



# ENGINEERING THERMODYNAMICS

**PROF. JAYANT K. SINGH**

Department of Chemical Engineering  
IIT Kanpur

**TYPE OF COURSE :** Rerun | Core | UG

**COURSE DURATION :** 8 weeks (24 Jan'22 - 18 Mar'22)

**EXAM DATE :** 27 Mar 2022

**INTENDED AUDIENCE :** BE

**PRE-REQUISITES:** An introductory background in chemistry, physics and Maths (calculus) will be needed. Thus, the course is ideal for first or second year engineering students.

**INDUSTRY SUPPORT :** All engineering Based industry

**COURSE OUTLINE :**

This course provides an introduction to the most powerful engineering principles -Thermodynamics: the science of energy and its transformation from one form to another form. The subject is widely applicable in several branches of engineering and science. The objective of this course is to introduce different tools needed to analyze energy systems from various daily lives to large scale engineering applications. More specifically, we will cover the topics of mass and energy conservation principles; first law analysis of closed and open systems; understanding second law of thermodynamics and entropy; exergy; properties of pure substances; power generation and refrigeration on thermodynamic cycles; thermodynamic relation, combustion and reaction.

**ABOUT INSTRUCTOR :**

Prof. Jayant K. Singh received his B.Tech from IIT Kanpur in Chemical engineering in 1997. He subsequently completed his Masters degree in computer science and engineering and Ph.D. in Chemical engineering in the area of molecular simulation from SUNY Buffalo, USA in 2004. Dr. Singh is currently a professor in the department of Chemical engineering at IIT Kanpur. Dr. Singh's current research interest is in thermodynamics and statistical mechanics, material modeling, confined fluids and development of molecular simulation tools. Dr Singh has co-authored more than 100 peer reviewed articles in international journals of repute. He is a recipient of prestigious awards such as Humboldt Fellow for experienced researcher, Young Engineers of Indian National Academy of Engineers, Amar-Dye Chem award and BRNS Young Scientist Award. He is also an elected member of National Academy of Sciences, Allahabad.

**COURSE PLAN :**

**Week 1 :** Introduction to Energy and Energy transfer

**Week 2 :** Properties of Pure Substances

**Week 3 :** Energy analysis of closed system

**Week 4 :** Mass and Energy Analysis of open systems

**Week 5 :** The second law of thermodynamics and entropy

**Week 6 :** Exergy Analysis

**Week 7 :** Power & Refrigeration Cycles

**Week 8 :** Thermodynamic Potentials I Law Application to Chemically Reacting Systems