

Course Descriptions

Courses are listed in alphabetical-numerical order according to the course code. The credit for each course is indicated after the title in the course description. A credit is mainly based on the number of lecture hours per week and is less affected by the number of laboratory or on-the-job training hours per week.

Advanced Energy Systems (AES)

AES-711 Introduction to Nuclear Technology (3 CR)

This course covers the introduction to nuclear power technology, including nuclear technology history, current status, nuclear terminologies and radiation protection. This course also covers the fundamentals of atomic structure, mass defect, and binding energy; nuclear interactions and reactions; cross-sections; neutron activation; half-life determination; isotope identification methods; ionization (Bremsstrahlung, ionization and excitation); radiation interactions with matter (pair production, Compton scattering, photoelectric effect); and, neutron interactions (elastic and inelastic scattering, charged particle emission, fission, radioactive capture).

Lecture 3 hrs/wk, Tutorial 1 hr/wk. Prerequisite: PHYS-111. Corequisite: AES-711P.

AES-711P Introduction to Nuclear Technology Laboratory (1 CR)

The purpose of the laboratory course is to explore some of the main concepts experimentally, which are covered in the lectures of AES-711 Introduction to Nuclear Technology.

Laboratory 2 hrs/wk. Corequisite: AES-711.

AES-712 Nuclear Reactor Theory (4 CR)

This course provides knowledge of nuclear reactor principles, concepts and reactor operating fundamentals. The course covers basic concepts and theories associated with the theory of the fission chain reaction; neutron flux effects on reactor power; neutron leakage; fission products; neutron sources; reactivity coefficients; changes in reactor operational parameters; radiation from fission and from fission products; residual heat/decay heat. This course also covers the introduction to nuclear reactor operation, including nuclear reactor kinetics, reactor control, reactor startup, power operation, and shutdown.

Lecture 4 hrs/wk, Tutorial 1 hr/wk. Prerequisite: AES-711.

AES-722 Mechanical Technology I for Nuclear Power Plant Operators (3 CR)

This course covers the operating principles and types of valves, pumps, heat exchangers, steam traps, filters and strainers, air compressors, lubrication, and hangers and snubbers used in nuclear power plants.

Lecture 3 hrs/wk. Tutorial 1 hr/wk. Prerequisite: PHYS-111. Corequisite: AES-722P.

AES-722P Mechanical Technology I Laboratory (1 CR)

This course contains the laboratory experiments that complement Mechanical Technology I for Nuclear Power Plant Operators course (AES-722). The purposes of these laboratory experiments are to (1) apply the theoretical knowledge, (2) learn technical know-how related to the topics covered in the class and (3) learn to write a technical report. The students demonstrate, conduct, and analyze experiments in a group, and write laboratory reports individually.

Laboratory 2 hrs/wk. Corequisite: AES-722.

AES-723 Mechanical Technology II for Nuclear Power Plant Operators (2 CR)

This course covers the operating principles and types of refrigeration machines; heating, ventilation, and air conditioning systems; steam turbines; and, diesel engines.

Lecture 2 hrs/wk. Tutorial 1 hr/wk. Prerequisite: AES-722.

AES-731 Electrical Technology I for Nuclear Power Plant Operators (2 CR)

This course covers basic electrical concepts and theory relating to DC circuit analysis including Ohm's law, Kirchhoff laws, resistive networks, equivalent circuits, capacitance and inductance. It also covers the DC motors and DC generators.

Lecture 2 hrs/wk, Tutorial 1 hr/wk. Prerequisite: MATH-100. Corequisite: AES-731P.

AES-731P Electrical Technology I for Nuclear Power Plant Operators Laboratory (1 CR)

This is a laboratory course intended to be conducted concurrently with AES-731 Electrical Technology I for NPP Operators. Students carry out practical procedures, conduct experiments, collect and analyze data relevant to DC circuits and DC machines.

Laboratory 2 hrs/wk. Corequisite: AES-731.

