Universitat de Lleida

DEGREE CURRICULUM

SUSTAINABLE CONSTRUCTION II

Coordination: BARRAU , JEROME

Academic year 2023-24

SUSTAINABLE CONSTRUCTION II 2023-24

Subject's general information

<table>
<tr><td>Subject name</td><td>SUSTAINABLE CONSTRUCTION II</td></tr>
<tr><td>Code</td><td>101432</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Architectural Technology and Building Construction</td><td>4</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
<tr><td>Bachelor's Degree in Energy and Sustainability Engineering</td><td>4</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
<tr><td>Bachelor's Degree in Mechanical Engineering</td><td>4</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
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<tr><th>Activity type</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>3</td><td>3</td></tr>
<tr><td>Number of groups</td><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>BARRAU , JEROME</td></tr>
<tr><td>Department</td><td>ENVIRONMENT AND SOIL SCIENCES AND CHEMISTRY</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>60 h of classroom work(40%)
90 h of independent student work (60%)</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Distribution of credits</td><td>Adrià Mateo: 3 credits
Gabriel Zsembinszki: 3 credits</td></tr>
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SUSTAINABLE CONSTRUCTION II 2023-24

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
BARRAU , JEROME	jerome.barrau@udl.cat	0	
MATEO FORNÉS, ADRIÀ	adria.mateo@udl.cat	3,6	
ZSEMBINSZKI , GABRIEL SEBASTIAN	gabriel.zsembinszki@udl.cat	3,6	

Subject's extra information

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

We suggest you the joint realization of Sustainable Construction 3 (Procedures on the energy efficiency of buildings in relation to Spanish law) due to the fact that it deals with complementary tools in this course in terms of evaluation and optimizing the energy efficiency of buildings. The project can be done for this course can be done in conjunction with the one of Sustainable Construction 3.
You can find educational materials and other documents related to the subject on the Virtual Campus: http://cv.udl.cat

According to Directive 2010/31 / EU of the European Union, all new buildings must be, in 2020, Near-Zero Energy Buildings (NZEB). Consequently, the energy demand of buildings should be reduced and energy consumption should be supplied by the same building through renewable energy generation systems.

This course is aimed at achieving the necessary skills for the development of the activity of the Engineer and Technical Architect in relation to such buildings. Therefore, following the procedure of designing a building NZEB, the course is structured in two parts:

1- Passive design of the building: The purpose of this section is to minimize the energy demand of the building, by optimizing the design parameters (thermal insulation, orientation, shade elements ...). This optimization is done mainly through the free tool for energy assessment of buildings *EnergyPlus,* developed by the *U.S. Department of Energy Office Building Technologies*, and internationally recognized.

2. Active Renewable Systems. The aim here is to approach and size the renewable energy systems, applicable to buildings, to meet the energy demands of the building. In this section, we will work specifically on solar thermal and photovoltaic energy, but also on other technologies that can be applied to buildings.

Learning objectives

- Understand and apply the regulations.
- 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.

SUSTAINABLE CONSTRUCTION II 2023-24

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

Unit 0. INTRODUCTION

NZEB, *European Directive 2010/31/UE*

Net balance

Unit 1.BUILDING SIMULATION SOFTWARE: *How to reduce the Energy consumption of the buildings?*

OpenStudio + EnergyPlus + CypethermHE

Building modeling

Building energy performance

Energy balance

Passive solutions

Unit 2. RENEWABLE ENERGY FOR BUILDINGS: *How to cover the low Energy Consumption by on-site renewable energy?*

Solar energy

Solar PV systems

Solar Thermal systems

Other technologies (control and regulation systems)

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.- Virtual video tutorials

3.- 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.

4.- Individual practical sessions

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

Development plan

Week	Methodology	Content	Classroom hours	Independent work hours	Professor
1	Lecture	Unit 0. INTRODUCTION	4	5	J.Barrau A.Mateo G. Zsembinszki
2-4	Lecture Practices Weighted practices Videotutorials	Unit 1. BUILDING SIMULATION SOFTWARE	12	20	A.Mateo
5-8	Lecture Practices Weighted practices Videotutorials	Unit 2. RENEWABLE ENERGY FOR BUILDINGS	12	20	G. Zsembinszki
9	Evaluation	Mid-term exam			J.Barrau A.Mateo G. Zsembinszki
10-15	Lecture Practices Group work	Unit 1. BUILDING SIMULATION SOFTWARE Unit 2. RENEWABLE ENERGY FOR BUILDINGS	20	45	A.Mateo G. Zsembinszki
16-17	Evaluation	Final exam Group project			J.Barrau A.Mateo G. Zsembinszki
18-19	Recovery	Mid-term exam Final exam Group project			J.Barrau A.Mateo G. Zsembinszki

Evaluation

Objectives	Evaluation Activities	Criteria	%	Dates	O/V(1)	I/G(2)	Observations
Units 1-2	Mid-term exam	• **Minimum mark of 5/10**	30	Week 9	O	I	100% recoverable
Units 1-2	Project (Document + Simulation files)	• **Minimum mark of 5/10** • *Continued work* • *Delivered files* • *Originality and realism of the proposals* • *Quality of the report and conclusions* • *Program Control*	30	Weeks 16 and 17	O	G	100% recoverable The project will be delivered at the proposed date
Units 1-2	Oral presentation of projects	• **No minimum mark** • Presentation quality • Presentation and analysis of the results	10	Weeks 16 and 17	O	G	Individual mark Not recoverable The project presentations will be done at the proposed date
Units 1-2	Final exam	• **Minimum mark of 5/10**	30	Weeks 16 and 17	O	I	100% recoverable
Units 1-2	Mid-term exam recovery	• **Minimum mark of 5/10**	30	Week 19	O	I	
Units 1-2	Final exam recovery	• **Minimum mark of 5/10**	30	Week 19	O	I	
Units 1-2	Project recovery	• **Minimum mark of 5/10** • *Continued work* • *Delivered files* • *Originality and realism of the proposals* • *Quality of the report and conclusions* • *Program Control* • *Program Control*	30	Week 19	O	G	The project will be delivered at the proposed date

(1) Obligatory / Voluntary.
(2) Individual / Group.

*Same criteria for alternative evaluation students

Bibliography

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

National Renewable Energy Laboratory (NREL) http://www.nrel.gov/

EnergyPlus Website https://energyplus.net/

Beckman, William A.; Proyecto de sistemas térmico-solares por el método de las curvas- f. / por William A. Beckman, Sanford A. Klein, John A. Duffie ; Laboratorio de Energía Solar de la Universidad de Madison, Wisconsin; Madrid 1982