INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Energy and Environment			Field of study	Engineering and Related Techniques		
Master in	Environmental Technology			School	School of Agriculture		
Academic Year	2023/2024	Year of study	1	Level	2-1	ECTS credits	5.0
Type	Semestral	Semester	2	Code	1076-809-1202-00-23		

Workload (hours)	135	Contact hours	T -	TP -	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): João Paulo Miranda Castro

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Know and understand the energy context at mundial, european and national scales;
2. Acquire and understand fundamental concepts related to energy systems and energy efficiency;
3. Know the different systems of energy conversion, accumulation and storage;
4. Quantify and to qualify energy resources;
5. Select the most appropriate technology for the exploitation of energy resources;
6. Integrate different systems of energy use.

Prerequisites

Before the course unit the learner is expected to be able to:
Basic knowledge on physics, biology, ecology and informatics.

Course contents

1. Basics of Energy. 2. Sustainable Energy. 3. Fossil Fuels Energy. 4. Nuclear Energy. 5. Renewable Energy Systems. 6. Integration of Energy Systems.

Course contents (extended version)

1. Basics of Energy
   - Force, energy and power.
   - Conservation of energy.
   - Thermodynamics laws.
   - Forms of energy.
   - Conversion and efficiency.
   - Energy use.
   - World energy, politics, laws and tendencies.
2. Energy Use and Society
   - Energy sources.
   - Energy services.
   - Main energy uses and energy efficiency improvement.
   - Statistics of Energy.
   - Global environmental implications.
   - Future perspectives- tendencies and goals.
3. Fossil Fuels Energy
   - Coal.
   - Oil.
   - Gas.
4. Nuclear Energy
   - Radioactivity.
   - Nuclear fission.
   - Thermal fission reactors.
   - Nuclear fusion.
5. Renewable Energy
   - Solar thermal.
   - Solar photovoltaics.
   - Bioenergy.
   - Hydropower.
   - Wind power.
6. Integration of Energy Systems
   - Energy flows and distribution.
   - Case Studies.

Recommended reading

1. Boyle, G. , “Renewable energy. Power for a Sustainable Future”, Oxford University Press, Oxford, 2004
2. Boyle, G. , B. Everett & J. Ramage, “Energy systems and sustainability. Power for a sustainable future”, Oxford University Press, Oxford, 2003
3. Ramage, J. , “Guia da Energia. Um Guia Prático para os Aspectos mais importantes da Energia”, Monitor, Lisboa, 2003.
4. Sorensen B. , Renewable energy, 2nd ed, Academic Press, cop. , San Diego, 2000.
5. Castro, Rui, "Uma Introdução às Energias Renováveis: Eólica, Fotovoltaica e Mini-hídrica", IST PRESS, Lisboa, 2011

Teaching and learning methods

Conventional lectures with oral presentation of subjects. Labs based upon development of pratical exercises related to energy systems. In tutorial classes, students receive further assistance in ongoing research activities. In tutorial classes, students receive further assistance in ongoing research activities.

Assessment methods

1. Regular - (Regular, Student Worker) (Final)
   - Practical Work - 50% (Evaluation of technical reports, practice tests and portfolio (3 ECTS))
   - Final Written Exam - 50% (Final written examination (3 ECTS))
2. Non-regular - (Student Worker) (Final, Supplementary, Special)

Assessment methods

- Final Written Exam - 100% (Theory and practice written exam (6 ECTS))

3. Special - Finalists and Workers - (Student Worker) (Special)
   - Final Written Exam - 100% (Theory and practice written exam (6 ECTS))
4. Supplementary - (Regular, Student Worker) (Supplementary)
   - Final Written Exam - 100% (Theory and practice written exam (6 ECTS))

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

João Paulo Miranda Castro	Amilcar António Teiga Teixeira	Manuel Joaquim Sabença Feliciano	Maria Sameiro Ferreira Patrício
02-02-2024	02-02-2024	03-02-2024	05-02-2024