AES-732 Electrical Technology II for Nuclear Power Plant Operators (3 CR)

This course covers basic concepts relating to AC systems, including basic AC theory, AC reactive components, three phase power, AC machines, electrical power transmission and distribution, electrical test instruments and measuring devices and basic electronics.

Lecture 3 hrs/wk. Tutorial 1 hr/wk. Prerequisite: AES-731. Corequisite: AES-732P.

AES-732P Electrical Technology II Laboratory (1 CR)

This is a laboratory course intended to be conducted concurrently with AES-732 Electrical Technology II for NPP Operators. Students carry out practical procedures, conduct experiments, collect and analyze data relevant to AC circuits, AC machines and electronic components.

Laboratory 2 hrs/wk. Corequisite: AES-732.

AES-741 Thermal Science for Nuclear Power Plant Operators (2 CR)

This course covers thermodynamics units, volumetric properties of pure fluids, important thermodynamics properties, mechanisms of heat transfer by conduction, convection, and radiation, heat exchanger design and sizing, fluid mechanics and fluid statics, application of thermodynamics to flow systems, in particular the Rankine cycle in nuclear power production in a pressurized water reactor.

Lecture 2 hrs/wk, Tutorial 1 hr/wk. Prerequisite: PHYS-111. Corequisite: AES-741P.

AES-741P Thermal Science for Nuclear Power Plant Operators Laboratory (1 CR)

This laboratory course and its experiments are intended to complement the Thermal Sciences for Nuclear Power Plant Operators course (AES-741). The purposes of these experiments are to (1) apply the theoretical knowledge, (2) learn technical know-how related to the topics covered in the class and (3) learn to write a technical report. The students demonstrate equipment familiarity, conduct experiments, analyze experimental results in a group, and write laboratory reports individually.

Laboratory 2 hrs/wk. Corequisite: AES-741.

AES-751 Instrumentation and Control Technology (3 CR)

This course provides knowledge and skills of fundamental instrumentation and control principles and concepts. It includes demonstrated knowledge of systems and components associated with process control, valve actuators and position indicators, miscellaneous sensors and detectors, chemistry instrumentation, and radiation detectors. It encompasses demonstrating an understanding of concepts of instrumentation and control, temperature sensors and detectors, pressure sensors and detectors, level sensors and detectors, flow sensors and detectors, and measurement.

Lecture 3 hrs/wk. Tutorial 1 hr/wk. Prerequisite: AES-731. Corequisite: AES-751P.

AES-751P Instrumentation and Control Technology Laboratory (1 CR)

The purpose of the course is to explore some of the main concepts experimentally, which are covered in the Instrumentation and Control Technology (AES-751) course. Students will conduct and analyze experiments on temperature, pressure, and flow, and describe their results in laboratory reports while working either individually or in teams. This course is to run concurrently with AES-741 Instrumentation and Control Technology.

Laboratory 2 hrs/wk. Corequisite: AES-751.

AES-761 Applied Technical Chemistry (2 CR)

This course covers fundamental knowledge and skills of chemistry concepts required to solve problems in engineering and energy technology related environments. It includes demonstrating knowledge of water chemistry fundamentals, sources and types of impurities, control/removal of impurities, effects of impurities, the use of hydrogen gas in oxygen control, radical production and recombination, and radiochemistry. It also encompasses demonstrated understanding of solution chemistry, physical states, and nomenclature with a focus on water chemistry involving effects of impurities, ion exchange, water treatment, and corrosion.

Lecture 2 hrs/wk, Laboratory/Tutorial 2 hrs/wk. Prerequisite: CHEM-111. Corequisite: AES-761P.

AES-761P Applied Technical Chemistry Laboratory (1 CR)

The purpose of the course is to explore some of the main concepts experimentally, which are covered in the Applied Technical Chemistry (AES-761) course. Students will conduct and analyze experiments on acids and bases, titration of unknown acid, conductivity probe, pH probe, chemical cells, dissolved oxygen monitor (analyzer), turbidity detector, and describe their results in laboratory reports while working either individually or in teams. This course is to run concurrently with AES-761 Applied Technical Chemistry.

Laboratory 2 hrs/wk. Corequisite: AES-761.

