



ACADEMIC PROGRAM

PROJECTS I: DIGITAL TECHNOLOGIES AND TECHNIQUES

B.F.A. IN COMPUTER SCIENCE

MODALITY: ON CAMPUS

ACADEMIC YEAR: 2023-2024

| | |
|----------------------------|---|
| Name of the course: | Projects I: Digital technologies and techniques |
| Degree : | Computer Science |
| Location: | Centro Universitario de Tecnología y Arte Digital |
| Area: | Projects |
| Year: | 1º |
| Teaching period: | Anual |
| Type: | OB |
| ECTS credits: | 6 |
| Teaching modality: | On campus |
| Language: | English |
| Lecturer / Email | Luis Miguel Campoy Cervera / luis.campoy@u-tad.com |
| Web page: | http://www.u-tad.com/ |

SUBJECT DESCRIPTION

Area description

The projects subject is a tool that will enable the student to strengthen and reinforce the skills acquired in the rest of the subjects of the degree, as well as develop teamwork skills and the acquisition of professional work dynamics. It will also allow essential interdisciplinary work for the insertion and development of any digital profession.

Subject description

The subject Projects I: Digital Techniques and Technologies provides students with the necessary tools for the development of applications embedded in microcontrollers. Through a software application and the development of electronic circuits, they will be able to operate a mechatronic system, combining basic knowledge of electronic, mechanical and software engineering. In this subject you work with the Arduino development environment, and multiple electronic components, sensors and actuators are used to create circuits, operated by software applications developed with the Arduino IDE

COMPETENCIES AND LEARNING OUTCOMES

Competencies

BASIC AND GENERAL COMPETENCIES

CG1 - Ability to understand, schedule and solve problems through software development

CG2 - To develop software that are environmental friendly, engaged with society and natural resources and law and ethics compliant

CG3 - Knowledge of the scientific fundamentals applicable to the resolution of computer problems

CG4 - Ability to simplify and optimize computer systems by understanding their complexity

CG5 - Management of human and technological resources for the proper delivery of computer projects

CG6 - Develop collaborative projects showing teamwork skills, versatility, flexibility, creativity and respect for the work of the team members

CG7 - Knowledge of the creative foundations of ideation in software development projects.

CG9 - Ability to learn, modify and develop new software solutions

CG10 - Use of creative techniques to carry out computer projects

CG11 - Ability to search, analyze and manage information for insights capture

CG12 - Ability of decision-making during development of a digital project, based on the analysis of its context and in accordance with its target audience and business model

CG13 -Development of the critical spirit in social and communication spheres to properly behave in the knowledge and information society

BC1: Students should demonstrate knowledge in an area of study that builds upon the foundation of general secondary education and goes beyond at a level that, while supported by advanced textbooks, also encompasses certain aspects derived from the cutting edge of their field of study.

BC2: Students should be able to apply their knowledge to their work or vocation in a professional manner, and they should possess the competencies typically demonstrated through the development and defence of arguments as well as problem-solving within their field of study.

BC3: Students must possess the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that involve reflection on socially, scientifically, or ethically significant issues.

BC4: Students should be capable of conveying information, ideas, problems, and solutions to both specialized and non-specialized audiences.

BC5: Students should have developed the learning skills necessary to pursue further studies with a high degree of autonomy.

TRANVERSALES COMPETENCIES

CT1 - Knowledge of the definition, scope and implementation of the fundamentals of project management methodologies for technology projects

CT2 - Knowledge of the main sectorial players and the life cycle of a digital content development and commercialization project

SPECIFIC COMPETENCIES

CE5 - Ability to design and deploy client-side and server-side web applications with scalable standard technologies

CE10 - Ability to work with a release manager and generate application documentation automatically.

