

## ME 407: Course Outline

Dr. Md. Zahurul Haq

Professor  
Department of Mechanical Engineering  
Bangladesh University of Engineering & Technology (BUET)  
Dhaka-1000, Bangladesh

zahurul@me.buet.ac.bd  
<http://zahurul.buet.ac.bd/>

**ME 407: Advanced Thermodynamics**

<http://zahurul.buet.ac.bd/ME407/>



## ME 417: Syllabus

[3.00 Credit Hours]

Introduction to classical and statistical viewpoints in thermodynamics; Concepts of equilibrium, stability, reversibility, irreversibility and availability; Concepts of entropy; Principle of increase of entropy; Calculation of entropy changes; Statistical interpretation; Entropy of mixing; Absolute entropy; Entropy flow and entropy production; Properties of pure substances; Ideal gases; Ideal gas mixtures of constant composition; Ideal gas mixtures of variable compositions; Thermodynamic potentials: Helmholtz free energy functions, Gibbs free energy function; Application of free energy functions; Transformations and thermodynamic potentials; Maxwell relations; Phase transitions; The Clausius-Clapeyron equation; Statistical mechanics: fundamental principles, energy states and levels; Thermodynamic probability: Bose-Einstein statistics, Fermi-Dirac statistics; Thermodynamic properties of a system; Special Topics: elastic systems, fuel cells, magnetic systems, thermo-electricity.



## Tentative Lecture Plan

Topic	cr. hr./Lectures
A. Classical Thermodynamics	<b>1 cr. hr.</b>
1. EOS & Thermodynamic property relationships	3 lectures
2. Thermodynamics of homogeneous mixtures	3 lectures
3. Multiphase-Multicomponent systems	3 lectures
4. Chemical Equilibrium	3 lectures
B. Statistical thermodynamics	<b>2 cr. hr.</b>

**B. Statistical Thermodynamics will be covered by Dr. Kazi Arafat Rahman**



## Reference Books

- K. Wark (1995), *Advanced Thermodynamics for Engineers*, McGraw-Hill.
- T. Engel & P. Reid (2013), *Thermodynamics, Statistical Thermodynamics, & Kinetics*, Pearson.
- M.W. Zemansky & R.H. Dittman (1981), *Heat and Thermodynamics*, McGraw-Hill.
- F.W. Sears & G. L. Salinger (1975), *Thermodynamics, Kinetic Theory, and Statistical Thermodynamics*, Addison-Wesley.

