



FUNDAMENTALS OF NUCLEAR POWER GENERATION

PROF. DIPANKAR N. BASU

Department of Mechanical Engineering
IIT Guwahati

TYPE OF COURSE : Rerun | Elective | UG/PG

COURSE DURATION : 12 weeks (24 Jan' 22 - 15 Apr' 22)

EXAM DATE : 24 Apr 2022

PRE-REQUISITES : Basic UG-level Heat Transfer & Fluid Mechanics.

INTENDED AUDIENCE : Undergraduate students of Mechanical/Power/Energy Engg. (5th semester onwards) and postgraduate students specializing in the thermofluids/energy/nuclear engg; industry personnel associated with nuclear/power industries; faculty members associated with Power/Energy engg.

INDUSTRIES APPLICABLE TO : Bhabha Atomic Research Centre (BARC), Nuclear Power Corporation of India Ltd. (NPCIL), National Thermal Power Corporation (NTPC), Atomic Energy Regulatory Board (AERB), General Electric India

COURSE OUTLINE :

The depleting stock of fossil fuels and global concern over the preservation of environment has projected nuclear energy as a very relevant option, particularly considering the near-zero emission and huge resource availability. From technological point of view, nuclear power production is quite different from the conventional thermal plants and therefore it is the need of the hour to grasp the essentials at an early level. Present course introduces the students to the fundamentals of nuclear power generation. Starting from the atomic structure, students will be gradually familiarized with different concepts, finally leading to the design of different reactors. Important topics such as nuclear waste management, biological impact of radiation and safety issues pertinent to handling nuclear fuels will also be discussed.

ABOUT INSTRUCTOR :

Prof. Dipankar N. Basu is an Associate Professor in the department of Mechanical Engineering at Indian Institute of Technology Guwahati since June 2012. He received his undergraduate and postgraduate degree from Jadavpur University, Kolkata, and completed his Ph.D. from Indian Institute of Technology Kharagpur in 2011. He served as an Assistant Professor at IEST Shibpur for nearly four years before joining IIT Guwahati. His principal research interest is in the field of nuclear thermalhydraulics, two-phase flow, supercritical heat transfer, optimization of thermal systems and microchannel heat transfer. He is currently working on computational tool development for simulation of flows with free-surfaces. He has co-authored more than 65 referred journal and conference publications and also a book chapter on supercritical natural circulation loop. He is a regular reviewer of many reputed international journals and also associated with several sponsored projects.

COURSE PLAN :

Week 1: Fundamentals of nuclear power

Week 2: Radioactivity & nuclear reactions

Week 3: Nuclear fission

Week 4: Chain reaction in reactors

Week 5: Reactor thermalhydraulics

Week 6: Reactor control

Week 7: Thermal reactors

Week 8: Breeder reactors

Week 9: Nuclear fusion

Week 10: Biological effects of radiation

Week 11: Reactor safety & security

Week 12: Waste management & economics