

## **ENVIRONMENTAL SYSTEMS AND STRATEGIES 2**

### **Bachelor in Architectural Studies BAS SEP-2023 ESS2-AS.3.S.A**

Area Architecture and Design

Number of sessions: 30

Academic year: 23-24

Degree course: THIRD

Number of credits: 6.0

Semester: 2º

Category: COMPULSORY

Language: English

Professor: **FRANCISCO JAVIER AVILÉS MONTES**

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### **FRANCISCO JAVIER AVILÉS MONTES**

Architect, entrepreneur and university professor; expert witness architect and member of the Madrid Architects Association and of AENOR's Technical Committees of Certification AEN/CTC 003 and AEN/CTC 014.

He manages the architecture firm Fundamenta Arquitectura S.L.U., providing service in all Spain, and he is specialized in legal architecture, energy efficiency and in building construction technology. His work has been shown in exhibitions and published in different media. He has been invited as a speaker to conferences and has participated in developing international cooperation projects.

Currently, he combines his professional work as an architect with his teaching activities at Universidad Europea and IE University, as a bilingual professor for the Architecture, Civil Engineering, Building Engineering and Design Degrees, mainly in the construction, building services and energy efficiency areas.

#### **Corporate Experience**

- Chief Executive Officer and founder. Fundamenta Arquitectura S.L.U. (formerly J.M.G. 97 S.L.). Spain, 2011-present.
- Board member of the Technical Certification Committees AEN/CTC 003 and AEN/CTC 014. AENOR, Spain, 2015-present.
- Chief Executive Officer and co-founder. Raumplan S.L., Spain, 2017-2018.
- Chief Executive Officer and co-founder. Avilés y Bárcena Construcciones y Rehabilitaciones, S.L., Spain, 2010-2012.
- Technical collaborator. Carpe Diem Obras y Reformas S.L., Spain, 2006.

#### **Academic Experience**

- Adjunct Professor at the School of Architecture, Engineering & Design. Universidad Europea, Spain, 2012-present.
- Adjunct Professor at the School of Architecture & Design. IE University, Spain, 2022-present.

## **Academic Background**

- Architect. Universidad Europea de Madrid, Spain, 2011.

### **Office Hours**

Office hours will be on request. Please contact at:

faviles@faculty.ie.edu

## **SUBJECT DESCRIPTION**

Energy efficiency as well as building services have a very important role in every kind of building; thus, their learning is vital during the training of an architect. Thinking architecture without considering these issues would mean the failure of a project; that is why the main target of this course is to form the students in design and calculation aspects, so they achieve the necessary knowledge to succeed during their professional activity.

From a teaching point of view it is indispensable not to focus only in a theoretical area, but to complement it with the self- investigation of the student, and especially with the solving of exercises that relate the achieved knowledge with the reality of professional activity, and therefore helping to secure the rote knowledge. Consequently, during the year the students will apply their theoretical knowledge to practical cases, proposing, designing and calculating different kinds of building services, assessing and improving energy efficiency on buildings, and selecting the necessary systems, materials and products to satisfy current technical regulations.

## **LEARNING OBJECTIVES**

(Per Ministerial Decree EDU/2075/2010, 29 of July; and the official accreditation request for the Bachelor in Architectural Studies, July 2015; see BOCYL, 14 March 2018: p. 10477-10481)

### **2.1-BASIC AND GENERAL OBJECTIVES**

CB1: Students have demonstrated knowledge and an understanding of a given area of study, building upon the foundation of secondary education, supported by advanced texts, and including aspects that engage the latest advances in their area of study.

CB2: Students know how to apply their knowledge professionally to their work or vocation and possess the competencies that are often demonstrated through elaboration and defense of arguments and the resolution of problems within their area of study.

CB3: Students can gather and interpret relevant facts (usually within their area of study) in order to make judgments that include reflection on relevant social, scientific, and ethical topics.

CB4: Students can transmit information, ideas, problems, and solutions to both specialized and non-specialized audiences.

CB5: Students have obtained the needed learning abilities to start future studies with a high level of autonomy.

CG4: An understanding of the fundamental issues in structural design, construction, and engineering as related to building projects, as well as the techniques used to address these issues.

CG5: Knowledge of the issues related to building physics, technologies, and programmatic uses, in order to create buildings that provide internal comfort and protection from the elements.

CG6: Knowledge of the industries, organizations, regulations, and procedures needed in order to transform projects into buildings, and to integrate drawings into the planning process.

## 2.2-SPECIFIC COMPETENCIES

Module: Installations.

CE13: Ability to apply technical and constructive codes and regulations.

