

**Degree Project**

Code: 104051  
ECTS Credits: 12

Degree	Type	Year	Semester
2500097 Physics	OB	4	0

**Contact**

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**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: Yes  
Some groups entirely in Spanish: No

**Prerequisites**

The student must have passed at least 2/3 parts of the total of ECTS corresponding to the studies they are studying (160 ECTS for students of the Degree in Physics, 220 ECTS for students of the double Degree in Physics and Mathematics and 230 ECTS for students of the double degree of Physics and Chemistry) to enroll in this subject. To complete the enrollment, in addition to the standard procedure established by Academic Management, it will be necessary to provide the coordinator of the subject (via web form, the link will be announced through the Virtual Campus), the following information: Title of the Work, director (and tutor if applicable), expected date of presentation and a brief description of the objectives and the methodology.

**Objectives and Contextualisation**

The objective of the Work is to get deeper, to apply and know how to transmit all the knowledge acquired during the Physics Degree. In general, the work can incorporate both theoretical and practical aspects. It is desirable, but not necessary, that the Work shows a certain degree of originality, either in the discussion of known results or in obtaining a new result. The work will be presented in front a court that does not necessarily have to be a specialist, since one of the main objectives is to develop transversal competencies (both written in the report and orals in the presentation), in which we would like to highlight the capacity of adapting the memory and presentation to a broad public in physical sciences community.

**Competences**

- Act, and issue reports and judgments, with ethical and social responsibility, according to legal, prevention-based and environmental conditions.
- Apply fundamental principles to the qualitative and quantitative study of various specific areas in physics
- Be familiar with the bases of certain advanced topics, including current developments on the parameters of physics that one could subsequently develop more fully
- Carry out academic work independently using bibliography (especially in English), databases and through collaboration with other professionals
- Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, and before both specialist and general publics
- Develop critical thinking and reasoning and know how to communicate effectively both in the first language(s) and others
- Develop independent learning strategies

- Develop the capacity for analysis and synthesis that allows the acquisition of knowledge and skills in different fields of physics, and apply to these fields the skills inherent within the degree of physics, contributing innovative and competitive proposals.
- Formulate and address physical problems identifying the most relevant principles and using approximations, if necessary, to reach a solution that must be presented, specifying assumptions and approximations
- Generate innovative and competitive proposals for research and professional activities.
- Plan and perform, using appropriate methods, study, research or experimental measure and interpret and present the results.
- Respect the diversity and plurality of ideas, people and situations
- Use computer tools (programming languages and software) suitable for the study of physical problems
- Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
- Use mathematics to describe the physical world, selecting appropriate tools, building appropriate models, interpreting and comparing results critically with experimentation and observation
- Using appropriate methods, plan and carry out a study or theoretical research and interpret and present the results
- Work independently, have personal initiative and self-organisational skills in achieving results, in planning and in executing a project

## Learning Outcomes

1. Act, and issue reports and judgments, with ethical and social responsibility, according to legal, prevention-based and environmental conditions.
2. Apply concepts, principles and theories adequately in preparing for academic or professional work within the field of physics.
3. Apply the skills acquired in the field of physics to study problems in other fields.
4. Carry out a theoretical study in the field of physics that includes approach, resolution, interpretation and presentation.
5. Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, in front of both specialist and general publics.
6. Conduct an experimental study in the field of physics that includes approach, resolution, interpretation and presentation.
7. Demonstrate a knowledge and understanding of how a work is developed in areas related to physics.
8. Determine type of photon source based on applications, differentiating between dipoles, wigglers and undulators
9. Develop critical thinking and reasoning and communicate ideas effectively, both in the mother tongue and in other languages.
10. Develop independent learning strategies.
11. Generate innovative and competitive proposals for research and professional activities.
12. Respect diversity in ideas, people and situations.
13. Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
14. Use mathematical methods appropriate for carrying out a study in the field of physics.
15. Use suitable programming and data-processing tools in carrying out theoretical and experimental studies in the field of physics.
16. Work independently, take initiative itself, be able to organize to achieve results and to plan and execute a project.
17. Carry out academic work independently using bibliography (especially in English), databases and through collaboration with other professionals

## Content

The work of degree must correspond to the level of knowledge and skills of a graduate in Physics.

There are 2 options to choose the subject of the Degree work:

1. The student can choose from a list of topics proposed by the professors of the Department of Physics of the UAB or prestigious researchers from collaborating research institutions. The offer will include, at least, the provisional title, objectives, brief description of the work to be carried out and the contact information of the professor who will direct the Work.

2. From the student's own initiative, on condition that it is agreed with a UAB professor (or external) who will direct the Work.

In both cases, the student and the director will agree, once the theme of the work is defined, the lines of development. The director will facilitate access to basic documentation for its realization. The approximate duration will be one semester.

In the case of works directed by researchers external to the Department of Physics, the participation of a professor from the Department of Physics will be required, who acting as the administrative tutor will validate the thematics, objectives and work plans.

## **Methodology**

The subject will have a professor of the Department of Physics that will be the Coordinator during the academic year [1].

There will also be a space on the Virtual Campus where all the information to the students will be uploaded.

Enrollment and formalization of the TFG.

To complete the enrollment, in addition to the procedure established by Academic Management, once the TFG has been agreed (see content section option 'TFG list' or 'other' list), the coordinator of the course will be required you (via web form whose link will be announced on the Virtual Campus) the following information: Title of the Work, director (and tutor if applicable), expected date of presentation and a brief description of the objectives and the methodology. This information must be previously agreed with the director of the TFG.

