INTENDED AUDIENCE: Undergraduate students of mechanical engg., and possibly aero- engg. Also any person interested in the basics of energy conversion. Students preparing for GATE, etc.

PRE-REQUISITES: 12 th standard science (PCM or PCB), and basic knowledge of differential calculus.

INDUSTRY SUPPORT: The course encompasses power generation, I.C. engines, process engineering, refrigeration and air-conditioning, and energy conversion in general, amongst others.

COURSE OUTLINE:
This course is on basic engineering thermodynamics. The first part, on single component systems, topics are basic concepts and definitions, conservation of mass, 1st and 2nd laws of thermodynamics for closed and open systems, thermodynamic properties of a pure substance and practical applications. The second part covers physical behaviour of a mixture of ideal gases, psychrometry, thermodynamics of reacting systems, combustion, phase and chemical equilibrium, and applications. Lecture notes will be provided and supplemented with assignments that emphasize systematic problem solving.

ABOUT INSTRUCTOR:
Professor Sunil R. Kale has been with the Department of Mechanical Engineering since 1989. He has developed and taught UG courses (thermodynamics, energy conversion, heat and mass transfer, power plant technologies, engineering drawing, and mechanical core laboratory), and PG courses (experimental methods for thermal engineering, multiphase flows). His research, academic and industry-related, is in the fields of heat transfer, fluid mechanics, fire dynamics, combustion, and energy conversion.

COURSE PLAN:
Week 2: Conservation of mass for closed and open systems and Internal energy and Enthalpy
Week 3: First Law of Thermodynamics. 1st law for closed and open systems. SSSF and USUF processes.
Week 6: Carnot's cycle realization – in closed and open systems for ideal gas and vapour states. Practical limitations. Modifications to realize it.
Week 7: Thermodynamics of engineered equipment: turbine, compressor, pump, heat exchanger, diffuser, nozzle, throttling, flow through pipes/ducts, etc.
Week 10: Psychrometry and its applications. Specific and relative humidity. Dew point. Saturation and wet bulb temperature. Psychrometric chart. Conditioning of air and applications (air-evaporative cooling, cooling towers, humidification, etc.)