

Course code	Course Name	L-T-P-Credits	Year of Introduction
ME371	Nuclear Engineering	3-0-0-3	2016
Prerequisite : Nil			
Course Objectives: <ul style="list-style-type: none"> • To explore the engineering design of nuclear power plants using the basic principles of reactor physics, thermodynamics, fluid flow and heat transfer. • To provide an overview on reactor principles, nuclear safety, and reactor dynamic behaviour. • To understand the standards of radiation protection and need for nuclear waste disposal 			
Syllabus Review of Elementary nuclear physics, Nuclear fission, Boiling water reactor, Structural materials, Nuclear fuels, Reactor heat removal, Safety and disposal			
Expected Outcome: The students will be able to <ol style="list-style-type: none"> 1. understand the theories and principles of nuclear power generation 2. understand the heat removal techniques applied to reactor heat transfer systems. 3. acquire knowledge about safe disposal of nuclear wastes 			
Text books/ Reference books <ol style="list-style-type: none"> 1. S. Glasstone and A. Sesonske, <i>Nuclear Reactor Engineering</i>, D. Van Nostrand Company, INC. 1967. 2. S Glasstone, Source book on atomic energy, Krieger Pub Co., 1979 			
Course Plan			
Module	Contents	Hours	End Sem. Exam. Marks
I	Review of Elementary nuclear physics: Atomic structure – nuclear energy and nuclear forces – Nuclear fission. Nuclear reactions and radiations – Principles of radioactive decay interactions of an ray with matter – Neutron cross sections and reactions –The fission process – Chain reactions	7	15%
II	Basic principles of controlled fusion .Nuclear reactor principles – Reactor classification – Critical size. Basic diffusion theory - Slowing down of neutrons – Neutrons – Neutron flux and power – Four factor formula – Criticality condition – Basic features of reactor control .	7	15%
FIRST INTERNAL EXAMINATION			

III	Boiling water reactor . Description of reactor system – Main components –Control and safety features .Materials of reactor construction – Fuel , moderator , coolant	7	15%
IV	Structural materials – Cladding –Radiation damage, Nuclear fuels : Metallurgy of Uranium – General principles of solvent extraction – Reprocessing of irradiated fuel – Separation process fuel enrichment .	7	15%
SECOND INTERNAL EXAMINATION			
V	Reactor heat removal / equations of heat transfer as applied to reactor cooling– Reactor heat transfer systems – Heat removed in fast reactors. Radiation safety : Reactor shielding – Radiation doses – Standards of radiation protection	7	20%
VI	Safety and disposal: Nuclear plant safety-safety systems-changes and consequences of accident-criteria for safety-nuclear waste-types of waste and its disposal-radiation hazards and their prevention-weapons proliferation	7	20%
END SEMESTER EXAMINATION			

Question Paper Pattern

Maximum marks: 100

Time: 3 hrs

The question paper should consist of three parts

Part A

There should be 2 questions each from module I and II

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

There should be 2 questions each from module III and IV

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

There should be 3 questions each from module V and VI

Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: Each question can have a maximum of four sub questions, if needed.

APJ ABDUL KALAM
TECHNOLOGICAL
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Estd.



2014