

MINIMUM CORE SUBJECT AREAS: NUCLEAR ENGINEERING

AREA	SUBJECTS / DESCRIPTION	RECOMMENDED CONTACT HOURS
A recommendation of at least 200 hours from which at least 40 hours in total from Group 1 and at least 40 hours in total from Group 2.		
Group 1: at least 40 hours in total from the following areas		
1. Nuclear Engineering	<ul style="list-style-type: none"> - Nuclear physics, nuclear criticality, neutron transport theory, nuclear fission and fusion reactions, nuclear reactor theory and design, reactor kinetics and control, thermal-hydraulic design of nuclear reactors, nuclear fuel cycle, operational governance and licensing of nuclear installations, management of decommissioning process 	
2. Nuclear / Radiation Safety Management	<ul style="list-style-type: none"> - safety management systems for nuclear/radiation applications, Nuclear/radiation accident prevention and analysis, emergency response systems, nuclear and radiation event response protocols, nuclear reactor safety 	
3. Radiation Protection and Detection Engineering	<ul style="list-style-type: none"> - Radiological physics, radiobiology, radiation protection principles and applications, radiation detection and measurements, radiation dosimetry, radiation detection and analytical tools, Ionizing and non-ionizing radiation, principles of electromagnetics, ultrasound, magnetic resonance, medical applications of radiation, radioisotope application in medical diagnosis and therapy. 	
4. Electrical and Electronic Engineering for Nuclear / Radiation Application	<ul style="list-style-type: none"> - Use and effects of radiation on electrical and electronic circuitry, digital and analogue circuits, transmission line theory for power transfer, electric power systems, electronic measurement and instrumentation in radioactive environment, signal processing, medical image processing, cooling systems, steam generation, balance of plant, power conversion and generation 	
Group 2: at least 40 hours in total from the following areas		
1. Risk Engineering and Management	<ul style="list-style-type: none"> - Principles of risk assessment and management, system assurance, risk control principles, hazard identification and management, probabilistic risk assessment, quantitative methods for risk assessment, disaster and crises management, safety case development 	
2. Environmental Management	<ul style="list-style-type: none"> - Waste and environmental management, radioactive waste management, processing, storage and disposal of radioactive waste/ treatment and disposal, water and air radiation monitoring and dispersion modelling, environmental impact assessment, environmental hazard risk assessment, site selection and assessment 	
3. Fluid mechanics, Thermodynamics and heat Transfer	<ul style="list-style-type: none"> - Fluid mechanics thermodynamics, heat and mass transfer fundamentals, thermal hydraulics, heat exchangers, principles and applications of fluid mechanics, energy cycle, computational fluid dynamics 	
4. Material Science in Nuclear / Radiation Environment	<ul style="list-style-type: none"> - Material science fundamentals, radiation damage and material failure mechanism, material properties in nuclear/radiation applications, interaction of radiation against materials, materials and lifetime behaviour in nuclear/radiation environment 	
5. Control Engineering	<ul style="list-style-type: none"> - Control theories and applications, control system design for power plants, feedback control systems, system stability, vibration control, signal processing 	

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6. Nuclear Interaction with Particle Accelerator	- Selected topics on engineering design in particle accelerators, particle Engineering in the nuclear/radiation industry, radiation protection and health physics, Monte-Carlo simulation for nuclear interaction, radiation protection standard and management, Protection shielding design	
7. Medical Applications of Radiation Technology	- Principles, mechanism and application of radiography, fluoroscopy, radionuclide imaging, computed tomotherapy, MRI, linear accelerator, proton therapy system, brachytherapy system, therapeutic nuclear medicine.	
8. Industrial Applications of Radiation Technology	- Nuclear/radiological-related topics in non-destructive and non-intrusive inspections	
9. Electric Power Generation, Transmission, and Distribution	- Electric power generation, transmission systems, distribution systems, power quality, electrical protection systems, high voltage engineering, design and application of earthing systems, circuit theory, electromagnetic theory, digital electronics, microwave engineering and waveguide technology	
10. Other Topics with Nuclear Applications	- Engineering management, computer programming, big data, artificial intelligence and machine learning, low-carbon energy, robotics, legal systems and licensing requirements, policy, regulation and licensing, seismic protection, fire protection	