UCLouvain

lphys2199

2024

Master's thesis

26.00 credits		Q1 and Q2

Teacher(s)	Ringeval Christophe (coordinator) ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	The student must have acquired at least 30 credits of teaching units from his Master's programme.
Main themes	The master's thesis is a formative activity that should lead the student to demonstrate his/her ability to : • treat in depth a physics problem in all its real complexity, by carrying out personal research, under the guidance of a promoter ; • write a synthesis of his/her work and defend it in public in a rigorous and pedagogical manner, while being able to answer relatively sophisticated questions.
Learning outcomes	**At the end of this learning unit, the student is able to :** **a. Contribution of the teaching unit to the learning outcomes of the programme (PHYS2M)** AA1: 1.1, 1.2, 1.3, 1.4, 1.5 AA2: 2.1, 2.2, 2.3, 2.4, 2.5 AA3: 3.1, 3.2, 3.3, 3.4 AA4 : 4.1, 4.2 AA5 : 5.1, 5.2, 5.3, 5.4 AA6: 6.1, 6.2, 6.3, 6.4, 6.5 AA7 : 7.1, 7.2, 7.3, 7.4, 7.5, 7.6 AA8 : 8.1, 8.2 1 AA9 : 9.1, 9.3 **b. Specific learning outcomes of the teaching unit** At the end of this teaching unit, the student will be able to : 1. appropriate a scientific question and implement a research methodology to answer it ; 2. select the existing relevant bibliography on the subject under study and correctly cite the sources of information ; 3. critically read and summarize a scientific article ; 4. imagine and develop a research strategy to carry out a substantial physics project in a timely manner ; 5. interact with members of a research team ; 6. evaluate and argue the validity of a physical result ; 7. represent complex physical results in graphical form ; 8. write a scientific report respecting the structure and style of the relevant field of physics ; 9. present orally a research subject in physical sciences or physics didactics respecting the constraints of time and using an adequate visual support ; 10. answer the asked questions accurately and concisely.
Evaluation methods	The promoter, after consultation with the readers, submits a provisional grade to the President of the School of Physics no later than two working days before the date of the public defence of the thesis. This mark is based on the following criteria, each of which accounts for 25%: 1. quality of the writing of the thesis, 2. the importance of the student's personal work and the scientific quality of the work, (3) the degree of independence and initiative of the student, and (4) the student's understanding of the subject and critical thinking. At the end of the public defence, a short deliberation takes place in the presence of a moderator (Chair of the School of Physics). The grade awarded is then modulated according to the quality of the presentation and the answers to questions posed by the sponsor, the readers and the rest of the audience.
Teaching methods	The student carries out a research project aiming at originality in the physical sciences or in the didactics of physics under the guidance of a promoter. The various stages are: compilation of a relevant bibliography on the subject, reading and understanding of the selected articles, implementation and execution of the project, analysis and interpretation of the results obtained, writing of a summary manuscript and oral presentation of the latter. To carry out this project, the student is immersed in a research group with which he/she can interact.
Content	**Organisation** This teaching unit consists of the student carrying out a research project aimed at originality in the physical sciences or in the didactics of physics, supervised by a promoter, who guides him/her in solving the proposed problem. This

project, which is substantial, is carried out (1) in one of the UCL research institutes in which academic members of the School of Physics are assigned (ELI, IMCN, iMMC, IRMP and IACCHOS), (2) in one of the federal scientific institutes in which academic members of the School of Physics work (Royal Observatory of Belgium and the Belgian Institute for Space Aeronomy), in a private company or in the hospital environment. In all cases, at least one academic member of the School of Physics must be a promoter, possibly in co-promotion with a member of the host institution if the latter is not a member of the School of Physics.

A non-exhaustive list of possible topics is communicated by the different research centres concerned during the second semester of the annual block 1 of the Master.

It is also recommended that the student explores on his/her own the various research activities in the physical sciences carried out at or outside UCLouvain.

