

B.Sc. in Nuclear Engineering Study Plan

University Compulsory Courses		16 C.H	2003130 NE313	RADIATION DETECTION & MEASUREMENT LAB (1)	1
Page (64)					
University Elective Courses		9 C.H	2003140 NE314	RADIATION DETECTION & MEASUREMENT LAB (2)	1
Pages (64 & 65)					
Faculty Compulsory Courses		32 C.H	2003220 NE322	RADIATION PROTECTION & DOSIMETRY	3
Line No. Code	Course		2003300 NE330	NUCLEAR REACTORS THERMAL HYDRAULICS	3
224000	CHE400CH PROFESSIONAL ETHICS FOR ENGINEERS	1	2003400 NE340	NUCLEAR REACTORS THEORY	3
242020	EE202EE COMMUNICATION SKILLS FOR ENGINEERS	2	2004410 NE441	NUCLEAR REACTORS ANALYSIS	3
901010	MATH101 CALCULUS(1)	3	2004430 NE443	NEUTRON INTERACTION LABORATORY	1
901020	MATH102 CALCULUS (2)	3	2004480 NE448	NUCLEAR REACTOR LAB	3
902010	MATH201 INTERMEDIATE ANALYSIS	3	2004510 NE451	NUCLEAR POWER PLANT SYSTEM & OPERATION (1)	3
902030	MATH203 ORDINARY DIFFERENTIAL EQUATIONS	3	2004520 NE452	NUCLEAR INSTRUMENTATION & CONTROL	3
911010	CHEM101 GENERAL CHEMISTRY(1)	3	2004600 NE460	FUEL CYCLE & WASTE MANAGEMENT	3
911020	CHEM102 GENERAL CHEMISTRY (2)	3	2004650 NE465	NUCLEAR REACTOR MATERIAL	3
911072	CHEM107B GENERAL CHEMISTRY LAB	1	2004710 NE471	RADIATION INTERACTIONS & SHIELDING DESIGN	3
921010	PHY101 GENERAL PHYSICS (1)	3	2004720 NE472	MODELING & SIMULATION OF NUCLEAR REACTORS	3
921020	PHY102 GENERAL PHYSICS (2)	3	2004810 NE481	NUCLEAR ENGINEERING SEMINAR	1
921072	PHY107B GENERAL PHYSICS (LAB)	1	2004900 NE490	ENGINEERING TRAINING	3
1731150	CS115 C++ PROGRAMMING LANGUAGES	3	2005210 NE521	NUCLEAR REACTOR SAFETY	3
Department Compulsory Courses		96 C.H	2005710 NE571	IN CORE FUEL MANAGEMENT	3
Line No. Code	Course		2005910 NE591	GRADUATION PROJECT (1)	1
223400	CHE340 THERMODYNAMICS	3	2005920 NE592	GRADUATION PROJECT (2)	3
242121	EE212A ELECTRIC CIRCUIT ANALYSIS	3	Department Elective Courses		6 C.H
242130	EE213 ELECTRICAL CIRCUITS LAB	1	Line No. Code	Course	
242401	EE240 INTRODUCTION TO LINEAR SYSTEMS	3	255012 ME501B	WATER DESALINATION	3
243051	EE305 NUMERICAL METHODS FOR ENGINEERS	3	2005000 NE500	ECONOMIC & ENVIRONMENTAL ASPECTS OF NUCLEAR ENERGY	3
251010	ME101 ENGINEERING WORKSHOPS	2	2005010 NE501	NON POWER APPLICATIONS OF NUCLEAR ENERGY	3
251011	ME101A ENGINEERING WORKSHOP (LAB)	0	2005250 NE525	ENVIRONMENTAL RADIOACTIVITY	3
252000	ME200 ENGINEERING DRAWING (A)	1	2005520 NE552	NUCLEAR POWER PLANT SYSTEMS & OPERATION (2)	3
253433	ME343C FLUID MECHANICS	3	2005600 NE560	RADIOCHEMISTRY	3
254453	ME445C THERMALOFLUIDS LAB	1	2005790 NE579	NUCLEAR REACTOR DESIGN METHODOLOGY	3
254511	ME451A HEAT TRANSFER (1)	3	2005810 NE581	SPECIAL TOPICS IN NUCLEAR ENGINEERING	3
292110	IE211 MECHANICS OF MATERIAL	3	TOTAL	159 C.H	
293410	IE341 ENGINEERING ECONOMY	2	<p>* For prerequisite & equivalent courses see the Courses' Description.</p>		
293610	IE361 ENGINEERING MATERIALS	3			
293650	IE365 ENGINEERING MATERIAL LAB	1			
2001010 NE101	BASICS OF NUCLEAR ENGINEERING AND TECHNOLOGY	1			
2002010 NE201	NUCLEAR TECHNOLOGY IMPROVEMNET	1			
2002020 NE202	FUNDAMENTALS OF NUCLEAR SCIENCE	3			
2002720 NE272	PROGRAMMING FOR NUCLEAR ENGINEERS	3			
2003010 NE301	INTRODUCTION TO NUCLEAR ENGINEERING	3			
2003110 NE311	IONIZING RADIATION & MEASUREMENT	3			

