Course guide
330242 - SAR - Automatic and Robotic Systems

Last modified: 09/05/2023

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: TERESA ESCOBET CANAL

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge of the fundamentals and applications of electronic power circuits.
2. Knowledge of the main principles and applications of sensing systems and actuation systems
3. Knowledge and ability to use existing tools and instrumentation for the analysis, design, development and verification of electronic, computer and communications systems.
4. Ability to model and simulate systems in the field of the degree and apply the results to problem solving within this field.
5. Ability to understand and use feedback theory and electronic control systems
6. The ability to analyze, select and use real-time data processing, control and automation systems, especially in embedded systems.
7. The ability to design, understand and use systems made to perform a specific task based on the stimuli captured in their environment, including robotic systems. An understanding of the basic concepts of complementary technology in the field of ICT with the aim of acquiring a broad perspective of the technology applied to engineering.

Transversal:
8. EFFECTIVE USE OF INFORMATI0N 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.
9. 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.

TEACHING METHODOLOGY

The class will consist of four hours per week. One hour will be a lecture of the main content and the remaining three hours are devoted to solving practical problems in the laboratory or classroom. Supervised learning hours carried out in small groups and pairs consist of solving practical problems, which are aimed at helping students develop basic instrumental skills in a control and automation laboratory, as well as initiating students in the use of the scientific method to solve problems.

Generally speaking, before and after each session, tasks to be completed outside of the classroom are proposed and must be worked on individually or in groups. They form the basis for supervised activities. Other hours of independent learning should also be taken into account, such as those dedicated to guided reading, solving the proposed problems or completing independent learning questionnaires on the content via ATENEA.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the subject of Automatic and Robotized Systems, the student:
1. Design automated systems.
2. Select and integrate sensors, perception systems and actuators into automated systems.
3. Implement moderately complex real-time information processing systems, including algorithms and control/supervisory hardware.
4. Program control systems bearing in mind environmental factors.
5. Understand the principles of robotic systems and their areas of application and integrate them into automated environments.
6. Understand supervision techniques to integrate them into embedded systems.
7. Detect their own training needs and resolve them using the services and tools available.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

TOPIC 1: T INTRODUCTION TO AUTOMATED SYSTEMS

Description:
This topic presents the basic principles of automated systems:

- Definition
- History
- Current paradigm
- Industrial applications
- Application in devices with a specific purpose
- Robotic systems

Related activities:
All

Full-or-part-time: 8h
Theory classes: 4h
Self study : 4h

TOPIC 2: SYSTEMS AUTOMATION

Description:
This topic covers automated system modelling tools and how to implement them:

- Automated systems.
- Models of control systems with continuous variables.
- Models of discrete event systems.
- Systems monitoring and supervision.

Related activities:
All

Full-or-part-time: 52h
Theory classes: 10h
Laboratory classes: 12h
Self study : 30h

TOPIC 3: SENSORY SYSTEMS

Description:
- Sensors in automated systems: use, applications, features ...
- Sensors for intelligent systems

Related activities:
All

Full-or-part-time: 44h
Theory classes: 8h
Laboratory classes: 8h
Self study : 28h

TOPIC 4: AUTONOMOUS ROBOTS

Description:
- Robotized arm
- Autonomous robots
- Path control

Related activities:
All

Full-or-part-time: 46h
Theory classes: 8h
Laboratory classes: 10h
Self study : 28h

ACTIVITIES

ACTIVITY 1: WRITTEN EXAMS

Description:
There will be a midterm that students must take individually. At the end of the class, there will be a final exam on the overall knowledge acquired.

Specific objectives:
At the end of the activity, the student must be able to know, understand and use the basic principles of all the contents of the subject

Material:
Support statements
Course work

Delivery:
The control test qualification sets the variable CON
The final test grade sets the FIN variable

Full-or-part-time: 26h
Theory classes: 6h
Self study: 20h

ACTIVITY 2: LABORATORY SESSIONS/INDIVIDUAL AND GROUP WORK

Description:
Students must solve small projects related to the class content. They are to be completed during independent learning time. Face-to-face sessions will be held at the laboratory during the scheduled weekly hours. Both prior preparation and execution will be assessed.

Specific objectives:
Practically solve the problem posed.
Write and present documents that reflect the work done

Material:
The supporting materials are:

- Manual of practices
- Laboratory equipment
- Recommended bibliography
- Published teaching material

Delivery:
Before carrying out a problem, students will deliver the corresponding individual preliminary study.
The achievement of the objectives achieved in each task will be valued, taking into account the degree of understanding of each student's work.
At the end of each task, each group will give the practical teacher a file explaining the work done and the knowledge acquired and, if it is the case, a public presentation of the work will be made.
The qualification obtained in these activities configures the LAB variable

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

GRADING SYSTEM

The final mark for the class will be calculated using the following equation:

Final mark = 0.20 * CON + 0.40 * LAB + 0.40 * FIN

Assessment will be continuous.

Note 1. If the final exam mark is greater (in part or in total) than other aspects assessed, it will substitute the results obtained on other activities during the class.

Note 2. If the marks obtained on individual activities are substantially lower than those obtained on group activities, students may be requested to complete individual activities similar to those completed in group. The marks on these individual activities will replace the group ones.

EXAMINATION RULES.

The activities will be carried out following the uses and customs of academic work and, particularly, the following guidelines will be respected:

1. Those activities that are explicitly declared as individual, whether in person or not, will be carried out without any collaboration from other people.
2. The dates, formats and other delivery conditions that are set will be mandatory.
3. Carrying out laboratory activities is a necessary condition to pass the subject.
4. If any of the activities of the subject is not carried out, it was considered a grade with zero.

RESOURCES

Other resources:
Teaching material published in ATENEA
User manuals for the equipment used