

## Bachelor's Degree Final Project

Code: 106542  
ECTS Credits: 12

**2024/2025**

Degree	Type	Year
2502441 Computer Engineering	OB	4

### Contact

Name: Jordi Pons Aroztegui

Email: jordi.pons@uab.cat

### Teachers

Jorge Bernal del Nozal

Anna Barbara Sikora

### Teaching groups languages

You can view this information at the [end](#) of this document.

### Prerequisites

The prerequisites for the Bachelor's Degree Final Project (TFG: "Treball de final de grau" in Catalan) are those included in the UAB's progression plans (registration progress), which specifies that, in order to be able to register for the TFG, students must have passed, at least all first-year subjects and a minimum of two thirds of the total ECTS in the syllabus (that is, 160 ECTS).

At all events, it is recommended that students register for the TFG on completion of all the subjects in the specialisation and is in a position to complete their degree studies in the same academic year in which the TFG would be written.

It should be borne in mind that students must obligatorily write their TFG in the field of the specific technology (specialisation) studied.

### Objectives and Contextualisation

The TFG should be seen as a globalising subject facilitating an integrated assessment of the competences associated with the degree. It represents the culmination of the learning process in which students should show a level of maturity in multiple competences and learning outcomes. Students must demonstrate their ability to integrate and put into practice the knowledge, skills and attitudes acquired throughout their studies (associated both with the degree and the specialisation studied) and thereby facilitate the assessment of their professional capacity in developing a project.

## Competences

- Acquire personal work habits.
- Capacity to design, develop, select and evaluate computer applications and systems, ensuring reliability, security and quality, in accordance with ethical principles, and applicable standards and legislation.
- Communication.
- Direct the activities associated with projects in the field of computing.
- Have the capacity to conceive, draft, organise, plan, develop and sign projects in the field of computer engineering for the conception, development and exploitation of computer systems, services and applications.
- Have the right personal attitude.
- Plan, conceive, deploy and direct computer projects, services and systems in all fields, overseeing their implementation and continuous improvement and monitoring their economic and social impact.

## Learning Outcomes

1. Adapt to unforeseen situations.
2. Analyse and explain any security, health or hygiene risks in a project, indicating the measures established to avoid or minimise them.
3. Analyse the cost (material, time and personnel) of different alternatives, comparing them with the available resources.
4. Apply the basic concepts of conception, planning, realisation and direction of computer projects, services and systems.
5. Be introduced to the fundamentals of Physics, including electromagnetism, classical mechanics and relativity.
6. Communicate efficiently, orally or in writing, knowledge, results and skills, both in the professional environment and before non-expert audiences.
7. Critically evaluate the work done.
8. Decompose a general problem into simpler and more achievable tasks.
9. Define project specifications.
10. Define the specifications of an IT application or system.
11. Develop curiosity and creativity.
12. Distribute tasks.
13. Establish a work plan that meets the aims of a project.
14. Establish a work plan.
15. Evaluate and explain, if necessary, the impact of the project on the prevention and solution of environmental and energy problems.
16. Generate proposals that are innovative and competitive.
17. Identify and select the most suitable tools to implement a project and perform follow-up of the same.
18. Identify regulations (laws, standards, etc.) that are susceptible to application to a project and have the capacity to apply and reference them properly.
19. Identify the criteria used to evaluate proposed solutions.
20. Identify the possible ethical conflicts that may be derived from a project and, should they exist, report on the associated risks.
21. Identify the specific aims of the project.
22. Identify the various alternative solutions, evaluating their cost.
23. Identify when faced by a problem, the most relevant aspects of the new situation.
24. Maintain a proactive and dynamic attitude with regard to the development of one's own professional career, personal growth and continuing education. Be able to cope with adversities.
25. Make one's own decisions.
26. Manage information by critically incorporating the innovations of one's professional field, and analysing future trends.
27. Prevent and solve problems.
28. Properly apply the chosen tools.
29. Properly identify and reference regulations susceptible to application in the development or adaptation of an IT application or system.

30. Search for information on similar problems, showing that major sources of reference in the field of study have been consulted.
31. Study the technical and economic feasibility of the development or adaptation of an IT application or system.
32. Understand the criteria for the evaluation of an IT application or system and be able to apply them.
33. Use English as the language of communication and professional relations .
34. Work independently.

## Content

### What is the Bachelor's Degree Final Project (TFG: "Treball de final de grau")?

The TFG is an original exercise that should be carried out individually and presented and defended before a university examination committee. It consists of a project within the field of specific technologies in Computer Engineering, of a professional nature, synthesising and integrating the competences acquired throughout the degree. This project represents a student workload of 300 hours.

Only one type of TFG is defined, this being an "applied project", which should not be seen only as a development project. The objective of this project could be any problem, system or situation that can be solved by applying techniques, practices and the resources pertaining to the profession.