CE20: Capacity to develop, calculate, design, and execute the supply, treatment, and drainage of heating and cooling fluids, and to integrate this into buildings and urban complexes.

CE22: The capacity to design building and urban installations of electrical transformation and power supply, audiovisual communication, acoustic conditioning, and artificial lighting.

CE23: The capacity to preserve mechanical and electrical systems.

## 2.3-TRANSVERSE COMPETENCIES OF THE UNIVERSITY

CT2: Ability to exercise professional behavior in accordance with constitutional principles and ethical values of the respective profession.

CT4: Use disciplinary knowledge to analyze and evaluate current situations.

CT5: Integrate oneself into interdisciplinary and multicultural teams to achieve common goals in a context of diversity.

## 2.4-SPECIFIC OBJECTIVES AND SKILLS

The main target of the course will be the achievement of the specific competencies CE13, CE20, CE22, and CE23, as described above.

## TEACHING METHODOLOGY

IE University teaching method is defined by its collaborative, active, and applied nature. Students actively participate in the whole process to build their knowledge and sharpen their skills. Professor's main role is to lead and guide students to achieve the learning objectives of the course. This is done by engaging in a diverse range of teaching techniques and different types of learning activities such as the following:

Learning Activity	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	26.67 %	40.0 hours
Discussions	13.33 %	20.0 hours
Exercises in class, Asynchronous sessions, Field Work	6.67 %	10.0 hours

Group work	40.0 %	60.0 hours
Individual studying	13.33 %	20.0 hours
TOTAL	100.0 %	150.0 hours

## **PROGRAM**

### **SESSIONS 1 - 2 (LIVE IN-PERSON)**

#### **LU.01\_PSYCHROMETRICS**

Air composition.

Psychrometric chart.

Sensible heating and cooling processes.

Adiabatic cooling.

Thermal comfort.

### **SESSIONS 3 - 4 (LIVE IN-PERSON)**

#### **LU.01\_PSYCHROMETRICS**

Air composition.

Psychrometric chart.

Sensible heating and cooling processes.

Adiabatic cooling.

Thermal comfort.

### **SESSIONS 5 - 6 (LIVE IN-PERSON)**

#### **LU.02\_INSULATION IN BUILDINGS**

Transmittance and thermal resistance.

Convection, conduction, radiation.

Calculations.

Insulation materials.

### **SESSIONS 7 - 8 (LIVE IN-PERSON)**

#### **LU.02\_INSULATION IN BUILDINGS**

Transmittance and thermal resistance.

Convection, conduction, radiation.

Calculations.

Insulation materials.

### **SESSIONS 9 - 10 (LIVE IN-PERSON)**

#### **LU.03\_VENTILATION**

Regulations.

Natural, mechanical and hybrid systems.

Calculation and design criteria.  
Examples.

## **SESSIONS 11 - 12 (LIVE IN-PERSON)**

### **LU.03\_VENTILATION**

Regulations.  
Natural, mechanical and hybrid systems.  
Calculation and design criteria.  
Examples.

## **SESSIONS 13 - 14 (LIVE IN-PERSON)**

### **LU.04\_ENERGY DEMAND AND CONSUMPTION LIMITATION**

Regulations.  
Passive design criteria.  
Energy-demand simulation.  
Thermal installations selection criteria.  
Energy-consumption simulation.  
Examples.

## **SESSIONS 15 - 16 (LIVE IN-PERSON)**

### **LU.04\_ENERGY DEMAND AND CONSUMPTION LIMITATION**

Regulations.  
Passive design criteria.  
Energy-demand simulation.  
Thermal installations selection criteria.  
Energy-consumption simulation.  
Examples.

## **SESSIONS 17 - 18 (LIVE IN-PERSON)**

### **LU.04\_ENERGY DEMAND AND CONSUMPTION LIMITATION**

Regulations.  
Passive design criteria.  
Energy-demand simulation.  
Thermal installations selection criteria.  
Energy-consumption simulation.  
Examples.

## **SESSIONS 19 - 20 (LIVE IN-PERSON)**

### **LU.05\_THERMAL LOADS**

Exterior & interior conditions.  
Heating load calculation.

Cooling load calculation.  
Thermal installations selection criteria.

#### **LU-06\_HEATING, COOLING AND AIR-CONDITIONING**

Regulations.  
Systems.  
Design and calculation criteria.  
Examples.

#### **SESSIONS 21 - 22 (LIVE IN-PERSON)**

##### **LU-06\_HEATING, COOLING AND AIR-CONDITIONING**

Regulations.  
Systems.  
Design and calculation criteria.  
Examples.

