Unit information

Program	Mechanical Science (53001010053P0)
Course unit	Classical Thermodynamics
Unit code	PCMEC0192
Unit number	0192
Credit points	4
Period	-
Professor	Taygoara Felamingo de Oliveira
Prerequisites	

Unit outline

Objective:

Establish the conceptual basis of Classical Thermodynamics, emphasizing the logical structure of the theory. The student, at the end of the course, should be able to discern the scope of combustion applications, understand its postulatory basis, know its formal and methodological structure, and employ its methods in solving scientific problems.

Purpose:

This is a course for students who will develop their dissertations or thesis on topics related to Thermodynamics, especially those who develop their work in the field of energy and environment.

Contents:

Introduction: conservative systems, observations on Classical Mechanics and the scope of application of Classical Thermodynamics; **Fundamental concepts:** Thermodynamic system and state, walls and constraints, quasi-stationary processes; Zeroth Law of Thermodynamics, temperature measurements; First Law of Thermodynamics, internal energy, quantitative definition of heat, boundary work; Second Law of Thermodynamics, statement of processes, differential forms, Carathéodory's theorem, entropy postulates; Synthesis of the theoretical basis of Thermodynamics. **Equilibrium conditions and formal relations**: Intensive parameters. Temperature, pressure and electrochemical potentials, equations of state; Thermal balance and mechanical balance; Euler and Gibbs-Duhem equations of Thermodynamics. Applications for ideal gases; **Thermodynamic potentials**: Legendre transformations, enthalpy, Helmholtz free energy and Gibbs free energy; Maxwell equations, T-dS relations, heat capacity; Euler and Gibbs-Duhem equations of Thermodynamics. Applications for ideal gases; **Phase equilibrium in thermodynamic systems**: Phase shift, Clausius-Clapeyron equation; Gibbs phase rule;

Assessment

Homework, guided self-studies, Exams, and seminars

Obs:

Reference:

1) Principles of Thermodynamics, Cambridge University Press, 2019

2) Fermi, E.Thermodynamics, Dover Publications, 2012;

3) Zemansky, M. and Dittman, R. Heat and Thermodynamics, An Intermediate Textbook, (7th ed.). McGraw-Hill, 1997.

4) Callen, H. Themodynamics. John Wiley & Sons, 1960.