ISEL
INSTITUTO SUPERIOR DE ENGENHARIA DE LISBOA

ADEM
Área Departamental de Engenharia Mecânica

Sheet course ()

Course	MSc IN MECHANICAL ENGINEERING		
Unit	Energy Management in Buildings	Mandatory	☐
		Optional	☒
Unit scientific area	Control Systems	Category	B

Unit category: B - Basic; C - Core Engineering; E - Specialization; P - Complementary.

Year: 2nd	Semester: 1st		ECTS: 5,0			
Contact time	Total:	T:	TP: 45,0	PL:	S:	OT:

T - Lectures; TP - Theory and practice; PL - Lab Work; S - Seminar; OT - Tutorial Guidance.

Unit Director	Title	Position
Nuno Paulo Ferreira Henriques	Master of Science	Associate Professor

Learning Objectives (knowledge, skills and competences to be developed by students)

(max. 1000 characters)

The aim of this course is to assure that students get a set of knowledge and tools that make them aware of how important is the rational use of energies and turn them able to analise and optimize its generating and using systems in order to manage the energy consumption in buildings.

After completing the course students should have acquired basic skills enabling them:

- to recognize the relevance of energy management and know the applicable regulations for energy certification of buildings;
- identify obstacles difficulting the design of energy efficient buildings;
- to carry out energy audits and analise its results;
- to evaluate the influence of maintenance on energy consumption;
- to equip buildings with energy efficient technical systems;
- to evaluate the influence of automation on installation operation and energy management;
- to implement efficient technologies to comply with regulations requirements;
- to know how to implement and manage an energy management system.

Syllabus

(max. 1000 characters)

Standardisation and energy regulation: National regulations of energetic systems of conditioning and regulation on thermal behaviour.

Energy management of buildings: Energy auditing. Management rational programmes of energy. Organization of energy management systems. Economic analysis and implementation costs.

Building Automation Systems: Energy management systems and centralized technical management systems. Field equipment. Programmable controllers. Supervision, control and operation of facilities.

Control Equipment: Types of control. Control equipment. Internal control depending on external conditions. Automatic control equipment and facilities.

Production systems of thermal energy: Thermal sources. Integrated production systems. Use of solar energy in the air conditioning.

Energy recovery systems: Recovery and heat storage. Storage of cold. Heat exchangers.

Demonstration of consistency of the syllabus with the objectives of the course

(max. 1000 characters)

Each basic skill that should be acquired by students is directly linked with each course main theme. Skills could be acquired by lectures and practical classes assistance and by the execution of a set of pedagogically fundamental activities for continuous evaluation, each one related with one course main theme.

Teaching methodology (evaluation included)

(max. 1000 characters)

The course teaching is based on lectures, practical classes and guided visits to important services buildings to show to the students solutions implemented in those buildings.

Students are motivated to take an active approach on search of basic information and on solving practical problems.

In order to successfully complete this course, students must succeed a set of pedagogically fundamental activities for continuous evaluation, in small groups, consisting on development of four to five (4 to 5) themes related with the subject.

The continuous evaluation activities are compulsory and their classifications are minimum values of 10. Individual oral examination can be requested if necessary.

Demonstration of consistency of teaching methods with the learning objectives of the course

(max. 3000 characters)

Lectures are oriented to discussion and exposure of the syllabus and practical classes are used for the analysis and resolution of practical problems, allowing students to acquire the expertise needed about techniques, technologies and equipments that allow them to manage the management energy systems of buildings.

Guided visits to important buildings allow to show to the students solutions used in buildings energy management systems and centralized technical management systems and to discuss strategies and programmes used by energy managers.

The continuous evaluation depends on the group mark of continuous evaluation activities and individual performance along the classes and guided visits, taking into account the communications skills – oral while answering questions during the activities and oral examinations or written on the reports.

Main Bibliography

(max. 1000 characters)

- Donald R. Wulfinghoff, Energy Efficiency Manual

Energy Institute Press, 1999, ISBN: 978-0-9657926-7-7

- Barney Capehart, Wayne Turner & William Kennedy, Guide to Energy Management

The Fairmont Press, 2002, ISBN: 0-88173-421-7

- Eastop & Watsoon, Mechanical Services for Buildings

Longman, USA, 1992, ISBN: 0582050950

- Luís Roriz, Climatização – Concepção, instalação e condução de sistemas

Edições Orion, 2008, ISBN: 9728620098

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