Obviously, the proposals must take into account the competencies associated with the subject and the specific specialisation in which the project is framed. In addition, the project must have well-defined start and end points as it must be able to be completed in 300 hours over a single semester. When making the proposal and defining the related work, therefore, the competences and time requirements should both be taken into account.

Each project must be considered unique and original. This does not mean that it needs to be innovative or to produce improvements with respect to other similar solutions. But it must be unique in terms of its resolution. It is therefore possible for distinct students to carry out the same project or to divide a large project among several students.

The final objective of the project is not necessarily to implement an application or a productive system, given restraints on time and resources. However, correct completion of the whole process must be ensured, as well as ensuring that the development of the possible application or system is viable on the basis of the analysis and the design produced. However, a demonstrated ability to develop a part of the application or a prototype of the system should be positively valued.

### Who can propose TFGs?

a) Lecturing staff/departments. Following the calendar approved by the School, staff or departments should propose subjects/projects using the corresponding computer application. If deemed appropriate, the person responsible for the subject and/or the TFG Committee will determine whether the proposed projects are appropriate.

b) Companies or external Institutions. The project can be carried out in the framework of a collaboration agreement with a company or external institution. The entity must submit the proposal in writing (following the model established for this purpose, on the dates specified) to the person responsible for the subject. This staff member and/or the TFG Committee will determine whether the proposed project is appropriate (assessing whether the competences established for the degree-and the corresponding specialisation-can be evaluated, and ensuring that the duration and workload are suitable). If the proposal is accepted, a tutor will be assigned from the corresponding specialisation and all relevant data will be logged into the application. These projects are supervised by an academic tutor from the School and by a tutor from the company.

c) Students. Students can make a proposal in writing (following the model established for this purpose, on the dates specified) referring to a specific subject or project to the lecturer responsible for the specialisation being studied. Acceptance is not immediate, as assessment must first be made of whether the competences

established for the degree-and the corresponding specialisation-can be evaluated, and that the duration and workload are suitable. The lecturer responsible for the specialisation will accept or reject the proposal; if accepted, this lecturer will instruct the student to find a tutor. If the student is unable to find a tutor, they will have a tutor assigned to them at the end of the assignment process.

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Supervised			
Monitoring tutorial sessions with the tutor	9	0.36	1, 2, 7, 15, 6, 13, 14, 16, 26, 23, 19, 17, 29, 24, 25
Preparation of all documentation (initial, monitoring, final and defence documentation)	30	1.2	1, 7, 6, 16, 26, 24, 33
Type: Autonomous			
Development of the project	260	10.4	1, 3, 2, 28, 4, 7, 15, 30, 32, 10, 9, 8, 11, 12, 13, 14, 31, 16, 26, 18, 23, 19, 20, 17, 29, 21, 22, 24, 25, 27, 34, 5

The Moodle classroom on the UAB Virtual Campus and/or the TFG monitoring application will specify the calendar/timeline to be followed, the mechanism for consulting and selecting proposals, and the project-assignment system.

Students must complete the TFG in a single semester and have only one exam session in which to present it: February (first-semester projects) and July (second-semester projects).

TFG registration is carried out in mid-July (in the ordinary period, with all other subjects in the syllabus); the semester for presenting the project must be indicated on registration.

A computer application (Sigma-TFE) will be used for offering, registering and assigning projects. Project assignment must be completed during the week prior to the beginning of the semester.

Once the TFG has been assigned, the tutor and student will meet during the first week of the semester to determine the work to be carried out and to define the general guidelines for monitoring the project.

The tutor will carry out project monitoring through a minimum of 4 tutorial/supervision sessions. Before each of these, the student must submit a document outlining the current state of the project, specifying the work carried out in each of the stages and the procedures that are being carried out to ensure its completion. These documents will be stored in a TFG dossier that will include the original documents presented for each monitoring tutorial, as well as any improvements introduced in the reports produced on the basis of the tutor's comments and observations.

The TFG dossier will be the compendium of all the work carried out during the course of the project (reports, feasibility study, planning diagrams, code, user manuals, data specifications, analysis and design diagrams, use cases, business plan, legal and ethical studies, etc.) and must be submitted at the end of the process in digital format. It must be presented in an organised and easily accessible manner. If relevant, it should also reflect the changes produced in the submitted documents, in light of the comments that the tutor may have proposed throughout the tutorials. All changes must be verified by means of a "list of changes".

### Monitoring sessions:

- 1st monitoring session (week 4): the student submits an initial report

- 2nd monitoring session (week 9): the student submits a first progress report (I)
- 3rd monitoring session (week 14): the student submits a second progress report (II)
- 4th monitoring session (week 17): the student submits the proposal for the final report and finalises the project.
- 5th monitoring session (week 18-19): the student submits the proposal for the presentation/defence.

