutron capture therapy, a new cancer treatment for inoperable brain tumors. Nuclear engineers also help to protect our environment through the use of activatable tracers for charting underground water flow. Or, coupled with the space program nuclear engineers provide the power for deep space missions to Mars and beyond.

### Skill Set

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- Design, construct, and operation of fission reactors
- Research and development related to fusion reactors
- Design, develop and operate nuclear power plants, reactor control and safety systems
- Research and development related to imaging, therapy, and industrial applications of radiation
- Investigate applications of radiation which include biomedical imaging
- Development of computer simulation methods for nuclear medicine
- Investigate and optimize advanced nuclear fuel cycles
- Design, construct, and operate advanced power systems design and construct power systems for space exploration and propulsion
- Design methods for securing and verifying excess nuclear weapons material
- Develop arms control and nonproliferation technologies
- Expand and improve the use of radionuclides in medicine
- Monitor and remediate environmental exposures to radiation
- Control and monitor the use of radioisotopes in industrial and medical
- Regulate and audit the use of radionuclides in industry, medicine, and research
- Design improved transport methods for moving nuclear waste and useful isotopes
- Extend the operating life of present nuclear power plants
- Manage provide technical expertise for use of radionuclides and nuclear fuel

### Industry Occupations

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Engineering Consulting	Electrical Power Companies	Hospitals and Medical Research Centers
Government-DOE/NRC	Reactor Manufacturers	Public Utilities
National Laboratories	Consulting/Research	National Defense
Fusion Research	Nuclear Utilities	Nuclear Vendors
Advanced Reactors	Reactor Physics	Thermal Hydraulics

#### *Nuclear Fission*

Advanced Reactors	Reactor Physics	Thermal Hydraulics
Safety Analysis	Fuel Cycle Issues	Probabilistic
Safety Assessment	Waste Disposal	

### ***Radiation, Science and Technology***

Medical Applications	Quantum Computing	Boron Neutron Capture Neutron
Atomistic Simulations	Accelerator Applications	Nuclear Chemistry
Neutron Imaging	Environmental Analysis	Computational Fluid Dynamica
Waste Isolation Studies	Industrial Applications	Measurement Devices

### ***Fission Energy***

Utilities at Operating Plants	National Laboratories	Consulting Companies
Specialty Companies	Decommissioning	Policy Institutes
Corporate Design and Research Offices		

### ***Nuclear Industry***

Nuclear Plants Design	Operations--Maintenance, Inspection	Advanced Fuels Design - Materials
Core Monitoring Analysis	Core Reload Analysis - Reactor Physics	Radiation and Health Physics
Safety Analysis -- Thermal	Environment	

### ***National Laboratory Choices***

Basic and Applied research	Research Reactor Operations and Experiments	Fundamental science applications
Decommissioning and site cleanups	Space Applications	Waste Disposal Technologies
Nuclear Computer Code development		

### ***Nuclear Medicine***

Nuclear physicians	Nuclear pharmacist	Nuclear medicine technologist
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For in-depth information on Nuclear Engineering visit <http://www.careerplanit.com/resource/profile.asp> or to explore other careers, peruse the Occupational Outlook Handbook <http://www.bls.gov/oco/>

## **Careers of Nuclear Engineering Alumni**

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- Associate Physical Scientist, RAND
- Senior Manager, Sandia National Laboratories
- Engineer, Lockheed Martin-KAPL
- Associate Engineer, Cambridge Environmental
- Staff Scientist, Science Applications Intl. Corp.
- Software Developer, Visible Genetics
- Senior Mgr, Intl Bus. Development, Cubic Defense Systems Inc.
- President & CEO, PRI Automation Inc
- Program Manager/New Prod Development, Applied Materials Inc.
- Physicist, Lawrence Livermore National Lab
- Engineer, Federal Energy Regulatory Commission

To contact alumni in your area of interest, check out the ICAN network at <http://alum.mit.edu/cs/ican/index.html>

## Internships

### Programs at MIT

Undergraduate Practice Opportunities Program <http://web.mit.edu/engineering/upop/>

### Jobs and Internships During and After MIT

Monstertrak - On Campus Recruiting <http://www.monstertrak.com>

## Companies who recruit Nuclear Engineering Majors

GPU Nuclear	Sandia National Laboratories	ABBCE
Brookhaven National Laboratory	Broker Instruments	Institute of Nuclear Energy
McKinsey and Co.	RVSI Electronics	Guidant
Environmental and Energy Study Inst	Lawrence Livermore National Lab	Department of Energy
AES New Energy Inc.	Cambridge Environmental	Westinghouse
Silicon Graphics	Boeing--Rocketdyne	Texas Instruments
Institute of Nuclear Power Operations	Knolls Atomic Power Lab	Argonne National Lab
Goldman Sachs	Mass General Hospital	Morgan Stanley
Procter and Gamble	Studsvik	TRW
Los Alamos	Enanta Pharmaceuticals	Options Trading -Archelon

## Career and Job Search Internet Resources

- ANS Information, UCB, Nuclear Engineering <http://www.nuc.berkeley.edu/main/links.htm>
- Nukem Nuclear Tech.Co.-Engineering,Design & Construct <http://www.nukem.com/eng/>
- Nuclear Plant Journal WebSite - Serving the Nuclear Industry <http://www.npj.goinfo.com/>
- WWW Virtual Library: Nuclear Engineering [http://www.nuc.berkeley.edu/main/vir\\_library.html](http://www.nuc.berkeley.edu/main/vir_library.html)

## Salary Information

### *B.S Salary Information*

Annual Salary (rounded to the nearest hundred)

Years of Experience:	<b>0 Years</b>	<b>1 Year</b>	<b>3 years</b>	<b>4-7 Years</b>	<b>8-10 Years</b>
Total received	24	25	28	31	36
Average (Mean):	\$44,500	\$49,500	\$54,100	\$61,400	\$71,900
Median:	\$43,200	\$47,500	\$52,800	\$60,000	\$69,800
Standard Deviation:	\$5,700	\$8,300	\$8,600	\$9,300	\$12,500

### ***M.S Salary Information***

Years of Experience	0 Years	1 Year	3 Years	4-7 Years	8-10 Years
Total received:	23	22	25	26	31
Average (Mean):	\$48,900	\$54,200	\$57,800	\$66,900	\$78,000
Median:	\$48,400	\$51,800	\$57,000	\$64,700	\$73,900
Standard Deviation:	\$6,100	\$8,900	\$7,300	\$12,800	\$14,900

### ***PhD Salary Information***

Years of Experience	0 Years	1 Year	3 Year	4-7 Years	8-10 Years
Total received:	16	14	17	16	22
Average (Mean):	\$58,400	\$59,700	\$67,100	\$76,400	\$86,100
Median:	\$58,900	\$56,100	\$65,900	\$73,300	\$82,900
Standard Deviation:	\$8,300	\$8,000	\$10,500	\$17,000	\$17,600

Source: U.S. Department of Energy

## **Professional Associations**

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- American Nuclear Society <http://www.ans.org/>
- MIT's American Nuclear Society <http://web.mit.edu/ans/www/>
- Society of Nuclear Medicine at MIT

## **Departmental Homepage**

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MIT Department of Nuclear Engineering <http://web.mit.edu/ned/www/>

## **Next Steps**

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**E**xplore other career engineering majors guides located at <http://web.mit.edu/career/www/Engineering/guides.htm>.

**N**etwork with current students, alumni /nae in your area of interest.

**V**isit the Careers Office to schedule an appointment with a counselor in the School of Engineering to discuss career choices.