



# CONVECTIVE HEAT TRANSFER

## PROF. SAPTARSHI BASU

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**INTENDED AUDIENCE** : Mechanical Engineering/Chemical Engineering

**PRE-REQUISITES** : Heat Transfer and Fluid Mechanics

**INDUSTRIES APPLICABLE TO** : GE, Siemens, HPCL, GTRE

## COURSE OUTLINE

Convective heat transfer is ubiquitous to many domains ranging from large scale power generation to microscale flow. The course as outlined aims to offer insights and fundamentals into convective heat transfer processes. The course will first cover the basics of conservation equations in generalized convective heat transfer systems. Subsequently in the later modules, it will offer in depth analyses of specific areas like a.) internal and external forced convection, b.) internal and external free convection and c.) advanced topics like turbulent heat transfer. The coverage will benefit people from many industries like gas turbines, solar thermal, materials processing to name a few.

## ABOUT INSTRUCTOR

Prof. Saptarshi 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 expertise in optical diagnostics particularly laser induced fluorescence, particle image velocimetry, tunable diode laser absorption spectroscopy, IR-thermography, rayleigh scattering and laser induced incandescence. He has authored over 190 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, [Awarded to 1 researcher in heat and mass transfer biennially all over India]. Prof. Basu is a Fellow of the Indian National Academy of Engineering.

## COURSE PLAN

**Week 1** : Introduction to Convective Heat Transfer

**Week 2** : Introduction to external forced convection

**Week 3** : Integral solutions-II

**Week 4** : Other wall heating conditions-unheated length

**Week 5** : Effect of conduction across a solid coating

**Week 6** : Heat transfer to fully developed flow-I

**Week 7** : Heat transfer to developing flow-II

**Week 8** : Integral solutions-II

**Week 9** : Vertical channel flow-I

**Week 10** : Scaling analysis-II

**Week 11** : Rayleigh-Benard convection

**Week 12** : Introduction to turbulent heat transfer -II