ipb
INSTITUTO POLITÉCNICO
DE BRAGANÇA

Course Unit	Thermodynamics I			Field of study	Thermodynamics and Thermal Processes	
Bachelor in	Mechanical Engineering			School	School of Technology and Management	
Academic Year	2022/2023	Year of study	2	Level	1-2	ECTS credits 6.0
Type	Semestral	Semester	1	Code	9123-759-2105-00-22	

Workload (hours)	162	Contact hours	T -	TP 60	PL -	TC -	S -	E -	OT -	O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s)	Manuel Luís Pires Clara

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Acquire knowledge and understanding about several physic laws in the energy field (heat and work).
2. Analyse, evaluate, and apply energetic processes and systems.
3. Understand and to know how to use the tables of the pure substances.
4. Understand and to know how to use equations of the pure substances for the determination of correspondent properties.
5. Know how to use the state diagrams to analyse the thermodynamic systems.
6. Get communication skills and self-learning.

Prerequisites

Before the course unit the learner is expected to be able to:
Not applicable.

Course contents

Basic concepts of thermodynamics. Properties of pure substances. The first law of thermodynamics applied to closed systems. The first law of thermodynamics applied to control volumes. The second law of thermodynamics. Entropy.

Course contents (extended version)

1. Basic Concepts of Thermodynamics
   - Units; Systems; Energy; Properties; Temperature and Zero Law; States and Thermodynamic Processes.
2. Properties of Pure Substances
   - Definition; Phases and Phase Change Processes; Properties Tables; Thermodynamic State Equations.
3. The First Law of Thermodynamics Applied to Closed Systems
   - Heat and Work; First Law; Internal Energy, Enthalpy and Specific Heat.
4. The First Law of Thermodynamics Applied to Control Volumes
   - Thermodynamic Analysis of Control Volumes; Steady Flow Devices.
5. The Second Law of Thermodynamics
   - Heat Engines, Refrigerators and Heat Pumps; Cycle, Heat Engine, Refrigerator and Carnot Principles.
6. Entropy
   - Entropy; Entropy Increase Principle; Entropy Change; Isentropic Efficiencies.

Recommended reading

1. Afonso, C. - Termodinâmica para Engenharia - Edições FEUP - 2012
2. Yunus A. Çengel, Mehmet Kanoglu e Michael A. Boles. Thermodynamics: An Engineering Approach, SI. Ninth ed. New York: McGraw-Hill
3. M. J. Moran and H. N. Shapiro. Fundamentals of Engineering Thermodynamics. 4th ed. New York: John Wiley & Sons, 2000.

Teaching and learning methods

The unit will be taught using a combination of lectures such as: self guided learnig and pratice classes. A study guide and support material will be provided to the students.

Assessment methods

1. Alternative 1 - 2 tests along the semester - (Regular, Student Worker) (Final)
   - Intermediate Written Test - 50% (First Test at the middle of semester. Minimum grade required (35%).)
   - Intermediate Written Test - 50% (Second Test at the end of semester. Minimum grade required (35%).)
2. Alternative 2 - (Regular, Student Worker) (Final, Supplementary, Special)
   - Final Written Exam - 100%

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Manuel Luís Pires Clara	João Eduardo Pinto Castro Ribeiro	João da Rocha e Silva	Paulo Alexandre Vara Alves
10-10-2022	11-10-2022	11-10-2022	24-10-2022