

Course Specification Document

Title	Thermodynamics
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Credits	5 ECTS
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Aims	This course aims to enable the student to understand the basics of thermodynamics, to explain the natural phenomena related to heat exchanges and to understand the principle of thermal machines. The course also gives the student the ability to analyze thermal effects in laboratory and industrial equipment.
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Intended learning outcomes

On successful completion of this course, the student will be able to:

- Solve problems related to whole gas, real gas, liquids and solids
- Analyze the natural phenomena based on the first principle and the second principle.
- Arrive at scientific conclusions from his reading of the phase diagram of a pure body.
- Thermodynamically analyze the work of different thermal machines, representing the work cycles of these machines and deducing their efficiency.
- Estimate the efficiency or effectiveness of a thermal machine.
- Estimate the heat capacity of thermodynamic systems.
- Devise solutions to problems related to heat and energy in general.

Syllabus

- **Thermodynamic systems:** State variables, thermodynamically balanced system, temperature scales, pressure in a fluid
- **Ideal gas:** Ideal gas equation, macroscopic study, microscopic study, kinetic pressure, internal energy. Application: The change of atmospheric pressure with height.
- **The first principle of thermodynamics:** Text of the first principle, work, the amount of heat, Joule-Gay-Lussac expansion, Joule-Thomson expansion, the quasi-static transformation of an ideal gas, the Carnot loop of an ideal gas, engine efficiency, the efficiency of a heat pump.
- **The second principle of thermodynamics:** Text of the second principle, examples of calculating entropy changes.
- **Phase Change of a pure body:** Equilibrium phase diagrams, saturation curve, vaporization in vacuum, vaporization in confined atmosphere, saturation pressure, Andrew's isothermal charts, entropy change with phase change, Clapeyron relations, anomalies in phase change, delayed phase change, applications: Wilson's Chamber, Bubble Chamber.