



Universitat de Lleida

DEGREE CURRICULUM
SUSTAINABLE CONSTRUCTION
III

Academic year 2013-14

Subject's general information

Subject name	SUSTAINABLE CONSTRUCTION III
Code	101433
Semester	1r Q Continuous Assessment
Typology	Optional
ECTS credits	6
Theoretical credits	0
Practical credits	0
Department	Medi Ambient i Ciències del Sòl
Teaching load distribution between lectures and independent student work	60 h in the classroom (40%) 90 h self employment (60%)
Language	English
Distribution of credits	Dr. Jérôme Barrau: 6 credits
Office and hour of attention	with appointment

Dr. Jerome Barrau

Subject's extra information

Subject that requires continuous work throughout the semester in order to achieve the goals.

Advised the joint realization of the subject CS II due to the great help that the HVAC and control systems on the one hand, and simulation softwares for buildings (EnergyPlus) on the other hand, can contribute to the improvement and evaluation of energy efficiency in buildings.

You can find educational materials and other documents related to the subject Campus: <http://cv.udl.cat>

Subjects to be taken in the 1st semester of the 4th year of teaching. It belongs to module "Optional Training", namely the subject "Sustainable Construction".

Requirements: SUSTAINABLE CONSTRUCTION I

Learning objectives

See section "Competences"

Significant competences

Strategic competencies of the University of Lleida

- Mastery of a foreign language

Objectives

- Know the different standards of sustainable construction and the differences between national regulations in force regarding the energy efficiency of buildings.

Specific skills of the Degree

- Ability to adapt building materials to the type and use of the building, managing and directing the reception and quality control of materials, putting in work, the control of execution and conducting test and final test.

Objectives

- Assess the main parameters that affect the energy efficiency of buildings.
- Knowledge of the environmental impact assessment of the building process and demolition, of sustainability in the building, and of the procedures and techniques for assessing the energy efficiency of buildings.
- Know and use the study tools for improving the energy efficiency of buildings.
- Do measurements to analyze the energy efficiency of buildings.
- Develop procedures for energy rating of buildings and energy audits.
- Generate documents for energy certification of buildings from the official program.
- Knowledge of building systems and materials used in traditional or prefabricated building, its varieties and physical and mechanical characteristics that define them.

Objectives

- Interpret the main concepts related to energy audits and certifications.
- Ability to apply technical standards in the construction process, generate documents and technical specifications for building construction methods and procedures.

Objectives

- Apply the regulations at the state, regional and local level.

Transversal competences of the degree

- Ability to consider the socio-economic and sustainability criteria into engineering solutions.
- Ability to plan and organize the work.
- Ability to work in situations of lack of information and / or under pressure.
- Ability to work in teams, both as unidisciplinari or multidisciplinary.
- Ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audience.

Subject contents

Unit 1. INTRODUCTION

- 1.1. Comfort and energy
- 1.2. Energy and Environment
- 1.3. Residential Sector
- 1.4. Environmental assessment of buildings

Unit 2. ENERGY EFFICIENCY

- 2.1. Definition
- 2.2. Regulations
- 2.3. Energy certificates
 - 2.3.1. Definition
 - 2.3.2. Features
 - 2.3.3. Objectives
 - 2.3.4. Scope
- 2.4. Energy audits
 - 2.4.1. Definition
 - 2.4.2. Features
 - 2.4.3. Objectives
 - 2.4.4. Scope
- 2.5. Standards of energy efficient buildings

Unit 3. PARAMETERS AFFECTING THE ENERGY PERFORMANCE OF BUILDINGS

- 3.1. Classifications
 - 3.1.1. By phase
 - 3.1.2. By type of involvement
- 3.2. Parameter Description
 - 3.2.1. Parameters relating to the thermal envelope of buildings
 - 3.2.2. Parameters related to passive systems of buildings
 - 3.2.3. Parameters for active systems in buildings
 - 3.2.3.1. HVAC Systems
 - 3.2.3.2. Lighting Systems

