DEGREE CURRICULUM

SUSTAINABLE CONSTRUCTION 2

Academic year 2014-15

SUSTAINABLE CONSTRUCTION II 2014-15

Subject's general information

Subject name	Sustainable Construction 2
Code	101432
Semester	1st term
Typology	Optional
ECTS credits	6
Theoretical credits	0
Practical credits	0
Office and hour of attention	By appointment
Department	Informàtica i Enginyeria Industrial - Medi Ambient i Ciències del Sol
Teaching load distribution between lectures and independent student work	60 h of lectures (40%) 90 h of independent student work (60%)
Modality	Presencial
Important information on data processing	Consult this link for more information.
Language	English
Degree	Degree in Architectural Technology
Distribution of credits	Dr. Gabriel Zsembinszki: 3 credits Dr. Jérôme Barrau: 3 credits
Office and hour of attention	By appointment
E-mail addresses	gabrielz@diei.udl.cat jerome@macs.udl.cat

SUSTAINABLE CONSTRUCTION II 2014-15

Dr. Gabriel Zsembinszki
Dr. Jérôme Barrau

Subject's extra information

Subject that requires continuous work throughout the semester in order to achieve the goals. We suggest you the joint realization of Sustainable Construction 3, due to the great interction between both subjects. You can find educational materials and other documents related to the subject Campus: http:cv.udl.cat

Learning objectives

• Understand and apply the regulations.
• Know the physical and engineering concepts of air conditioning systems in buildings and assess their economic reliability.
• Analyze behaviors of buildings using energetic simulation programs
• Identify and evaluate proposals for improvement of buildings
• Develop sizing of renewable energy systems for buildings
• Advising on the main services offered by home automation systems and control and regulation.
• Interpret the main concepts related to home automation systems and control and regulation.

Competences

Strategic competences of UdL

- UdL2 Command of a foreign language.

Cross-disciplinary competences

- EPS3. Capacity to convey information, ideas, problems and solutions to both a specialized and no specialized public.
- EPS7. Capacity to work in situations with a lack of information and/or under pressure.
- EPS8. Capacity of planning and organizing the personal work.
- EPS9. Capacity for unidisciplinary and multidisciplinary teamwork.
- EPS13. Capacity to consider the socioeconomic context as well as the sustainability criteria in engineering solutions.

Specific competences

- GEE12. Manufactured or traditional constructive systems and materials knowledge, its varieties and physics and mechanical characteristics that define them.
- GEE13. Capacity to adapt the materials of construction to the typology and use of buildings; manage the reception and the quality control of the materials, its use in the building works, the execution control of the units of work and the performance of tests and final proofs.
- GEE20. Knowledge of the environmental impact evaluation for building and demolition process, of sustainability in buildings, and of the procedures and techniques to determine the energy efficiency in buildings.
- GEE21. Capacity to apply technical rules to the building process, and produce documents of technical specification of the procedures and constructive methods of buildings.

Subject contents

Part A: ENERGY SYSTEMS FOR BUILDINGS

Item A1. BASIC CONCEPTS OF HEAT TRANSFER

1.1. Introduction to heat transfer

1.2. Heat transfer mechanisms

1.3. Simultaneous heat transfer mechanisms

1.4. Radiation properties

1.5. View factors

1.6. Radiation heat transfer

Item A2. STEADY HEAT CONDUCTION

2.1. Steady heat conduction in plane walls

2.2. Thermal contact resistance

2.3. Heat conduction in cylinders

2.4. Critical radius of insulation

2.5. Overall heat transfer coefficient

Item A3. GLOBAL ENERGY BALANCES

3.1. Types of heat exchangers

3.2. Flow analysis in a tube

3.3. Analysis of heat exchangers

3.4. Heat emitters or radiators

3.5. Thermal balance of a conditioned space

3.6. Optimal thickness of insulation

Item A4. PSYCHROMETRIC PROCESSES

4.1. Introduction. Basic concepts

4.2. Thermodynamic properties of moist air

4.3. Properties representation. Psychrometric charts

4.4. Main psychrometric processes

4.5. Examples of systems and devices

4.6. Supply air in a conditioned space

4.7. Psychrometric analysis of some systems

Part B: NEAR ZERO ENERGY BUILDINGS (NZEB)

B0. INTRODUCTION

NZEB, *European Directive 2010/31/UE*

Net balance

B1. BUILDING SIMULATION SOFTWARE: *How to reduce the Energy consumption of the buildings?*

Pack**:** Google Sketch-up + Open Studio + EnergyPlus

B2. RENEWABLE ENERGY FOR BUILDINGS: *How to cover the low Energy Consumption by on-site renewable energy?*

Solar PV systems

Solar Thermal systems

Other technologies

B3. CONTROL AND REGULATION SYSTEMS: *How domotics (or SCADA systems) can help to reduce the Energy Consumption?*

Introduction

Services to manage

Design of SCADAs

Visit to CREA Building; SCADA system

Methodology

The main methodology of the course is divided into:

1.-Sessions of theoretical lectures, where the teacher will expose theoretical concepts required for the acquisition of knowledge and for the proper conduct of the practical sessions.

2.-Problem sessions, where the teacher will make some examples, but where the students will take an active part in the learning process, by working in small groups or individually.