The following courses (AES-771 through AES-774) are provided by the Nawah Energy Company at the Barakah Nuclear Power Plant in the western region of Abu Dhabi. A minimum of 26 CR of on-the-job training (OJT) is required for the HDNT which consist of the following courses:

AES-771 OJT 1 Nuclear Power Plant Systems and Operation

This course introduces and develops trainees' knowledge and skills in nuclear power plant systems, general NPP site layout, and location of major systems components and is conducted at the Barakah Nuclear Power Plant by Nawah industrial training providers.

AES-772 OJT 2 Nuclear Power Plant Familiarization

This course introduces the trainee to the different departments at the Barakah Nuclear Power Plant to which they will potentially be assigned and is in the form of workplace shadowing.

AES-773 OJT 3 Specialization Qualifications Part A

AES-774 OJT 3 Specialization Qualifications Part B

This course is conducted over two semesters (Parts A and B, respectively) and is designed to train the student to correctly perform tasks leading to the award of specialization-specific Job Qualification Certificates (JQCs) by the Nawah Energy Company.

AES-781 Nuclear Safety and Regulations (3 CR)

This course covers basic concepts of a Design Basis Accident (DBA), severe accidents, accident analysis, principles and methods for assessing risk and reliability for Nuclear Power Plants. The course also covers several safety parameters and safety analysis of NPPs and safety improvement, international cooperation, and trends. The course also covers UAE's nuclear energy and safety laws, nuclear energy regulatory framework, applied technical standards and specifications for NPPs.

Lecture 3 hrs/wk. Prerequisite: AES-712.

AES-782 Radiation Measurement and Protection (3 CR)

This course covers two main subjects: first to teach students how to measure radiation and understand the principle of radiation detection, and second to provide detailed radiological protection theory and techniques and develop student understanding and skills in radiation protection fundamentals needed to apply in the operation and maintenance of a nuclear power plant.

Lecture 3 hrs/wk, Tutorial 1 hr/wk. Prerequisite: AES-711. Corequisite: AES-782P.

AES-782P Radiation Measurement and Protection Laboratory (1 CR)

This laboratory is an experimental course intended to complement the Radiation Measurement and Protection (AES-782) course. Students will conduct, analyze and interpret experiments on counting, energy calibration, gamma spectra measurements, detector resolution, Compton scattering, Pair production and annihilation and absorption of gammas by different materials individually or in teams. This course is to run concurrently with Radiation Measurement and Protection (AES-782).

Laboratory 2 hrs/wk. Corequisite: AES-782.

AES-784 Work-based Learning (3 CR)

This course provides supplemental curriculum to prepare students for their practical experience (OJT 3) and content is related to their specialization (Operation, Chemistry Technology, or Radiation Protection).

Lecture 3 hrs/wk. Registration for this course requires Head of Program approval.

AES-786 Materials Science for Nuclear Power Plant Operators (2 CR)

This course covers the introduction to material problems in a nuclear power plant, including basic material properties, brittle fracture characteristics, radiation-induced property changes, and temperature effects such as heat up and cool down rate limits.

Lecture 2 hrs/wk. Tutorial 1 hr/wk. Prerequisite: AES-711. Corequisite: AES-786P.

AES-786P Materials Science for Nuclear Power Plant Operators Laboratory (1 CR)

This laboratory is an experimental course intended to complement Materials Science for Nuclear Power Plant Operators (AES-786) course. The purpose of the course is to explore some of the main materials science concepts experimentally. Students will conduct and analyze experiments on stress strain behavior by tensile and compression tests, behavior of materials under torsion test, measurement of specimen toughness by impact test, hardness measurement, creep rate measurement, and describe their results in laboratory reports while working either individually or in teams. This course is to run concurrently with Materials Science for NPP Operators (AES-786).

Laboratory 2 hrs/wk. Corequisite: AES-786.

AES-787 Capstone Project I (2 CR)

This course is the first part of the capstone program in nuclear engineering technology to develop student understanding in broader issues in the commercial nuclear power industry. Students review topics and select and propose a project for further research and presentation.