Unit 4. MEASUREMENT TECHNIQUES FOR THE ANALYSIS OF THE ENERGY CHARACTERISTICS OF A BUILDING

- 4.1. Thermography
 - 4.1.1. Fundamentals
 - 4.1.2. Using a thermal imager
 - 4.1.3. Analysis of thermal images
- 4.2. Thermal equipment measurements
- 4.3. Electrical equipment measurements
- 4.4. Analysis by thermal flow meters

4.5. Renovations and infiltration measurements

4.6. Monitoring

Unit 5. BACKGROUND PAPER SAVING ENERGY (DB-HE) THE TECHNICAL BUILDING CODE

5.1. DB-HE1: Limitation of energy demand

5.1.1. Simplified option

5.1.2. General option: Software LIDER

5.2. DB-HE2: Efficiency of thermal installations

5.3. DB-HE3: Energy efficiency of lighting installations

5.4. DB-HE 4: Minimum solar contribution to hot water

5.5. DB-HE 5: Minimum PV contribution to electricity

5.6. Relationship between the DB-HE and reducing the environmental impact of building

Unit 6. ENERGY CERTIFICATES

6.1. Introduction

6.2. Procedure for energy certification of buildings

6.2.1. Simplified option

6.2.2. General option: Software CALENER

6.2.3. Simplified option CE2

6.3. Scale and energy indicators of the grade

6.4. Specifics of the software CALENER GT

6.5. Other tools for building simulations

Unit 7. ENERGY AUDITS

7.1. Introduction

7.1.1. Audits in the context of energy efficiency

7.1.2. Regulations

7.1.3. General objectives

7.1.4. Benefits

7.1.5. Best Practices

7.1.6. Types of audits

7.1.7. The market for energy audits

7.2. Procedure to conduct an energy audit

7.3. Relationship between energy audits (EN 216 501), control and regulation systems (UNE EN 15232) and energy management systems (UNE 216301)

7.4. Criteria for evaluating proposals for improvement

7.4.1. Calculation of energy costs

7.4.2. Economic feasibility analysis

7.5. Examples

Methodology

The main methodology of the course will be divided into:

1.-Theoretical sessions where the master teacher will present the theoretical necessary for the acquisition of knowledge and the proper conduct of the sessions.

2.-Sessions problems where the teacher made ??examples, but where students take an active part in the learning process working in small groups or individually.

3.-Practical laboratory sessions where students work in group practices related to the theme developed in the lectures.

Development plan

The development plan will follow the order of the content. This plan will be presented in detail when we know the

number of students enrolled and we can set up groups and workshops.

Introduction: 2 hours

Unit 1: 2 hours

Unit 2: 6 hours

Unit 3: 12 hours

Unit 4: 8 hours

Unit 5: 8 hours

Unit 6: 12 hours

Unit 7: 6 hours

Assessment activities: 4 hours

Evaluation

Assessment test 1 (PA1): individual written test, 40%

Units 1 to 4

Work on the limitation of the energy demand and energy certification (AA1) Project, 30%

Unit 5: Limitation of the energy demand of buildings:

File LEADER

Excel file simplified options

Analysis results document

Unit 6: Procedure for energy certification of buildings:

Excel file simplified option CE-2

File CALENER

Analysis results document

Energy audit work (AA2) Resolution of a case study, 15%

Unit 7: Quantitative assessment (energy level, economic and environmental) of the sustainability proposals applied to the building object of the activity AA1

Oral presentation AA1 and AA2 results (AA3) Oral, 15%

Clarity of presentation

Respect the rules

Personal contributions

Originality and realism of the proposals

Recovery exam, individual written test: Units1 to 7, 70%

Bibliography

Recommended Bibliography

Books

Eficiencia energética en edificios: Certificación y auditorías energéticas. Francisco Javier Rey Martínez, Eloy Velasco Gomez. Madrid. Thomsoncop., 2006.