B.Sc. in Nuclear Engineering

Courses' Description

NE 101 Basics of Nuclear Engineering & Technology 1C.H

What is nuclear engineering, what do nuclear engineers do, uses of nuclear energy, radiation around us, nuclear energy and its roll in society. *Pre: None*

NE 201 Ethics & the Development of Nuclear Technology 1C.H

Ethical issues arising from the development of nuclear technology, and our ability to address, deal and resolve them. Cases studies will be emphasized. *Pre: None*

NE 202 Fundamentals of Nuclear Science 3C.H

Atomic and nuclear physics, atomic models, relativity, x-rays, types of nuclear reactors, other topics related to nuclear sciences and technology. *Pre: Phys 102*

NE 272 Programming for Nuclear Engineers 3C.H

This course is designed to keep the nuclear engineering student on the cutting edge of operating systems and programming languages used in nuclear codes. The course will introduce the students to Fortran Language, Unix, parallel computation, and other languages deemed necessary for codes coupling. A set of laboratory experiments will provide hands-on experience in related topics. *Pre: CS 115*

NE301 Introduction to Nuclear Engineering 3C.H

Basic radioactivity, nuclear and neutron physics as applied to nuclear engineering. Introduction to neutron diffusion theory, neutron moderation, conditions for criticality of nuclear of nuclear reactors. *Pre: NE 202*

NE 311 Ionizing Radiation Detection and Measurement 3C.H

Sources, interaction of radiation with matter. Behavior of various nuclear radiation detectors. Properties of radioisotopes useful to industry are considered and evaluated from engineering point of view. *Pre: NE 202*

NE 313 Radiation Detection and Measurement Lab I 1C.H

Nuclear electronics, radiation detection and counting instrumentation, counting statistics, radiation survey, half-life and decay schemes. *Pre: Co-NE 311*

NE 314 Radiation Detection and Measurement LabII 1C.H

Gamma, alpha, and beta detectors, gamma spectroscopy, coincidence counting, proportional counters, HPGe detectors, spectrum analysis, scintillation detectors for charged particle. *Pre: NE 311*

NE 322 Radiation Protection and Dosimetry 3C.H

Principles of radiation protection, biological effects of radiation, radiation risk assessment, external and internal dosimetry. *Pre: Co-NE 311*

NE 330 Nuclear Reactors Thermal Hydraulics 3C.H

Reactor heat generation and removal, steady- and unsteady state conduction in reactor elements; single phase, two-phase, cooling, core thermal design. *Pre: ChE 340, CO-ME 451*

NE 340 Nuclear Reactors Theory 3C.H

An introduction to neutron diffusion theory, neutron moderation, conditions for criticality of nuclear reactors.

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

NE 441 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 3C.H

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: NE330 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 3C.H

Economics of nuclear power, economical and environmental impact, the nuclear fuel cycle. Impact on design, plant siting, regulation, and international laws.
Pre: NE 451

NE 501 Non-Power Applications of Nuclear Energy 3C.H

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 3C.H

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 3C.H

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 3C.H

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 3C.H

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 3C.H

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 3C.H

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 3 C.H

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 1C.H

Nuclear Engineering Graduation Design.
Completion of 114 Cr

NE 592 Graduation Project II 3C.H

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