Submission of all reports is compulsory, on the dates specified by coordination. Submission outside these deadlines may be accepted if justifiable causes can be demonstrated. However, any such delay may negatively affect the grade given by the tutor.

For each of the monitoring sessions, the sections to be included in the corresponding report and, therefore, in the TFG dossier must be defined. Some sections will be compulsory and others will be agreed on with the tutor, depending on the type of project and specialisation.

Evaluation rubrics have been drawn up to evaluate each of the reports, in order to ensure greater uniformity objectivity and traceability of final grades. Once each of the reports has been evaluated, the corresponding rubric will be published in the monitoring application, with the provisional grades and any observations considered appropriate for possible improvement (for inclusion in the TFG dossier), and for the improvement of subsequent reports.

Each document must include identify the student and the project: Student's Name, Academic Year, Specialisation, Project Title, Name of Tutor, and Date. Additionally, all relevant resources for written communication must be adequately used (writing, spelling, presentation, ...); recommended presentation formats must also be followed, where applicable.

The three reports should include the following (important: consult the evaluation rubrics in question):

- Initial report. The main objective of this report is to provide a detailed proposal of the TFG, which sets out the goals to be attained and the methodology to be used in achieving them. Similarly, the various steps to be followed in developing the project, both in terms of tasks to be carried out and the time-frame, must all be planned in detail. This proposal requires prior reflection on the part of the student, who will have to consult relevant sources of information in order to justify all decisions made and to programme the necessary work. The proposal should include the following, at the least:
  - Preliminary information on the topic to be addressed or the problem to be solved, specifying and commenting on the sources of information used.
  - A proposal covering the TFG's objectives and/or the point that the development of the proposed problem aims to reach.
  - General explanation of the methodology to be followed in attaining the objectives.
  - Identification of the steps to follow in developing the project; establishing a work plan to carry this out.
  - Referential bibliography consulted and complementary sources
- Progress Report I. The main objective of this report is to record the progress made in carrying out the TFG. At the same time, this report should ratify the planning carried out at the end of the initial phase, or, where appropriate, should propose any changes to be introduced to ensure a suitable conclusion of the TFG within the intended time period. This report should include the following, at the least:
  - Indication of the level of monitoring for the foreseen planning, and of the adjustments made and/or planned, if deemed necessary, with their justification in the latter case.
  - If necessary, indication of the changes introduced in the objectives established and/or the expected work methodology, both duly justified.
  - General explanation of the methodology being followed to achieve the objectives.
  - Referential bibliography consulted and complementary sources.
- Progress Report II. The main objective of this second report is to record both the work done in this last stage, and the conclusions that can be obtained from it. At the time of submitting this report, the TFG will be in its final phase as regards its development, and the student must have practically completed the proposed project. This report should include the following, at the least:

- Indication of the level of monitoring for the foreseen planning, and of the adjustments made and/or planned, if deemed necessary, with their justification in the latter case.
- General explanation of the methodology followed and changes made with respect to the initial proposal.
- Presentation and evaluation of results.
- Provisional conclusions.
- Sources of information consulted.

Apart from the supervision provide, students will work independently on their TFGs.

### Final phase

The TFG will culminate in a written report (the final report), in article format, and a public presentation and defence of the project. Students wishing to submit and defend their project should notify the tutor of this in the 4<sup>th</sup> obligatory monitoring tutorial. In such a case, the tutor will mark the project as *Finished* on the computer monitoring application. In week 19, the student will submit the digital TFG dossier through the application, in the corresponding monitoring session.

At the same time, from the *Submission* option that will have been activated when the tutor marks the project as *Finished*, the final report must be delivered (in pdf format) and all remaining fields should be completed, as required on form (title, summary and keywords in Catalan, Spanish and English, language of the document and authorisation for publication in the UAB's Digital Document Deposit).

For each submitted TFG, the TFG committee will appoint an evaluation committee, comprising three members of the lecturing staff, namely, the academic tutor (whenever possible) and two additional members from the areas of knowledge relating to the specialisation. With a minimum of three calendar days in advance, the commission will also establish the date and place for presenting/defending the TFG.

The final report. This will be written in article format and must be between 8 and 10 pages providing an explanation of the project, acknowledgments and bibliography. Up to 4 additional pages can be added to include appendix material. Students must strictly follow the publication format (based on that proposed by the IEEE Computer Society) and must include at the least the following content: objectives, state of the art, methodology, results, conclusions and bibliography. The report must be free from error, precise and synthetic in its use of language. The final report will be assessed by the evaluation committee (which will be the same for the public defence); the grade awarded is the average grade given in the committee's constituent-member assessments. An evaluation rubric has been established for this purpose.