Análisis y gestión energética de edificios: métodos, proyectos y sistema de ahorro energético. William H. Clark II. Mac Graw Hill. 1998.

Guía técnica para el aprovechamiento de la luz natural en la iluminación de Edificios. Grupo de Trabajo formado por el Comité Español de Iluminación (CEI) y el Instituto para la Diversificación y Ahorro de la Energía (IDAE). IDEA. 2005.

Guía técnica Contabilización de consumos. Asociación Técnica Española de Climatización y Refrigeración (ATECYR). IDEA. 2007.

Guías Técnicas para la Rehabilitación de la Envolvente Térmica de los Edificios. Asociación Nacional de Industriales de Materiales Aislantes (ANDIMA). 2007.

Els graus-dia de calefacció i refrigeració de Catalunya. Resultats a nivell municipal. Generalitat de Catalunya. Departament de Treball, Indústria, Comerç i Turisme. Institut Català d'Energia. 2003

Scientific papers

Do LEED-certified buildings save energy? Not really.. . John H. Scofield. Energy and Buildings. 41 (2009) 1386–1390.

Web references

IDAE- Institut per a la Diversificació i l'Estalvi de l'Energia

<http://www.idae.es/>

ICAEN- Institut Català d'Energia

<http://www.icaen.net/>

Codi Tècnic d'Edificació

<http://www.codigotecnico.org/>

Agenda de la construcció sostenible

<http://www2.csostenible.net/>

Infodomus. Construcción Sostenible y Eficiencia Energética

<http://www.infodomus.ws/>

E-nergias: Portal de l'energia per als edificis

<http://www.e-nergias.com/www/index.html>

Plataforma EdificacióPassivhaus

<http://www.plataforma-pep.org/>

Arquitectura y clima (pàgina en francès)

<http://www-climat.arch.ucl.ac.be/>

Comitè Europeu de normalització. Àmbit de la construcció

<https://www.cen.eu/cenorm/sectors/sectors/construction/index.asp>

Audiovisual material

Pota bufant (Blower door): Funcionament i interpretació de resultats

<http://www.youtube.com/watch?v=OvWAoL5uR3c>

<http://www.youtube.com/watch?v=LGHnx4qmDj0>

<http://www.youtube.com/watch?v=a-C9lcIEQcc>

Casa bioclimática

<http://www.youtube.com/watch?v=CKX1gbHlqeM>

Edificio bioclimático del CENER

<http://www.youtube.com/watch?v=ahFjOoXrVnM>

Other materials in the Virtual Campus

Guia docent de l'assignatura

Material didàctic

Listat de propostes de temes de PFG

Manuais d'usuaris dels programes oficials LIDER i CALENER

Manual LIDER de URSA

Plan estratégico España Sector Edificación 2004-2012

ESTUDIS MONOGRÀFICS Núm.14

Regulation

All regulations are available in digital format on the virtual campus.

Documento Básico HE - Ahorro de energía

REAL DECRETO 47/2007, de 19 de enero, por el que se aprueba el Procedimiento básico para la certificación de eficiencia energética de edificios de nueva construcción.

Opción Simplificada para la Calificación de Eficiencia Energética de Edificios de Viviendas. IDAE.

Escala de Calificación Energética para Edificios de Nueva Construcción. IDAE.

Directiva 2002/91/CE del Parlamento Europeo y del Consejo, de 16 de diciembre de 2002, relativa a la eficiencia energética de los edificios.

Ordenança solar tèrmica de Lleida. Butlletí Oficial de la província, núm. 99. 21 de Juliol de 2005.

DECRET 21/2006, de 14 de febrer, pel qual es regula l'adopció de criteris ambientals i d'ecoeficiència en els edificis.

UNE 216501:2009 Auditorías energéticas. Requisitos.

UNE 216301:2007 Sistema de gestión energética. Requisitos.