Nuclear Engineering (BS)

Nuclear engineers work in nuclear systems research, design, development, testing, operation, environmental protection, and marketing. The Bachelor of Science program prepares graduates for positions in industry, national laboratories, or for graduate study. The curriculum incorporates basic sciences and engineering, with emphasis on mathematics and physics, followed by course work in nuclear science and technology. Design concepts are introduced in numerous nuclear engineering courses throughout the curriculum to provide an integrated educational experience, cap-stoned by senior nuclear projects involving reactors and radiation systems. Attention is also given to the efficient utilization of energy resources and to the environmental aspects of nuclear energy. Computers are widely used throughout the curriculum.

The nuclear engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org, and leads to the degree of Bachelor of Science in Nuclear Engineering. Advanced undergraduates who desire to attend graduate school at NC State may enter a combined 5-year BS/MNE professional program or BS/MS bachelor/master degree program during their senior year which will culminate at the end of their fifth year with both the Bachelor of Science in Nuclear Engineering and the Master of Nuclear Engineering or the Master of Science degrees, respectively.

Plan Requirements

First Year		
Fall Semester		**Hours**
CH 101	Chemistry - A Molecular Science [1]	3
CH 102	General Chemistry Laboratory [1]	1
E 101	Introduction to Engineering & Problem Solving [2]	1
E 115	Introduction to Computing Environments	1
ENG 101	Academic Writing and Research [2]	4
MA 141	Calculus I [1]	4
	Hours	**14**
Spring Semester		
CSC 113	Introduction to Computing - MATLAB	3
MA 241	Calculus II [1]	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory [1]	4
Select one of the following:		3
ARE 201	Introduction to Agricultural & Resource Economics	
ARE 201A	Introduction to Agricultural & Resource Economics	
EC 201	Principles of Microeconomics	
EC 205	Fundamentals of Economics	
E 102	Engineering in the 21st Century	2
	Hours	**16**
Second Year		
Fall Semester		
MAE 206	Engineering Statics	3
MA 242	Calculus III	4
NE 201	Introduction to Nuclear Engineering	2
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
Advanced Communication Elective (p.)		3
	Hours	**16**
Spring Semester		
MA 341	Applied Differential Equations I	3
NE 202	Radiation Sources, Interaction and Detection [2]	4
NE 205	Thermodynamics for Nuclear Engineering	3
NE 228	Introduction To Fusion Energy	3
	Hours	**13**
Third Year		
Fall Semester		
NE 309	Introduction to Materials for Nuclear Energy	3
NE 301	Fundamentals of Nuclear Engineering [2]	3
NE 350	Applied Mathematics in Nuclear Engineering	3
MA 401	Applied Differential Equations II	3
	Hours	**12**
Spring Semester		
NE 360	Continuum Mechanics for Nuclear Engineers	3
NE 400	Nuclear Reactor Energy Conversion	4
NE 401	Reactor Analysis and Design	3
NE 403	Nuclear Reactor Laboratory	2
	Hours	**12**
Fourth Year		
Fall Semester		
NE 402	Reactor Engineering	4
NE 404	Radiation Safety and Shielding	3
NE 406	Nuclear Engineering Senior Design Preparation	1
NE Elective (p.)		3
Technical Elective (p.)		3
	Hours	**14**
Spring Semester		
NE 405	Reactor Systems	3
NE 408	Nuclear Engineering Design Project	3
Engineering Technical Elective (p.)		3
	Hours	**9**
	Total Hours	**106**

[1] A grade of C or higher is required.
[2] A grade of C- or higher is required.