Public presentation and defence: The student will present the project in a clear and orderly manner to the evaluation committee. Under no circumstances can this presentation exceed 15 minutes. It is then followed by a questions from the evaluation committee that will take, at most, an additional 15 minutes. TFG presentations will be organised in sessions in which members of the same committee will evaluate various presentations. An evaluation rubric will be used for this assessment. The final presentation grade is the average grade given in the committee's constituent-member assessment, and will be made public at the end of each session.

The TFG monitoring application provides the specifications of format and content for the distinct reports, as well as indicating the characteristics of the presentation. It also provides the rubrics with which each of the activities will be evaluated.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## **Assessment**

### **Continous Assessment Activities**

Title	Weighting	Hours	ECTS	Learning Outcomes
1- Tutor evaluation	40%	0	0	1, 3, 2, 28, 4, 15, 30, 32, 6, 10, 9, 8, 12, 13, 14, 31, 26, 18, 23, 19, 20, 17, 29, 21, 22, 24, 25, 27, 34, 5, 33
2- Final report (Evaluation Committee)	30%	0	0	2, 4, 7, 15, 30, 32, 6, 9, 11, 31, 16, 26, 19, 20, 17, 29, 21, 24, 25, 33
3- Presentation and Defence (Evaluation Committee)	30%	1	0.04	7, 6, 9, 11, 26, 19, 17, 24, 25

#### The TFG evaluation consists of two parts:

1. Tutor assessment (weighting: 40% of the grade). The tutor will evaluate the reports and materials that have been produced throughout the project (TFG dossier), emphasising the manner in which the project has evolved, and fulfilment of the objectives established. This evaluation is continuous and training-oriented. For each one of the submitted activities, a provisional grade will be awarded; this will not be deemed definitive for the overall TFG grade until the final submission. Each activity consists of certain items that must obligatorily be evaluated as they contribute to the final grade; items that can be optionally evaluated so as to provide students with an indication of their progression; and items that are not evaluated. The definitive grade for each item will be that given in the final activity evaluated by the tutor. All activities are obligatory, to be submitted on the dates specified by coordination. Submission outside established deadlines may be accepted if justifiable causes can be demonstrated. However, any such delay may negatively affect the grade given by the tutor.

2. TFG evaluation-committee assessment (weighting: 60% of the grade). The assessment committee consists of three members of the lecturing staff who will evaluate both the final report (30%) and the public presentation of the project (30%). If possible, the tutor will be part of the committee. Each member will indicate their grade and the average of these grades will be calculated to obtain the final grade awarded.

Evaluation rubrics will be used for each of the activities to ensure greater objectivity and traceability for all awarded grades. These rubrics will be available in the TFG monitoring application.

The final TFG grade will be decided by the evaluation committee and will also include the tutor's grade. To pass the subject, students must have, at least, 50% of the grade awarded by both the tutor and the evaluation committee. The final grade will be the weighted average of these two grades. Students who does not attain 50% of the available grade in each part of the assessment will be awarded a final grade of 'Fail', with a corresponding numerical note inferior to 5.0.

The evaluation committee may propose the distinction of "With Honours" to any one or several projects, provided that, in the final evaluation, such projects shall have obtained a grade equal to or greater than 9.0. Students who wish to opt for such a distinction will have to create a poster presentation of their TFG, in accordance with the model proposed by coordination, and submit this no later than three days subsequent to the submission of the final report and dossier. Given that the number of these mentions may not exceed 5% of students registered in the subject, in the event that the number of TFG candidates for the grade distinction should exceed the maximum possible number, the TFG Committee will decide on the award, taking into account the posters presented, project grades, the rubric-based observations made by the evaluation committee and the tutor, and the students' academic transcripts.

If the TFG is not successfully completed, students in question need to re-register and start the process again. In the event that the student concerned and the tutor are in agreement on this matter, the same project may be proposed again.

The final grade will be "Not evaluable" only in the event that no reports shall have been submitted.

If it can be demonstrated that any part of the TFG has been plagiarised and/or produced by a third party other than the registered student, this will automatically result in a fail grade.

## **Bibliography**

### General references:

- Alley, M. (2013). The craft of scientific presentations: critical steps to succeed and critical errors to avoid. Springer-Verlag. [Recurs electrònic] (<http://www.writing.engr.psu.edu/csp.html>)
- Alley, M. (1996). The craft of scientific writing. 3e. Springer-Verlag. (<http://writing.engr.psu.edu/csw.html>)
- Dawson, C.W. (2009). Projects in Computing and Information Systems. 2e. Addison Wesley.

### Specific references:

- It will be provided by tutor depending on the TFG.

## **Software**

Depending on the TFG.

## **Language list**

Information on the teaching languages can be checked on the CONTENTS section of the guide.