FOUNDATION FOR ENERGY SYSTEMS TECHNOLOGY

MODULE-I:

Renewable Energy Alternatives:

Solar Photovoltaic conversion, Wave Energy and Ocean Thermal Energy Conversion, Wind Energy Conversion, Biomass Energy Conversion, Energy from Waste, Mini/Micro-hydel

MODULE-II:

Basic Concepts of Thermodynamics

First law and its application, second law and its application, Irreversibility and power generation cycles.

Basic Concepts of Heat transfer: Heat exchangers, overall heat transfer co-efficient, Design of single and multiple pass heat Exchangers, Heat Pipes, Heat Pumps and their applications in Solar Energy systems

Basic Concepts of Fluid Mechanics:

Basic Concepts**,** Flow through pipes, Fluid flow in solar water heaters

MODULE-III:

Combustion Process Overview: Basic physical laws governing combustion, air as a source of oxygen for combustion, combustion principles of solid-liquid-gaseous fuels, proximate and ultimate analysis of solid and gaseous fuels, Estimation of calorific values, combustion process, flame velocity, excess air requirements and estimation, flue gas analysis, combustion efficiency

Text Books /References:

1. RE Sonntag, C Borgnakke, GJ Van Wylen, *Fundamentals of Thermodynamics*, 6th Edition, (Wiley-India)

2. PK Nag, *Engineering Thermodynamics*, Third Edition (*Tata McGraw-Hill)*

3. YA Cengel and MA Boles, *Thermodynamics: An Engineering Approach*, 6th Edition (Tata McGraw-Hill)

4. SR Turns, *An Introduction to Combustion: Concepts and Applications*, 2nd Edition (McGraw Hill)

5. JB Jones and RE Dugan, *Engineering Thermodynamics*, PHI, New Delhi,

6. SP Sukhatme, *Solar Energy - Principles of thermal collection and storage*, 2nd edition, Tata McGraw-Hill, New Delhi

7. JA Duffie and WA Beckman, *Solar Engineering of Thermal Processes*, 2nd edition, John Wiley, NY

8. DY Goswami, F Kreith and JF Kreider, *Principles of Solar Engineering*, Taylor and Francis, Philadelphia

9. M. W. Zemansky, *Heat and Thermodynamics*, 4th Edn. McGraw Hill, 1968.

10. A. L. Prasuhn, *Fundamentals of Fluid Mechanics*, Prentice Hall, 1980

11. S. P. Sukhatme, *A Text book on Heat Transfer*, Orient Longman, 1979.

12. John Twidell and Tony Weir, "Renewable Energy Resources" Second Edition, Taylor and Francis (2006)

13. G. N. Tewari and M. K. Ghosal, Renewable Energy Sources: Basic Principles and Applications, Narosa Publishing House (2005)

POWER GENERATION, TRANSMISSION AND DISTRIBUTION

MODULE-I:

Generation: