Course guide
330241 - IS - Systems Integration

Last modified: 30/06/2023

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR'S DEGREE IN ICT SYSTEMS ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: PERE PALA SCHONWALDER

Others: JORDI BONET DALMAU

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge of the architecture of communication networks and their application, as well as the ability to design, deploy and manage communication networks, especially computer networks.
2. Knowledge and ability to use existing tools and instrumentation for the analysis, design, development and verification of electronic, computer and communications systems.
3. The ability to perform the typical activities of the degree, taking into account the corresponding standards, rules and regulations.
4. Ability to model and simulate systems in the field of the degree and apply the results to problem solving within this field.
5. The ability to analyze, design and implement, select and use real-time data processing, control and automation systems, especially in embedded systems.
6. The ability to define, program, and use embedded devices with global connectivity.
7. The ability to define, analyze, design, develop, evaluate, document and launch systems that include electronic, computer and communications subsystems.

Transversal:
8. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
9. ENTREPRENEURSHIP AND INNOVATION - Level 3. Using knowledge and strategic skills to set up and manage projects. Applying systemic solutions to complex problems. Devising and managing innovation in organizations.
10. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
11. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
08 GEN. GENDER PERSPECTIVE: An awareness and understanding of sexual and gender inequalities in society in relation to the field of the degree, and the incorporation of different needs and preferences due to sex and gender when designing solutions and solving problems.

TEACHING METHODOLOGY

The subject consists of face-to-face activities consisting of 2 hours per week in the classroom (large group) and 2 hours per week in the laboratory (small group).
The student carries out learning through various mechanisms. In the lectures and participative classes in the classroom the contents of the subject are presented and the interaction between students and the teacher is facilitated. Individual / group personal work activities are also proposed that should contribute to the understanding of the subject.
In the small group classes the project will be worked on at the group level. The teacher will be available to answer questions and help the different work teams to adequately plan the activities to be carried out outside the classroom.
The fact of working in a team and also individually as well as the development, in the course project, of an innovative project makes the student work on all the generic competences.

LEARNING OBJECTIVES OF THE SUBJECT

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STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	20.00
Self study	90,0	60.00
Hours small group	30,0	20.00

Total learning time: 150 h

CONTENTS

1. INTRODUCTION

Description:
This topic presents the principles of electronic, computer and communication systems, focusing on their integration.
· Electronic subsystems
· Communication subsystems
· Computer subsystems
· Project partitioning

Related activities:
All.

Full-or-part-time: 30h
Theory classes: 6h
Practical classes: 6h
Guided activities: 18h

2. SYSTEMS INTEGRATION

Description:
· Electronic, computer and communication systems engineering.
· Scheduling.
· Concept simulation and validation
· Design of integrated systems.
· Specifications.
· Technical and financial assessment.
· Supply.
· User interfaces.
· Communication networks.
· Hardware-software codesign.

To achieve this objective, the paradigm of heuristics applied to the definition of complex systems is presented. A historical review of complex systems in context is made. Specific heuristics are presented and their use is proposed in specific cases. The areas of systems built by the builder, social systems, collaborative systems are presented ... Specific case studies are made (the GPS system, intelligent transport systems, layered architecture systems) and attention is devoted to the construction of models such as a necessary tool in all phases of the global project.

Related activities:
All.

Full-or-part-time: 120h
Theory classes: 24h
Practical classes: 24h
Self study : 72h

ACTIVITIES

TITLE OF ACTIVITY 1: LECTURES WITH PARTICIPATION

Description:
Theoretical content will be presented during these sessions. Students will have the opportunity to participate and interact with the professor.

Specific objectives:
All of the subject.

Material:
Published teaching material.
Recommended bibliography.

Delivery:
Occasionally, assessable activities will be carried out, which will contribute in a proportional part to the grade.

Full-or-part-time: 25h
Theory classes: 25h

TITLE OF ACTIVITY 2: PROJECT

Description:
Students will carry out a project throughout the entire class. Face-to-face sessions lasting two hours will be held at the laboratory every week in groups. Information will be published for students in the appropriate format. There will be computers as well as all the instrumentation necessary to complete the exercises in question at the laboratory.

Specific objectives:
· Design a complete integrated system.
· Carry out the experimental validation of prototypes.
· Write and present documents that reflect the design process.

Material:
Electronic equipment and instrumentation, breadboards, laboratory consumables, computer with suitable software.
Documentation and information to support the performance of the work.

Delivery:
Periodically the students will deliver documentation with the objectives of the work that will be developed. They will also periodically deliver documentation that reflects the actual progress of the course project.
At the end of the project, a global report will be written and a presentation will be made. The evaluation will take into account all the documentation, as well as the presentation and an assessment of the work carried out regularly.

Full-or-part-time: 75h
Laboratory classes: 30h
Self study: 45h

TITLE OF ACTIVITY 3: INDIVIDUAL / GROUP WORK

Description:
Students must complete certain activities on their own time in order to achieve the objectives of the subject.

Specific objectives:
All of the subject.

Material:
Published teaching material.
Recommended bibliography.

Delivery:
Individual / group personal work will be translated, in part, into exercises during the course. The qualification of these exercises will contribute to the evaluation of the subject as described later.

Full-or-part-time: 30h
Self study: 30h

TITLE OF ACTIVITY 4: EXAMS

Description:
At the end of the class, there will be a final exam on the overall knowledge acquired.

Specific objectives:
All of the subject.

Material:
Test statements.

Delivery:
The qualification of the tests will contribute to the evaluation of the subject as described below.

Full-or-part-time: 20h
Theory classes: 5h
Self study: 15h

GRADING SYSTEM

EXAMINATION RULES.

Those activities that are explicitly declared as individual, whether in person or not, will be carried out without any collaboration from other people.
The dates, formats and other delivery conditions that are established will be mandatory.

BIBLIOGRAPHY

Basic:
- Maier, M. W.; Rechtin, E. The art of systems architecting. 3rd ed. Boca Raton: CRC Press, 2009. ISBN 9781420079135.

Complementary:
- Langford, G. O. Engineering systems integration: theory, metrics, and methods. Boca Raton: CRC Press, 2012. ISBN 9781439852880.

RESOURCES

Other resources:
Teaching material published in the Open Courseware of the subject.