Direction of the TFGs.

The director/s will agree with the student the subject of the work and the lines of development. The works can be co-directed by up to 2 people.

In the cases where the Director does not belong to the Department of Physics of the UAB, a professor of the Physics Department will be appointed as a tutor who will validate that the contents of the work (objectives and methodology) are within the framework of the degree.

Practice agreement.

The projects can also be developed in institutions or companies external to the UAB and within the framework of mobility programs. In these cases, it will be necessary to specify the conditions of collaboration and that there is a commitment to follow up on the part of the person in charge of the other institution, which will be defined in the framework of an agreement. The student must submit to the Academic Management the agreement form with the pertinent information when enrolling (or later, but always before beginning the work), signed by the external institution or company and by the coordinator of the subject.

Work development.

The Work must be carried out individually by the student with the guide of the director.

Written memory and oral presentation

On the Virtual Campus a document template for the memory will be uploaded as a guide.

The document must consist of, at least, the following sections: Summary, Introduction, Body of the work (with the structure that is considered appropriate), Conclusions and Bibliography.

The cover page of the report must include the title, the indication that it is TFG of the Degree in Physics, the name of the director (and tutor, if applicable), the academic year and the call (February, July or September).

The written memory will have a maximum length of 10000 words. In the calculation of the extension, the sections will be considered from the introduction to conclusions, excluding the index, the possible initial summary, the bibliography, and the annexes. Annexes may be attached with supplementary information (data or other information that is not relevant to the body of the document), however, they will not be considered evaluable. (example: inclusion of security sheets, programming codes ...). The document extension calculation

will be made by the student himself using Word's word counting tool (including tables and equation) and to this value, he should add 200 words for each one of the figures. At the end of the written document, the student will include a form that will declare the extension of the document. Failure to comply with the maximum extension criteria will be subject to penalty since, in the memory, the capacity for synthesis, clarity and specification in the drafting of the document will be valued among other competencies. In order to consider the penalty, it will be assessed that if the student exceeds X% the maximum extension also waives the same X% of the final grade of the TFG. For example, a student who counts 8500 words in the Word tool (from introduction to conclusions) and has 15 figures (equivalent to 3000 words), will have a total of 11500 words, going on by 15% the maximum extension, and therefore, opting for only a maximum score of 8.5 (10-1.5).

Tentatively, the oral defenses of the works will be scheduled one week before the closing date for the corresponding announcement proceedings (February, July or September). Two weeks before face-to-face defenses, the copies of the paper memory must be delivered, and a copy in the digital format should be uploaded the Virtual Campus.

The deadlines for submitting the report will be announced at the beginning of the course on the virtual campus.

The oral presentation of the work, approximately 2 weeks after depositing the memory, will have a maximum duration of 15 minutes, followed by a turn of questions from the evaluation committee. In order to present the presentation, a document compatible with the official UAB software must be prepared, and only computers installed in the store may be used.

The presentation will also have to be delivered in computer support through the virtual campus.

Both the memory and the presentation can be done in Catalan, Spanish or English.

[1] Curs 2019-20: Dr. Aitor Lopeandia. Contacte: Aitor.Lopeandia@uab.cat

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Supervised			
Work under supervision of the TFG director	44.5	1.78	1, 2, 3, 5, 7, 10, 9, 8, 6, 17, 4, 11, 13, 12, 16, 15, 14
Type: Autonomous			
Research period, study and report preparation	255	10.2	1, 2, 3, 5, 7, 10, 9, 8, 6, 17, 4, 11, 13, 12, 16, 15, 14

## Assessment

The evaluation of the TFG work will be based on:

a) A mark issued by the director (with a weight of 30%) on the specific and transversal competencies demonstrated by the student during the development of the TFG. The director will send the assessment report of the student to the coordinator by email or ordinary mail. The assessment form will be available on the virtual campus and it is the obligation of the student to send it to his/her director. The evaluation of the director must reach the coordinator two weeks before the public defense of the work. In the case of not arriving on time, the coordination will not be able to consider this part of the evaluation.

b) A mark of the report (mandatory, with a weight of 30%). An evaluation board (non-specialist) formed by professors of the physics' department, or reputed scientists will read and evaluate the reports. The students will have to present a digital copy of the document and paper copies, one for each member of the board, following the instructions that will be sent via Virtual Campus.

c) A mark from the presentation in the public defense (compulsory, with a weight of 25%) issued by the members of the evaluation board.

d) A mark from question time in the public defense (mandatory, with a weight of 15%) issued by the three members of the evaluation board.

The content of the work, the methodology, the presentation, the answers to the questions of the evaluation board and, in general, the degree of maturity achieved by the student will be evaluated, not only the acquired knowledge but also his/her communication capacity (oral and written).

### Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Advisor evaluation	30%	0	0	2, 3, 5, 7, 10, 9, 8, 6, 17, 4, 11, 13, 12, 16, 15, 14
Public defense (presentation)	25%	0.25	0.01	1, 2, 3, 5, 7, 9, 17, 11, 13, 12
Public defense (questions)	15%	0.25	0.01	1, 2, 3, 5, 7, 10, 9, 6, 17, 4, 11, 13, 12, 16, 15, 14
Written report	30%	0	0	1, 2, 3, 5, 7, 10, 9, 6, 17, 4, 11, 13, 12, 16, 15, 14

### Bibliography

The reference bibliography for each TFG will be defined by the TFG director.