Lecture/Tutorial 2 hrs/wk. Registration for this course requires Head of Program approval.

AES-788 Capstone Project II (2 CR)

This is a blended-mode course which students take while doing their OJT. They build on the work they did in AES-787 Capstone Project I in order to complete their capstone project by producing a detailed, factual report on a relevant area in the nuclear industry and presenting an oral report to two examiners.

Lecture/Tutorial 2 hrs/wk. Prerequisite: AES-787. Registration for this course requires Head of Program approval.

Chemistry (CHEM)

CHEM-111 Chemistry I (3 CR)

The Chemistry I course introduces the elementary principles of chemistry and enables students to develop their problem solving skills and understanding the basic fundamentals of chemistry including SI units, unit conversions, significant figures, and periodic table. Emphasizes on chemical reactions and the use of symbolic representation and nomenclature, the mole concept and its applications and molecular structure, stoichiometry and solution stoichiometry, gases law and ideal gas law, and atomic structure and periodicity, chemical bonding and orbital hybridization.

Lecture 3 hrs/wk, Tutorial 2 hrs/wk.

CHEM-111P Chemistry I Laboratory (1 CR)

This Lab is an experimental course intended to complement Chemistry I and designed for students majoring science and engineering technology. The purpose of the lab course is to explore the safety in chemical laboratories and the fundamental chemistry concepts experimentally, which are covered in the Chemistry I course. Students will conduct, analyze and interpret experiments on physical property, resolution of mixture, composition of element, empirical formula, stoichiometry, types of chemical reactions, gas laws and localized electron model.

Laboratory 3 hrs/wk.

Engineering Fundamentals (ENG)

ENG-113 Engineering Drawings (2 CR)

This course introduces the engineering drawing tools, schematic and engineering diagrams, and engineering operations. It provides the needed training to show typical drawing views and the proper way to show interior and exterior part details. This course relates lines and planes to orthographic projection to show the size and shape of objects. It includes application of principles and graphic elements of sectioning to show interior detail; and, the dimensioning techniques and symbol usage common to all drafting disciplines. Students will learn how to read, interpret and understand the various graphic symbols, components, systems, and abbreviations found on various engineering drawings categories; Fluid Power Diagrams and Schematics, Process and Instrumentation Diagram (P&ID) and loop diagrams, Electrical / Electronic diagrams and schematics, Logic Circuits and Diagram and Engineering Fabrication Drawings.

Lecture 1 hrs/wk, Laboratory 2 hrs/wk.

ENG-114 Industrial Safety and Professional Ethics (2 CR)

This course is a study of safety and health management in the workplace as it related to hazard identification and control, accident investigation and prevention, emergency planning and moral responsibilities to society. It introduces the students to profession, professional ethics, various moral issues and uses of ethical theories, and codes of ethics in professional engineering societies.

Lecture 2 hrs/wk, Tutorial 1 hr/wk.

ENG-120P Mechanical Workshop (1 CR)

This course is a hands-on course covering mechanical shop safety procedures and use of manual and automated mechanical machining processes. It provides the student with skills and knowledge of hand tools, drill presses, mills, lathes, welding and precision measuring instruments.

Laboratory 3 hrs/wk.

English (ENGL)

ENGL-111 English Communication Skills (3 CR)

This course is a study of safety and health management in the workplace as it related to hazard identification and control, accident investigation and prevention, emergency planning and moral responsibilities to society. It introduces the students to profession, professional ethics, various moral issues and uses of ethical theories, and codes of ethics in professional engineering societies.

Lecture 3 hrs/wk.

ENGL-112 Technical English Skills (3 CR)

This course focuses on developing students' language skills in technical communication genres. It is designed to introduce students to information and language specifically for future technical careers. Covered in this course are the following: the importance of Technical Communication (TC); the goals of TC, ethical and legal considerations; verbal and nonverbal communication; features of effective oral presentations; routine correspondence; document design; descriptions and process analyses; long, formal reports; short, informal reports; and evaluation of criteria and reasons for conducting research in TC.

Lecture 3 hrs/wk. Prerequisite: ENGL-111.

