



# CONDUCTION AND CONVECTION HEAT TRANSFER

**PROF. SUMAN CHAKRABORTY**  
Department of Mechanical Engineering  
IIT Kharagpur

**TYPE OF COURSE** : Rerun | Core | UG  
**COURSE DURATION** : 12 weeks (24 Jan' 22 - 15 Apr' 22)  
**EXAM DATE** : 23 Apr 2022

**PROF. SANKAR KUMAR SOM**  
Department of Mechanical Engineering  
IIT Kharagpur

**PRE-REQUISITES** : Basic knowledge of Fluid Mechanics and Thermodynamics

**INTENDED AUDIENCE** : Students of BE/ME/MS/MSc/PhD can take it.

## **COURSE OUTLINE :**

This is an introductory course in conduction and convection heat transfer. The subject heat transfer has a wide scope and is of prime importance in almost all fields of engineering and biological systems. The course emphasizes the underlying concepts of the conduction and convection modes of heat transfer and enumerates the laws and governing equations relating to the rates of heat transfer, based on derivation from fundamentals. There is a well balanced coverage of physical concepts, mathematical operations along with examples and exercise problems of practical importance. After completion of the course, the students will have a strong foundation on conduction and convection heat transfer and will be able to apply the basic principles, the laws, and the pertinent equations to practical scenarios.

## **ABOUT INSTRUCTOR :**

Prof. Suman Chakraborty is currently a Professor in the Mechanical Engineering Department as well as an Institute Chair Professor of the Indian Institute of Technology Kharagpur, India, and the Head of the School of Medical Science and Technology. He is also the Associate Dean for Sponsored Research and Industrial Consultancy. His current areas of research include microfluidics, nanofluidics, micro-nano scale transport, with particular focus on biomedical applications.

Prof. Sankar Kumar Som is currently an emeritus Professor (on re-employment) in the department of Mechanical Engineering at the Indian Institute of Technology, Kharagpur. His field of expertise is thermo fluid sciences. His research interest is combustion science, and in particular, droplet and spray combustion. Apart from guiding 16 doctoral students and publishing more than 100 research papers in peer-reviewed international journals, he has served as principal investigator and chief consultant in several industrial projects with different government and private organizations.

## **COURSE PLAN :**

**Week 1** : Introduction to Conduction

**Week 2** : 1-D Steady State Heat Conduction

**Week 3** : Heat Conduction in Cylindrical and Spherical Geometry

**Week 4** : Heat Transfer from Extended Surfaces

**Week 5** : 2-D Steady State Heat Conduction; Transient Heat Conduction - Lumped Analysis

**Week 6** : Transient Heat Conduction in Semi-Infinite Medium; Introduction to Convection

**Week 7** : Review of Fluid Mechanics; Energy Conservation Equation

**Week 8** : Thermal Boundary Layer; Energy Integral Method

**Week 9** : Internal Forced Convection

**Week 10** : Viscous Dissipation; Introduction to Natural Convection

**Week 11** : Natural Convection; Condensation and Boiling

**Week 12** : Heat Exchangers