3.-Laboratory sessions, where the students will work in group some practices related to the topics covered in the theoretical sessions.

Development plan

The development plan will have the following number of hours dedicated to each topic:

Presentation of the subject/questionnaire: 1h

Part A: 29h00

Part B: 30h00

Evaluation

EVALUATION ACTIVITY EA1: SCIENTIFIC ARTICLE (oral presentationl)

- 20%: Item A

EVALUATION ACTIVITY EA2: FIRST MIDTERM EXAM (individual written exam)

- 30%: Item A

EVALUATION ACTIVITY EA3: ENERGYPLUS PROJECT (Project and oral presentation)

25%: Items B1

Delivery of a project report (20%):

This evaluation item also includes: a) Delivery of the files, b) Individual realization of modifications to the model

Oral presentation of the project (for both EA3 and EA4 projects) (5%)

EVALUATION ACTIVITY EA4: RENEWABLE ENERGY PROJECT (Project and oral presentation)

- 25%: Item B2

Delivery of a project report (20%)

Oral presentation of the project (for both EA3 and EA4 projects) (5%)

RECOVERY ACTIVITY: Items (A) and/or (B). Individual written exam; 100%

Bibliography

Recommended bibliography

Books

Manual de Aire Acondicionado Carrier. Ed. Marcombo1999. ISBN: 84-267-0115-9.

Fundamentos de aire acondicionado y refrigeración.Hernàndez Goríbar. Ed. Limusa 2001. (Noriega Editores).

Manuales prácticos de refrigeración. Tomos I-IV.Francesc Buqué. Ed. Marcombo 2006. ISBN: 84-267-1386-6.

Building energy management systems. G.J. Lovermore.Ed. E & FN SPON, 1992. ISBN: 0-419-15290-3.

Cómo ahorrar energía instalando domótica en suvivienda. Gane en confort y seguridad. CEDOM- IDAE. AENOR. 2008.

Recomendaciones Prácticas para Instalaciones Domóticas. Fundación Privada Institut Ildefons Cerdà. Ministerio de Ciencia yTecnología. 2001.

Domótica y Hogar Digital. Stephan Junestrand, Xavier Pasarte, Daniel Vásquez. Paraninfo. 2004

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Domótica. Edificios Inteligentes. Ramón J. Millántejedor, José Manuel Huidobro. Creaciones Copyright. 2004.

El Hogar Digital. Necesidades que atiende. Servicios que presta. Valentín Fernández. Creaciones Copyright. 2005.

Técnicas y Procesos en Instalaciones Automatizadas en Viviendas y Edificios. Juan Millán Esteller. Paraninfo. 2001.

Sistemas de control para viviendas y edificios. Domótica. Jose M. Quinteiro Gonzalez, Javier Lamas Graziani, Juan D. SandovalGonzalez. Madrid Paraninfo. 2003.

Domótica e Inmótica. Viviendas y Edificios Inteligentes. Cristóbal Romero Morales, Franciso Vazquez Serrano, Carlos deCastro Lozano. Madrid Ra-MA cop. 2006.

Instalaciones Automatizadas en Viviendas y Edificios. José Moreno Gil, Elías Rodríguez Diéguez, David Lasso Tárraga. Paraninfo. 1999.

Scientific papers

Lighting energy savings in offices using different control systems and their real consumption. B. Roisin, M. Bodart, A. Deneyer,P. D'Herdt. Energy and Buildings 40

(2008) 514–523.

Influence of sensor position in building thermal control: criteria for zone models. Peter Riederer, Dominique Marchio, JeanChristophe Visier. Energy and Buildings 34 (2002)

785–798.

Web references

CASADOMO. The website of digital home

http://www.casadomo.com/

SIMON- Automated material

http://www.simondomotica.es/

Digital Home White Paper.Telefónica.

http://www.telefonica.es/sociedaddelainformacion/html/publicaciones_libroblanco.shtml

Schneider Electric Formation Institute

www.isefonline.es/

Home automation informative web

http://domotica-online.com/

Audiovisual material

Management of a water treatment system with a SCADA

http://www.youtube.com/watch?v=rj44AkHmVCo

Human Machine Interface HMI

http://www.youtube.com/watch?v=P-E8NlUNiX4

Example of home automation

http://www.youtube.com/watch?v=XNtdCqy-ieA

Other materials in the Virtual Campus

Guide of the subject

Teaching materials

List of proposed topics of PFG

Guía BT-51: Instalaciones de sistemas de automatización, gestión técnica de la energía y seguridad para viviendas y edificios.

Situación de la domótica y claves para el éxito. Alfredo Villalba. INMOMATICA. CEDOM. 2007.

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STUDIS MONOGRÀFICSNúm.14

Regulation

All regulations are available in digital format on campus.

Reglamento particular RP 30.24. de la marca AENOR para instalaciones de sistemas domóticos en viviendas. AENOR. 2007

Especificación AENOR EA0026: 2006 para instalaciones de sistemas domóticos en viviendas. Prescripciones generales de instalaciones y evaluación. AENOR. 2006.

UNE EN 15232:2008. Eficiencia energética de los edificios. Métodos de cálculo de las mejoras de la eficiencia energética mediante la aplicación de sistemas integrados de

gestión técnica de edificios. AENOR. 2008.