


LAWS OF THERMODYNAMICS

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PRE-REQUISITES : Basic knowledge of mathematics

INTENDED AUDIENCE : Interested students

INDUSTRIES APPLICABLE TO : G.E., I.O.C.L, G.A.I.L., O.N.G.C, Shell

COURSE OUTLINE :

Thermodynamics is the branch of science that describes the basic laws and principles governing the processes of transfer and transformation of energy along with the changes in properties of the substances affected by such processes. The laws are formulated from observations in nature. The basic principles as corollaries of the laws are established through logical deductions following the laws. The science of thermodynamics also provides the relationships of the properties of substances for their use in determining the changes of properties in physical processes performed by the substances. The subject thermodynamics is of prime importance as a foundation pillar of all branches of engineering, since technological processes and their developments involve transfer and transformation of energy. In the present course we will discuss the laws of thermodynamics and its corollaries. The discussion will be based on physical concepts, mathematical expressions and illustrated examples of practical applications. This will not only clear the physical concepts of the students but will enable the students to get rid of usual misleading concepts in understanding the laws and their applications.

ABOUT INSTRUCTOR :

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. He has authored a text book titled 'Introduction to Heat Transfer ', published by PHI learning, and has also co-authored a text book titled 'Introduction to Fluid Mechanics and Fluid Machines', published by McGraw-Hill Education. He has made significant contributions in national programs on distant learning. He has contributed to NPTEL through his video based and web based courses on 'Fluid Mechanics', 'Thermodynamics', 'Fluid Machines and Compressible flows'. He has also taught Fluid Mechanics in a program titled 'Train Ten Thousand Teachers' under NMEICT. The present UG and PG course curricula in Engineering and Science at IIT Kharagpur were developed under his leadership as the chairman of a Curriculum Review Committee. He is a fellow of the National Academy of Sciences, India (FNASc) and also of Indian National Academy of Engineering (FNAE). In recognition to his consistent and high level teaching, he was bestowed with the INSA Teachers Award (2014). He has also served the administration at IIT Kharagpur as Head, Department of Mechanical Engineering; Dean, Undergraduate Studies; and Director (officiating)

Prof. Suman Chakraborty is currently a Prof essor in the MechanicalEngineering Department as well as an Institute Chair Professor of theIndian Institute of Technology Kharagpur, India, and the Head of th eSchool of Medical Science and Technology. He is also the AssociateDean for Sponsored Research and Industrial Consultancy. His cu rrentareas of research include microflu idics, nanofluidics, micro-nano scaletransport, with particular focus o n biomedical applications. He has beenawarded the Santi Swaroop Bhatnagar Prize in the year 2013, which isthe highest Scientific Award from the Government of India. He has beenelected as a Fellow of the American Physical Society, Fellow of the RoyalSociety of Chemistry, Fellow of ASME, Fellow of all the Indian NationalAcademies of Science and Engineering, recipient of the Indo-USResearch Fellowship, Scopus Young S cientist Award for high citation ofhis research in scientific/technical Journals, and Young Scientist/ YoungEngineer Awards from various National Academies of Science andEngineering. He has also been an Alexander von Humboldt Fellow, and avisiting Professor at th e Stanford University. He h as 380+ Journal publications.

COURSE PLAN :

Week 1: Introduction and Fundamental Definitions
Week 2: First Law of thermodynamics
Week 3: First Law (continued), Second law of thermodynamics
Week 4: Entropy and its transport