CE19 - Ability to conceive, design through graphic languages and implement a computer application using different development methodologies, from the conception of the product to its final development to the definition of its phases and iterations

CE20 - Ability to test the operation and functionality of a computer application, develop test plans and use test-oriented design and programming techniques

CE21 - Ability to assess the quality of a computer application by applying software quality measurement metrics, procedures, and standards

CE22 - Knowledge of the techniques and implications of maintaining computer applications including those that use reverse engineering principles to understand and modify software of unknown structure

CE26 - Knowledge of human-machine interaction fundamentals and the role that this interaction plays in the development of digital projects.

CE27 - Knowledge of methods and techniques related to the conceptualization, design, analysis and evaluation of usable and accessible interactive products

Learning outcomes

Upon completion of the degree, the graduate will be able to:

- To learn the Arduino microcontroller programming language
- To build electronic prototypes Arduino-controlled
- To develop a digital system built with microcontrollers
- To develop an interactive application using a graphic engine
- To understand the processes of security analysis and apply them in a simple scenario
- To know the value of data and build an iterative data-driven application

To develop a functional full stack application

CONTENTS

Each student will engage in one of the following projects

Techniques and technologies for digital art and design

Techniques and technologies for Physics and Electronics

Techniques and technologies for Computing (software and hardware)

Techniques and tec

SUBJECT SYLLABUS

First semester - Fundamentals of electronics and embedded systems programming

Familiarization with the Arduino development system, Arduino UNO board, Arduino IDE and basic electronic components:

- Resistances.
- Capacitors.
- Diodes
- Breadboard.
- Leds.
- RGBs.
- Sensors: LDRs, Push Buttons, Tilt Sensors.
- Actuators: Servomotor, Buzzer.
- LCD.

Second semester – Serial communication and advanced components

Familiarization with communication protocols in Arduino. Development of serial communication applications. Familiarization with advanced components:

- Ultrasonic Sensor
- Thermistor
- Shift register
- 7 segments
- 7 segments 4 digits
- IR remote control
- DC motor
- NPN transistor
- H-bridge
- Relay
- Joystick
- Optimization with low level instructions
- Basic concepts of state machines

TRAINING ACTIVITIES AND TEACHING METHODOLOGIES

TRAINING ACTIVITIES

| LEARNING ACTIVITIES | Total hours | Hours of presence |
|---|-------------|-------------------|
| <i>Theoretical / Expository classes</i> | 10,00 | 10,00 |
| <i>Practical classes</i> | 20,00 | 20,00 |
| <i>Tutorials</i> | 4,00 | 2,00 |
| <i>Independent study and autonomous work of the student</i> | 18,57 | 0,00 |
| <i>Elaboration of work (group or individual)</i> | 64,29 | 0,00 |
| <i>Evaluation Activities</i> | 8,57 | 8,57 |
| <i>Project Follow-Up</i> | 24,57 | 24,57 |
| TOTAL | 150 | 65,14 |

Teaching methodologies

Expository method or master lesson

Case learning

Learning based on problem solving

Project based learning

Cooperative or collaborative learning

inquiry learning

Flipped classroom methodology

Gamification

Just in time Teaching (JITT) or classroom on time

Expository method or master lesson

Case method

Learning based on problem solving

Project based learning

Cooperative or collaborative learning

inquiry learning

Flipped classroom methodology

Gamification

TEMPORAL DEVELOPMENT

DIDACTIC UNITS / TOPICS TIME PERIOD

First quarter. Fundamentals of electronics and embedded systems programming Weeks 1 - 14

Second term. Serial communication and advanced components. Optimization. Weeks 15 - 31

EVALUATION SYSTEM

| ASSESSMENT SYSTEM | MINIMUM SCORE RESPECT TO THE FINAL ASSESSMENT (%) | MAXIMUM SCORE RESPECT TO THE FINAL ASSESSMENT (%) |
|--|--|--|
| <i>Assessment of participation in class, exercises or projects of the course</i> | 20 | 40 |
| <i>Assessment of assignments, projects, reports, memos</i> | 40 | 70 |
| <i>Objective test</i> | 10 | 40 |