ENGL-118 English Technical Writing (3 CR)

Technical Writing aims to develop students' skills to be skilled writers in their chosen career. This course covers a variety of topics, such as appropriate usage of tools for professional writers, using international business English, writing and editing emails for various audiences, writing reports for industry, and an intermediate knowledge of grammar and writing.

Lecture 3 hrs/wk. Prerequisite: ENGL-112.

Humanities (HUM)

Two of the following three humanities courses offered by the Academic Support Department are required for the HDNT program.

HUM-111 Islamic Culture (3 CR)

This course introduces some of the basic study skills needed for success at college level in technical areas.

Lecture 3 hrs/wk.

HUM-112 Emirati Society and Culture (3 CR)

This course is a study of human societies in general, and in particular the general features and main ingredients of the UAE society, geographic location, population development and composition, and economic and geographic aspects. It deals with family and tribal systems and the nature of governance in a tribal society. The nature of services provided to the community before and after the introduction of oil will be discussed, plus the role of cultural, educational and media institutions and the services they contribute to the community. Students will also be provided with a comprehensive and integrated understanding of UAE society and various aspects of social and economic life, political and cultural rights, with particular reference to modern society-building since the establishment of the Union and foreseeing the future. This course aims to strengthen the sense of national belonging, loyalty and pride through consolidation of national culture and social concepts, by student participation in a research project during the semester covering all topics associated with the course.

Lecture 3 hrs/wk.

HUM-211 Arabic Communication Skills (3 CR)

The communication process of the Arabic language is essential in everyday life, and, based on it, we build our decisions on an individual, collective and international level. This course aims to develop students' capabilities in listening, reading, writing and speaking in their native language. It also helps students to gain linguistic abilities to communicate professionally and socially. In addition, it trains students in different communication skills to avoid common mistakes that can arise from miscommunication. Linguistic performance is developed through a solid and clear understanding of the meanings of different types of texts, which are relevant to the students' environment. Students will navigate through a variety of texts from the Quran, poetry, prose and short stories.

Lecture 3 hrs/wk.

Information and Communications Technology (ICT)

ICT-110 Introduction to Programming and Problem Solving (3 CR)

This introductory course in engineering problem solving and computer programming is for all undergraduate engineering students without prior programming experience in any language. The course covers the fundamentals of computer programming and its underlying principles using the Java programming language. Concepts and methods are illustrated by examples from various engineering disciplines. Useful numerical techniques and their applications to real world problems in science and engineering are also discussed.

Lecture 2 hrs/wk, Laboratory 2 hrs/wk.

Mathematics (MATH)

MATH-100 Precalculus (4 CR)

This course covers basic algebraic operations on numbers, exponents, roots and radicals, equations, inequalities, scientific notations, algebraic operations on expressions, solving formulas and literal equations. It also covers geometry, functions and its graphs, solving system of linear equations and quadratic equations algebraically and graphically, matrix and its determinant, solving linear equations using the determinant (Cramer's rule), factoring and fractions, exponents and radicals, solving logarithmic and exponential equations, trigonometry, radian measure, vectors and oblique triangles, law of sines and law of cosine, plotting trigonometric functions.

Lecture 4 hrs/wk, Tutorial 2 hrs/wk.

Physics (PHYS)

PHYS-111 Physics I (3 CR)

This course enables students to develop their skills in understanding physical concepts. It helps students approach questions in a logical and systematic manner. This course covers a variety of topics in mechanics that are relevant for the degrees offered at the polytechnic.

Lecture 3 hrs/wk, Tutorial 2 hrs/wk. Pre-/Co-requisite: MATH-100. Co-requisite: PHYS-111P.

PHYS-111P Physics I Laboratory (1 CR)

This Laboratory is an experimental course intended to complement Physics I. The purpose of the lab course is to explore some of the main concepts experimentally, which are covered in the Physics I course. Students will conduct, analyze and interpret experiments on timing, motion, forces and energy, rotational motion, forces and rotational energy and analyze and prepare lab reports working either individually or in teams.

Laboratory 3 hrs/wk.