


ADVANCED CONCEPTS IN FLUID MECHANICS

PROF. SUMAN CHAKRABORTY
PROF. ADITYA BANDOPADHYAY
IIT Kharagpur
Mechanical Engineering

TYPE OF COURSE : New | Core | UG
COURSE DURATION : 12 weeks (29 Jul'19 - 18 Oct'19)
EXAM DATE : 16 Nov 2019

INTENDED AUDIENCE : B. Tech/M. Tech/MS/B.Sc./M.Sc./PhD students of all disciplines and teachers of undergraduate Fluid Mechanics

INDUSTRIES APPLICABLE TO : Oil Companies (IOCL, SHELL, BPCL and others), Automobile and Aviation companies (GE, AIRBUS, TATA Motors and others)

COURSE OUTLINE :

This is a course which deals with advanced concepts in Fluid Mechanics. The course emphasizes the fundamental in underlying fluid mechanical principles and application of those principles to solve real life problems. There is a well-balanced coverage of physical concepts, mathematical operations along with examples and exercise problems of practical importance.

ABOUT INSTRUCTOR :

Prof. Suman Chakraborty is a Professor in the Mechanical Engineering Department of the Indian Institute of Technology (IIT) Kharagpur, India,and Indian National Academy of Engineering Chair Professor. He is also currently the Head, School of Medical Science and Technology at IIT Kharagpur. He has research interests in the area of Microfluidics and MicroNano scale transport processes, including their theoretical, computational, and experimental modeling, encompassing the underlying fundamentals as well as bio-medical.

Prof. Aditya Bandopadhyay is currently an Assistant Professor in the Mechanical Engineering Department at Indian Institute of Technology Kharagpur, India. His research interests include micro- and nanofluidics, transport through porous media, and electrohydrodynamics. He completed his Dual Degree from IIT Kharagpur (Insitute Silver Medal) in 2012 and received his Ph.D. from IIT Kharagpur in 2015.

COURSE PLAN :

Week 1**:** Essential Mathematical Foundations

Week 2**:** Kinematics of Fluid Flows

Week 3**:** Dynamics of Inviscid Flows

Week 4**:** Potential Flows

Week 5**:** Integral forms of Conservation Equations: Reynolds Transport Theorem

Week 6**:** Dynamics of Viscous Flows: Derivation of Navier-Stokes Equation

Week 7**:** Exact Solutions of Navier-Stokes Equations for Fully Developed Laminar Flows and some Unsteady Flows

Week 8**:** Laminar Boundary Layers

Week 9: Instability; Introduction to Turbulence

Week 10: Turbulence (contd.); Fluid flow about Immersed bodies

Week 11: Geophysical Fluid Dynamics

Week 12: Creeping Flows; Microscale Fluid Flows