Code	Title	Hours	Counts towards
GEP Courses			
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		6	

GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)	3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	2
GEP Elective (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)	3
GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement)	
World Language Proficiency (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/) (verify requirement)	
Total Hours	**17**

Advanced Communication Elective

Code	Title	Hours	Counts towards
COM 110	Public Speaking	3	
COM 112	Interpersonal Communication	3	
COM 211	Argumentation and Advocacy	3	
ENG 288	Fiction Writing	3	
ENG 289	Poetry Writing	3	
ENG 316	Introduction to News and Article Writing	3	
ENG 331	Communication for Engineering and Technology	3	
ENG 332	Communication for Business and Management	3	
ENG 333	Communication for Science and Research	3	
FLA 201	Intermediate Arabic I	3	
FLA 202	Intermediate Arabic II	3	
FLC 201	Intermediate Chinese I	3	
FLC 202	Intermediate Chinese II	3	
FLF 201	Intermediate French I	3	
FLF 202	Intermediate French II	3	
FLG 201	Intermediate German I	3	
FLG 202	Intermediate German II	3	
FLI 201	Intermediate Italian I	3	
FLI 202	Intermediate Italian II	3	
FLJ 201	Intermediate Japanese I	3	
FLJ 202	Intermediate Japanese II	3	
FLJ 203	Intermediate Japanese Conversation	1	
FLJ 204	Intermediate Japanese II Conversation	1	
FLN 201	Intermediate Hindi-Urdu I	3	
FLN 202	Intermediate Hindi-Urdu II	3	
FLP 201	Intermediate Portuguese I	3	
FLR 201	Intermediate Russian I	3	
FLR 202	Intermediate Russian II	3	
FLS 201	Intermediate Spanish I	3	
FLS 202	Intermediate Spanish II	3	
GRK 201	Intermediate Greek I	3	
GRK 202	Intermediate Greek II	3	
LAT 201	Intermediate Latin I	3	
LAT 202	Intermediate Latin II	3	
PER 201	Intermediate Persian I	3	
PER 202	Intermediate Persian II	3	

NE Electives

Code	Title	Hours	Counts towards
MSE 409	Nuclear Materials	3	
MSE 509	Nuclear Materials	3	
NE 409	Nuclear Materials	3	

NE 412	Nuclear Fuel Cycles	3
NE 418	Nuclear Power Plant Instrumentation	3
NE 509	Nuclear Materials	3
NE 512	Nuclear Fuel Cycles	3
NE 521	Principles of Radiation Measurement	3
NE 528	Introduction to Plasma Physics and Fusion Energy	3
PY 528	Introduction to Plasma Physics and Fusion Energy	3
NE 490	Health Physics and Radiological Emergency Response	3
NE 431	Nuclear Waste Management	3
NE 523	Computational Transport Theory	3
NE 529	Plasma Physics and Fusion Energy II	3
NE 533	Nuclear Fuel Performance	3
NE 541	Nuclear Nonproliferation Technology and Policy	3
NE 550	Introduction to Atomistic Simulations	3
NE 577	Multiscale Two-phase Flow Simulations	3
NE 531	Nuclear Waste Management	3
NE 590	Health Physics and Radiological Emergency Response	3
NE 570	Monte Carlo Methods for Radiation Transport	3
NE 560	Probabilistic Risk Assessment and Management of Nuclear Systems	3
NE 555	Advanced Characterization of Nuclear Materials	3
NE 530	Nuclear Waste Management	3

Technical Electives

Code	Title	Hours	Counts towards
CH 315	Quantitative Analysis	3	
CH 331	Introductory Physical Chemistry	4	
CSC 302	Introduction to Numerical Methods	3	
CSC 427	Introduction to Numerical Analysis I	3	
MA 405	Introduction to Linear Algebra	3	
MA 427	Introduction to Numerical Analysis I	3	
PY 341	Relativity, Gravitation and Cosmology	3	
PY 411	Mechanics I	3	
PY 414	Electromagnetism I	3	
PY 415	Electromagnetism II	3	
PY 511	Mechanics I	3	
PY 514	Electromagnetism I	3	
PY 515	Electromagnetism II	3	
PY 525	Computational Physics	3	
ST 370	Probability and Statistics for Engineers	3	
ST 371	Introduction to Probability and Distribution Theory	3	

