# B.Sc. in Nuclear Engineering

## Study Plan

### University Compulsory Courses  
16 C.H

<table>
<thead>
<tr>
<th>Line No.</th>
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<th>Course</th>
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<tr>
<td>224000</td>
<td>CHE400CH</td>
<td>PROFESSIONAL ETHICS FOR ENGINEERS</td>
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<td>242020</td>
<td>EE202EE</td>
<td>COMMUNICATION SKILLS FOR ENGINEERS</td>
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<td>901010</td>
<td>MATH101</td>
<td>CALCULUS (1)</td>
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<td>INTERMEDIATE ANALYSIS</td>
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<td>902030</td>
<td>MATH203</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS</td>
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<td>CHEM101</td>
<td>GENERAL CHEMISTRY( I)</td>
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<td>911072</td>
<td>CHEM107B</td>
<td>GENERAL CHEMISTRY LAB</td>
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<td>921010</td>
<td>PHY101</td>
<td>GENERAL PHYSICS (1)</td>
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<tr>
<td>1731150</td>
<td>CS115</td>
<td>C++ PROGRAMMING LANGUAGES</td>
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### University Elective Courses  
9 C.H

Pages (64 & 65)

### Faculty Compulsory Courses  
32 C.H

### Department Compulsory Courses  
96 C.H

### Department Elective Courses  
6 C.H

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<td>ECONOMIC &amp; ENVIRONMENTAL ASPECTS OF NUCLEAR ENERGY</td>
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<td>NE525</td>
<td>ENVIRONMENTAL RADIOACTIVITY</td>
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<td>NE552</td>
<td>NUCLEAR POWER PLANT SYSTEMS &amp; OPERATION (2)</td>
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<td>NE560</td>
<td>RADIOCHEMISTRY</td>
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<td>NE579</td>
<td>NUCLEAR REACTOR DESIGN METHODOLOGY</td>
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TOTAL  
159 C.H

* For prerequisite & equivalent courses see the Courses’ Description.
B.Sc. in Nuclear Engineering

Courses’ Description

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
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<td>Basics of Nuclear Engineering &amp; Technology</td>
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<td>NE 201</td>
<td>Ethics &amp; the Development of Nuclear Technology</td>
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<td>NE 202</td>
<td>Fundamentals of Nuclear Science</td>
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<td>NE 272</td>
<td>Programming for Nuclear Engineers</td>
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<td>NE301</td>
<td>Introduction to Nuclear Engineering</td>
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<td>NE 311</td>
<td>Ionizing Radiation Detection and Measurement</td>
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<td>NE 313</td>
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<td>NE 314</td>
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<td>NE 322</td>
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<td>NE 330</td>
<td>Nuclear Reactors Thermal Hydraulics</td>
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<tr>
<td>NE 340</td>
<td>Nuclear Reactors Theory</td>
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<tr>
<td>NE 340</td>
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<td>NE 341</td>
<td>Nuclear Reactors Analysis</td>
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<td>NE 441</td>
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<td>NE 448</td>
<td>Nuclear Reactor Lab</td>
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<tr>
<td>NE 451</td>
<td>Nuclear Power Plant Systems and Operations I</td>
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<td>NE 452</td>
<td>Nuclear Instrumentation &amp; Control</td>
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<td>NE 455</td>
<td>Nuclear Reactor Materials</td>
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<tr>
<td>NE 471</td>
<td>Radiation Interactions and Shielding Design</td>
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<tr>
<td>NE 472</td>
<td>Modeling &amp; Simulation of Nuclear Reactors</td>
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<td>NE 481</td>
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<tr>
<td>NE 490</td>
<td>Engineering Training</td>
<td>3</td>
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</table>

Four factor formula, six factor formula, neutrons economy, infinite reactor, and boundary conditions
Pre: NE 301

NE 341 Nuclear Reactors Analysis 3C.H
The Multi-group diffusion theory, diffusion method, heterogeneous reactors, reactor kinetics, changes in reactivity, the neutronics behavior of fission reactors, thermal neutron spectra, fine group whole spectrum calculations and coarse group constant generation. Pre: NE 330, 340

NE 443 Neutrons Interactions Laboratory 1C.H
Neutrons interactions experiments, subcritical assembly, graphite pile, neutron moderation, neutron activation analysis. Pre: NE 314