#### **SESSIONS 23 - 24 (LIVE IN-PERSON)**

##### **LU-06\_HEATING, COOLING AND AIR-CONDITIONING**

Regulations.  
Systems.  
Design and calculation criteria.  
Examples.

#### **SESSIONS 25 - 26 (LIVE IN-PERSON)**

##### **LU-07\_ACOUSTICS**

Regulations.  
Physical structure of sound.  
Design and calculation criteria.  
Examples.

#### **SESSIONS 27 - 28 (LIVE IN-PERSON)**

##### **LU-08\_LIGHTING**

Regulations.  
Light physics.  
Lighting systems.  
Energy efficiency in lighting installations.  
Calculation and design criteria.

#### **SESSIONS 29 - 30 (LIVE IN-PERSON)**

##### **FINAL SUBMISSION OF THE EXERCISES AND EXAM**

## EVALUATION CRITERIA

### GRADING AND ATTENDANCE NOTES:

**Students have access to a total of four enrollments, in two consecutive academic years.**

Students must attend at least 80% of all class sessions. Students who do not meet this minimum percentage automatically fail both first and second enrollments, and pass directly to the third enrollment.

Students that have failed the subject in first enrollment pass to the second enrollment, except those who do not meet the minimum attendance percentage, and that therefore pass directly to the third enrollment.

### Ordinary Examination (1st exam session):

For all students who fulfil the university's attendance requirements (which is a minimum of 80%), final assessment will be the weighted average of the aspects related above. If the obtained qualification is not equal or superior to 5.0, the student will have to take the extraordinary examination (2nd exam session). Students with a percentage of class attendance under 80% will be assessed directly on the 3rd and 4th exam sessions.

### Extraordinary Examination (2nd exam session):

Students will have to individually improve the main exercise of the course -the project- and only that part will be assessed.

Students can attend the extraordinary examination only if all exercises have been submitted and if the exams have been taken. The maximum grade that a student may achieve in second enrollment is an 8.

### Ordinary and Extraordinary Examinations (3rd and 4th exam sessions):

For those students that are on the 3rd and 4th exam sessions, the evaluation system will follow the same criteria. Taking into account the fact that they might not be able to attend the sessions regularly, they will be provided with the course material on the on-line campus.

However, all cases will be studied individually at the beginning of the course.

Students have access to a total of four enrollments, in two consecutive academic years.

### Evaluation Methods:

(Per Ministerial Decree EDU/2075/2010, 29 of July; and the official accreditation request for the Bachelor in Architectural Studies, July 2015; see BOCYL, 14 March 2018: p. 10477-10481)

This course will involve the following evaluation methods:

SE1: Attendance and Active Participation.

SE3: Submission and/or Presentation of Individual Projects.

SE4: Evaluation of Group Exercises.

SE5: Evaluation of Individual Exercises.

SE6: Exam/s.

criteria	percentage	Learning Objectives	Comments
Attendance and Active Participation	10 %		
Submission and/or Presentation of Individual Projects/Exercises	20 %		
Evaluation of Group Exercises	50 %		
Final Exam	20 %		

## **RE-SIT / RE-TAKE POLICY**

Refer to the previously presented information.

## **BIBLIOGRAPHY**

### **Recommended**

- Sanglier, del Río, Alonso, Rubio. *Physical Fundamentals in Building Systems*. Ediciones Asimétricas. ISBN 9788417905415 (Printed)
- Alonso, Bautista, Hormigos, Morollón. *Energy Savings in Building Design*. Ediciones Asimétricas. ISBN 978849479153 (Printed)
- Alonso, Bautista, Hormigos, Montero. *Air-Conditioning Systems in Building Design*. Ediciones Asimétricas. ISBN 9788494695742 (Printed)
- Alonso, Bautista, Morollón. *Hydraulic Systems in Building Design*. Ediciones Asimétricas. ISBN 978849443004 (Printed)
- Alonso, del Alma, Cesteros. *Acoustics in Building Design*. Ediciones Asimétricas. ISBN 9788494917851 (Printed)
- Alonso, del Río, Aramburu, Montero. *Lighting Systems in Building Design*. Ediciones Asimétricas. ISBN 9788494630026 (Printed)
- Wellpott. *Installations in Buildings*. Editorial Gustavo Gili. ISBN 9788425221156 (Printed)

## **BEHAVIOR RULES**

Please, check the University's Code of Conduct [here](#). The Program Director may provide further indications.

## **ATTENDANCE POLICY**

Please, check the University's Attendance Policy [here](#). The Program Director may provide further indications.

## **ETHICAL POLICY**

Please, check the University's Ethics Code [here](#). The Program Director may provide further indications.