Engineering Technical Electives

Code	Title	Hours	Counts towards
Engr Tech Elective			
BME 217	Biomedical Electronics Laboratory	1	

BME 301	Human Physiology : Electrical Analysis	3
BME 302	Human Physiology: Mechanical Analysis	3
BME 315	Biotransport	3
BME 325	Biochemistry for Biomedical Engineers	3
BME 335	Biomaterials	3
BME 345	Biomedical Solid Mechanics	3
BME 355	Biocontrols	3
BME 365	Linear Systems in Biomedical Engineering	3
BME 375	Biomedical Microcontroller Applications	3
BME 385	Bioinstrumentatior	3
BME 398	Biomedical Engineering Design and Manufacturing II	2
BME 462	Biomaterials Characterization	3
CE 301	Civil Engineering Surveying and Geomatics	3
CE 305	Introduction to Transportation Systems	3
CE 327	Reinforced Concrete Design	3
CE 339	Civil Engineering Systems	3
CE 342	Engineering Behavior of Soils and Foundations	4
CE 365	Construction Equipment and Methods	3
CE 367	Mechanical and Electrical Systems in Buildings	3
CE 373	Fundamentals of Environmental Engineering	3
CE 378	Environmental Chemistry and Microbiology	4
CE 381	Hydraulics Systems Measurements Lab	1
CE 383	Hydrology and Urban Water Systems	3
CE 437	Civil Engineering Computing	3
CHE 315	Chemical Process Thermodynamics	3
CHE 316	Thermodynamics of Chemical and Phase Equilibria	3
CHE 330	Chemical Engineering Lab I	4
CHE 331	Chemical Engineering Lab II	2
CHE 395	Professional Development Seminar	1
ECE 301	Linear Systems	3
ECE 302	Microelectronics	4
ECE 303	Electromagnetic Fields	3
ECE 305	Principles of Electromechanical Energy Conversion	3
ECE 306	Introduction to Embedded Systems	3
ECE 308	Elements of Control Systems	3
ECE 309	Data Structures and Object-Oriented Programming for Electrical and Computer Engineers	3
ECE 310	Design of Complex Digital Systems	3
ECE 331	Principles of Electrical Engineering	3
ECE 380	Engineering Profession for Electrical Engineers	1
ECE 381	Engineering Profession for Computer Engineers	1

ECE 383	Introduction to Entrepreneurship and New Product Development	3
ECE 384	Practical Engineering Prototyping	3
ISE 311	Engineering Economic Analysis	3
ISE 315	Introduction to Computer-Aided Manufacturing	1
ISE 316	Manufacturing Engineering I - Processes	3
ISE 352	Fundamentals of Human-Machine Systems Design	3
ISE 361	Deterministic Models in Industrial Engineering	3
ISE 362	Stochastic Models in Industrial Engineering	3
MAE 302	Engineering Thermodynamics II	3
MAE 305	Mechanical Engineering Laboratory I	1
MAE 306	Mechanical Engineering Laboratory II	1
MAE 315	Fundamentals of Vibrations	3
MAE 316	Strength of Mechanical Components	3
MAE 351	Aerodynamics II	3
MAE 352	Experimental Aerodynamics II	1
MAE 361	Dynamics & Controls	3
MAE 371	Aerospace Structures I	3
MAE 372	Aerospace Vehicle Structures Lab	1
MSE 301	Introduction to Thermodynamics of Materials	3
MSE 355	Electrical, Magnetic and Optical Properties of Materials	3
MSE 360	Kinetic Processes in Materials	3

Semester Sequence

This is a sample.