NE 448 Nuclear Reactor Lab 3C.H
Experimental measurements of basic nuclear reactor parameters, flux measurement, reactor period, approach to critical. Reactor operation and reactor safety. Pre: NE 441

NE 451 Nuclear Power Plant Systems and Operations I
Description of light water power plants systems, NSSS system, secondary systems, reactor safety systems, plant layout, steam cycles, electrical, mechanical, and nuclear system components, practical aspects of NPP system operation. Pre: NE 330, NE 340

NE 452 Nuclear Instrumentation & Control 3C.H
Nuclear digital I&C (Instrumentation & Control) related to the systems which receive thousands of plant field signals and process them to control the nuclear plants in normal and abnormal conditions. Pre: NE 340, EE 212

NE 460 Fuel Cycle and Waste Management 3C.H
The front and back end of the fuel cycle, management of radioactive, hazardous and mixed waste generated by all segments of the nuclear fuel cycle and users of radioisotopes; includes treatment, storage and disposal technologies. Pre: NE 441

NE 465 Nuclear Reactor Materials 3C.H
Nuclear reactor materials, fuel element, fission gas swelling, void swelling, cladding, moderators, materials thermal properties, chemical behavior and radiation damage. Pre: NE 340 & IE 311

NE 471 Radiation Interactions and Shielding Design 3C.H
Basic principles of radiation interactions and transport, especially as related to the design of radiation shields. Radiation sources, nuclear reactions, radiation transport, photon interactions, dosimetry, buildup factors and fast neutron shielding. Pre: NE 330 and 314

NE 472 Modeling & Simulation of Nuclear Reactors 3C.H
Analysis of radiation transport problems by Monte Carlo method, use of MCNP code system, reactor modeling and simulation. Pre: NE 441

NE 481 Nuclear Engineering Seminar 1 C.H
Seminar of nuclear engineering issues, each lecture is presented by a faculty member, or invited local and international nuclear engineers, researchers, policy makers, and industry people. Pre: Completion of 90 Cr

NE 490 Engineering Training 3C.H
Training at a nuclear or radiation facility, that is involved in the design or utilization of nuclear energy. Pre: Completion of 117 Cr
NE 500 Economic & Environmental Aspects of Nuclear Energy
Economics of nuclear power, economical and environmental impact, the nuclear fuel cycle. Impact on design, plant sitting, regulation, and international laws. Pre: NE 451

NE 501 Non-Power Applications of Nuclear Energy
Applications of nuclear energy in space exploration, agricultural, medical, industrial, and biomedical, and other related non-power generation fields. Pre: NE 314, NE 340

NE 521 Nuclear Reactor Safety
Nuclear reactor safety and probabilistic risk assessment. Analysis and evaluation applied to reactor design for accident prevention and mitigation, protective systems and their reliability, containment design, emergency cooling requirements, reactivity excursions and the atmospheric dispersion of radioactive material. Pre: NE 451

NE 525 Environmental Radioactivity
Radioactivity in the environment, traces in air, water, soil. Pathways of contamination. Pre: NE 314 & NE 322

NE 552 Nuclear Power Plant Systems and Operations II
LW power plant systems requirements and design parameters. Systems required for steam production, cooling of core in all modes of operation, and safe and efficient plant operation. NPP blue prints and systems components recognition, and processes flow. Safety analysis report. Pre: NE 451

NE 560 Radiochemistry
The chemistry of radioactive material, transuranic elements, the effect of radiation on the chemical properties of material. Pre: NE 314, IE 361

NE 571 In core Fuel Management
In core fuel management, and optimization of fuel cycle loading and design, reactor vendor’s codes. Pre: NE 441, NE 472

NE 579 Nuclear Reactor Design Methodology
Application of reactor theory and other engineering disciplines in fundamental and practical design of nuclear reactor systems for power applications. Use of computer codes in calculations, design and optimization. Pre: NE 472

NE 581 Special Topics in Nuclear Engineering
Special nuclear engineering issues that is not covered in the current curriculum, problems related to recent developments and practice, as well as related current literature. Pre: Instructor Approval

NE 591 Graduation Project I
Nuclear Engineering Graduation Design. Completion of 114 Cr

NE 592 Graduation Project II
Nuclear Engineering Graduation Design. Meeting with instructor, Final Report, and presentation. Pre: NE 591