



**MECHANICAL
ENGINEERING**

HEAT TRANSFER AND COMBUSTION IN MULTIPHASE SYSTEMS

Instructor Name : PROF. SAPTARSHI BASU (IISc Bangalore - Mechanical Engineering)

COURSE DURATION : Jan-Mar 2017 **CORE / ELECTIVE :** Core **UG / PG:** PG

PRE-REQUISITES : Basic courses in fluid mechanics, heat transfer and combustion

INTENDED AUDIENCE : Mechanical Engineering and Chemical Engineering

INDUSTRIES APPLICABLE TO : GTRE, GE, Siemens, HPCL

COURSE OUTLINE : Multiphase systems are ubiquitous to many domains ranging from large scale power generation to microscale surface patterning. The course as outlined aims to offer insights and fundamentals into such multiphase systems. The course will first cover the basics of thermodynamics and transport processes in generalized multiphase systems along with analyses of interfacial transport mechanisms. Subsequently in the later modules, it will offer in depth analyses of transport processes and combustion in specific areas like a.) droplet combustion, b.) droplet evaporation, c.) evaporation from porous media, d.) transport processes in sessile droplets, e.) boiling and f.) sprays. Some case studies related to diverse sets of industries will be provided. The coverage will benefit people from many industries like gas turbines, solar thermal, micro-nano scale engineering, materials processing to name a few.

ABOUT INSTRUCTOR : Dr. Saptarshi Basu is currently an Associate Professor in the Department of Mechanical Engineering at Indian Institute of Science. Prof. Basu leads large scale initiatives in the area of combustion, multi-phase flow and heat transfer. He is a project leader in the National Center for Combustion Research and Development and SERIUS (Solar Energy Research Institute for India and the United States). Before joining IISc, Dr. Saptarshi Basu was an Assistant Professor in the Department of Mechanical, Materials and Aerospace Engineering at University of Central Florida from August 2007-May 2010. Dr. Saptarshi Basu received his M.S. and Ph. D. degrees in Mechanical Engineering from University of Connecticut in 2004 and 2007 respectively. His current research interests include combustion instability, flame-vortex interaction, sprays, droplet combustion, colloids, droplet/spray vaporization, acoustic levitation of functional droplets, droplet dynamics in high temperature plasmas, water transport characteristics in fuel cells, thermal storage and general areas of heat transfer. He has authored over 180 technical publications in journals and conferences. Prof. Basu is a member of ASME, AIAA, ISHMT and Combustion Institute. Prof. Saptarshi Basu has been awarded the prestigious Swarnajayanti Fellowship in Engineering Sciences, 2013-2014; Department of Science and Technology, Government of India. Prof. Saptarshi Basu has been awarded the K.N Seetharamu Medal and Prize, 2015; Indian Society of Heat and Mass Transfer.

COURSE PLAN

Week 1: Introduction to Multiphase systems

Week 2: Fundamentals of interfacial heat and mass transfer

Week 3: Transport processes in droplets

Week 4: Transport processes in sessile droplets

Week 5: Sprays

Week 6: Droplet Combustion

Week 7: Boiling

Week 8: Case studies