First Year		
Fall Semester		**Hours**
CH 101	Chemistry - A Molecular Science [1]	3
CH 102	General Chemistry Laboratory [1]	1
E 101	Introduction to Engineering & Problem Solving [2]	1
E 115	Introduction to Computing Environments	1
ENG 101	Academic Writing and Research [2]	4
MA 141	Calculus I [1]	4
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
	Hours	**15**
Spring Semester		
CSC 113	Introduction to Computing - MATLAB	3
MA 241	Calculus II [1]	4
PY 205	Physics for Engineers and Scientists I [1]	3
PY 206	Physics for Engineers and Scientists I Laboratory	1
Select one of the following Economics courses:		3
EC 205	Fundamentals of Economics	
EC 201	Principles of Microeconomics	
ARE 201	Introduction to Agricultural & Resource Economics	
E 102	Engineering in the 21st Century	2
	Hours	**16**
Second Year		
Fall Semester		
MAE 206	Engineering Statics	3
MA 242	Calculus III	4
NE 201	Introduction to Nuclear Engineering	2
PY 208	Physics for Engineers and Scientists II	3
PY 209	Physics for Engineers and Scientists II Laboratory	1
Advanced Communication Elective (p. 2)		3
	Hours	**16**
Spring Semester		
MA 341	Applied Differential Equations I	3
NE 202	Radiation Sources, Interaction and Detection [2]	4
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
NE 205	Thermodynamics for Nuclear Engineering	3

NE 228	Introduction To Fusion Energy	3
	Hours	**16**
Third Year		
Fall Semester		
NE 301	Fundamentals of Nuclear Engineering [2]	3
NE 309	Introduction to Materials for Nuclear Energy	3
NE 350	Applied Mathematics in Nuclear Engineering	3
MA 401	Applied Differential Equations II	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
	Hours	**15**
Spring Semester		
NE 360	Continuum Mechanics for Nuclear Engineers	3
NE 400	Nuclear Reactor Energy Conversion	4
NE 401	Reactor Analysis and Design	3
NE 403	Nuclear Reactor Laboratory	2
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
	Hours	**15**
Fourth Year		
Fall Semester		
NE 402	Reactor Engineering	4
NE 404	Radiation Safety and Shielding	3
NE 406	Nuclear Engineering Senior Design Preparation	1
NE Elective (p. 2)		3
Technical Elective (p. 3)		3
	Hours	**14**
Spring Semester		
NE 405	Reactor Systems	3
NE 408	Nuclear Engineering Design Project	3
Engineering Technical Elective (p. 3)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
	Hours	**16**
	Total Hours	**123**

[1] A grade of C or higher is required.
[2] A grade of C- or higher is required.

Career Opportunities

Nuclear power reactor operation continues with ninety eight reactors operating in the nation, increasing our reliance upon nuclear energy as a substitute for energy from fossil fuels. Development of advanced fission and fusion reactors offers the potential of vast new energy sources. Industrial and medical applications of radiation continue to increase in diverse industries. Demand for nuclear engineers is on the rise within the electric power industry and national laboratories, naval reactors, and other industries. According to the National Society of Professional Engineers, nuclear engineers are among the top five best compensated of the engineering disciplines.

Career Titles

- Energy Engineer
- Engineering Professor
- Nuclear Engineer
- Nuclear Fuels Research Engineer
- Radiation Protection Engineer

Learn More About Careers

NCcareers.org (https://nccareers.org/)
Explore North Carolina's central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (https://www.bls.gov/ooh/)
Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (https://www.careeronestop.org/)
View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (https://careers.dasa.ncsu.edu/explore-careers/career-assessments/) (NC State student email address required)
This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an account. Make an appointment with your career counselor (https://careers.dasa.ncsu.edu/about/hours-appointments/) to discuss the results.

Focus 2 Apply Assessment (https://www.focus2career.com/Portal/Register.cfm?SID=1929) (Available to prospective students)
A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.

American Nuclear Society (http://www.ans.org/)
Nuclear Energy Institute (https://www.nei.org/home/)
National Association of Power Engineers (https://www.powerengineers.com/)
National Society of Professional Engineers (https://www.nspe.org/)