The student contacts his/her teachers preferably before the beginning of the following academic year or, if this is not possible, before the end of the first term of that year in order to agree with one of them to become his/her promoter. This choice is ratified by the Bureau of the School of Physics. Each promoter proposes to the President of the Master jury one (if co-promotion) or two names of potential readers for each of the theses he/she directs. In rare and justified cases, the President of the jury may accept two co-promoters and two readers. The brief is the subject of two oral presentations: the pre-defence and the defence.

The pre-defence is designed to help the student organise his/her results with a view to writing the final text and, if necessary, to complete his/her work on minor points. It is conducted in English or French in front of the promoter, readers and all interested parties. In particular, students of the annual block 1 of the Master [120] in Physical Sciences are invited to attend. The presentation lasts about half an hour and is followed by an in-depth discussion. The pre-defence must take place no later than two weeks before the start of the June examination session, or one week before the start of the September examination session if the dissertation is presented in that session. The date is agreed with the promoter and the readers. Students are requested to inform the School of Physics secretariat of this date and the room where the pre-defence will take place.

The defence is public. It is conducted in English or French (the choice of language is made in consultation with the sponsor), lasts 15 minutes and is followed by a 15-minute discussion with the sponsor (who is invited to ask only one question), the readers and the rest of the audience. It takes place on the Monday of the last week of the June examination session, or of the September session if the dissertation is presented in that session.

The manuscript of the dissertation should be submitted via DIAL no later than two weeks before the public defence. The student is responsible for providing a copy to his/her sponsor and readers.

Presentation of the manuscript

The dissertation manuscript, which may be written in English or French (the choice of language is made in consultation with the promoter), is generally about 50 pages long. It should be printed on both sides and not have a plastic cover. Brief explanatory annexes to the main text are allowed. Any voluminous appendix (details of experimental and measurement results, computer codes for numerical simulations, etc.) must be strictly electronic.

The cover should bear the following information

- Université catholique de Louvain
- Faculty of Science
- School of Physics
- Host research institute
- Host research centre
- Logo of the UCLouvain
- Title of the thesis
- Name and surname of the student
- Surnames and first names of the promoter and readers
- Dissertation presented in view of obtaining the academic degree of Master [120] in physical sciences, in-depth (or didactic or specialised)
- Academic year 20xx-20yy

Recommendations

The organisation of the dissertation may vary depending on the sponsor. In some cases, the student works throughout the year directly with the sponsor. In other cases, the student will more often work on a daily basis with doctoral or post-doctoral students. In all cases, the promoter remains the reference contact for scientific matters, since it is under his/her direction that the work is carried out.

It is the student's responsibility to present him/herself regularly in the host research centre and to request interviews with the promoter, and the promoter's responsibility to be sufficiently available. As a benchmark for the sponsor, a one-hour meeting every one to two weeks is considered normal.

In the early stages of dissertation research, the student will often be required to spend time on literature searches. Many tools are available for this purpose. Do not hesitate to ask doctoral and post-doctoral students for information.

If the work involves experimental measurements and/or numerical simulations, the student will have to interact with technical staff and/or computer scientists. It should be remembered that their time is divided between multiple research and teaching support tasks. The sponsor can provide guidelines for this.

The student is also expected to use resources (consumables and printing) carefully.

The promoter is the first line of defence in the event of personal disputes. In the event of a dispute with the promoter, the student will contact the Chair of the School of Physics and inform him/her of the problem.

The student is advised to keep an up-to-date personal notebook.

A scientific discussion with the sponsor should always precede the writing of the thesis manuscript. That said, the first chapters can sometimes be written very early. The difficulty of writing should not be underestimated. PhD students, post-docs and sponsors will often make numerous comments (accuracy, grammatical correctness, clarity, referencing, graphics) before a final version. Careful proofreading, one or two days apart, before submitting a version to the promoter, often saves a lot of time. A minimum reading portfolio is provided to the student at the beginning of the dissertation.

Bibliography	Un portefeuille de lecture minimum est communiqué à l'étudiant.e au début du mémoire.
Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Physics	PHYS2M	26		🔍