GRADING CRITERIA

| ASSESSMENT SYSTEM | ORDINARY EVALUATION | EXTRAORDINARY EVALUATION |
|--|------------------------|-----------------------------|
| <i>Assessment of participation in class, exercises or projects of the course</i> | 30 | 30 |
| <i>Assessment of assignments, projects, reports, memos</i> | 60 | 60 |
| <i>Objective test</i> | 10 | 10 |

General comments on the evaluations/assessments

- The evaluation of participation in class, in practices or in subject forums will be carried out based on attendance and proactivity in class and in the rest of the activities developed during the course. This aspect will represent 10% of the final grade for the subject in the ordinary call.
- Throughout the course, the student will be asked to keep a laboratory notebook with the guided practices that are carried out weekly (some will require two weeks), and may have an extra grade if the project has

been developed and improved beyond the approach. proposed by the teacher. It will represent 20% of the final grade for the subject in the ordinary call.

- The student will be asked for 2 own projects that will collect what they have seen in class in each semester. The first project will be delivered at the end of the first semester and the second at the end of the course. The two partial works will represent 60% of the final grade in the ordinary call (30% and 30% respectively).
- An exam will be carried out for each project that will have a valuation of 5% each, in which some modification will be requested on the project presented.
- To pass the subject in the ordinary call, it is essential that the final grade is at least 5.0 (out of 10). In addition to this requirement, it is necessary that the average of the two evaluation projects be at least 5.0 (out of 10) and that each one has a grade of at least 3. If any of these requirements are not met, the subject It will be considered automatically failed in the ordinary call regardless of the rest of the grades.
- Works out of form and date will not be accepted without justified cause, and if they are accepted it will be with a considerable reduction in the grade. Each delivery is understood as an exam and will have the right to review.
- The works must be original and developed by the student himself. Due to the way of working with free code, it is allowed to use fragments of other people's code shared publicly, but you must indicate the reference where it can be found and comment on how it has been used. Furthermore, it cannot be the main core of the work presented but only a part or complement to the main part of the project.
- In the case of detecting a work that is a copied or slightly modified public example, it will be considered plagiarism and will imply a score of zero, a report to the teaching staff and the academic coordinator, as well as the application of current regulations, which may entail very serious penalties for the student.
- If you attend less than 80% of the classes unjustifiably, you will lose the right to continuous evaluation and you will go to extraordinary evaluation.
- If the student does not get the pass in the ordinary call, the student will be able to take the extraordinary call in July, where he will have a new opportunity to submit an evaluation project, of greater complexity, which will represent 60% of his corresponding grade. to the weight of the projects in the ordinary call.
- The grade for the evaluation of participation in class, internships or projects in the ordinary call will be kept in the extraordinary call, being 30%. (10% evaluation of participation and 20% Evaluation of work, projects, reports and memories in class)
- 10% of the grade in the extraordinary call will correspond to an exam based on the project presented.
- No grades of any kind will be kept between different academic years, nor between different calls.
- It is not allowed to consume drinks or food in the classroom. The presence of any type of drink on the tables is also not permitted, even in closed containers.
- Active participation will be required from the student, necessary for the development of the classes.
- The student will be required to behave well at all times during classes. Bad behavior that prevents the normal development of the class may lead to expulsion from the classroom for a period of time to be determined by the teacher.

LIST OF REFERENCES (BOOKS, PUBLICATIONS, WEBSITES):

Basic Bibliography:

- Arduino Web: <https://www.arduino.cc/>
- Arduino project book. Scott Fitzgerald & Michael Shiloh

Recommended Bibliography:

- Arduino for dummies. John Nussey

REQUIRED MATERIALS, SOFTWARE AND TOOLS

Type of classroom

Theory classroom

Board and projection system

Materials:

PC I

Arduino IDE 2.2.1

Arduino Kit

ELEGOO Medium recommended

Software:

-