



# CONCEPTS OF THERMODYNAMICS

## **PROF. SUMAN CHAKRABORTY**

Department of Mechanical Engineering  
IIT Kharagpur

## **PROF. ADITYA BANDYOPADHYAY**

Department of Cryogenic Engineering  
IIT Kharagpur

**INTENDED AUDIENCE :** B.Tech students of all disciplines and teachers of undergraduatethermodynamics

### **COURSE OUTLINE :**

Thermodynamics is the basic building block of all of modern day industries (power generation, iron and steel, food processing etc.) and human convenience (refrigeration, engines, air conditioning etc.). Understanding and applying various ideas of thermodynamics is therefore at the heart of progress in science and engineering. The course aims at building strong fundamentals of work and heat interactions for various systems. Through various examples, the ideas of several industrial components and power/refrigeration cycles are further elucidated by addressing the problems from first principles. The ideas are extended to real systems where exergy or equivalently, the availability of a state is analyzed to give a feel of real problems to the students. Uniqueness of this course is a delicate balance between fundamental concepts and applications, in a manner consistent with the recently proposed AICTE Model Curriculum guidelines.

### **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.

Prof. Aditya Bandyopadhyay 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 (Institute Silver Medal) in 2012 and received his Ph.D. from IIT Kharagpur in 2015

### **COURSE PLAN :**

- Week 01 :** Fundamental definitions and concepts in thermodynamics
- Week 02 :** Properties of pure substances
- Week 03 :** Work and heat
- Week 04 :** First law of thermodynamics for closed systems
- Week 05 :** First law of thermodynamics for open systems – I
- Week 06 :** First law of thermodynamics for open systems – II
- Week 07 :** Second law of thermodynamics
- Week 08 :** Entropy transfer for closed systems
- Week 09 :** Entropy transfer for open systems
- Week 10 :** Irreversibility and exergy
- Week 11 :** Thermodynamic Cycles: Air Standard Cycles, Vapour Power Cycles
- Week 12 :** Thermodynamic Cycles: Vapour Power Cycles (contd), Refrigeration Cycles