

## **FYTM06, Theoretical Physics: Master's Degree Project II, 60 credits**

*Teoretisk fysik: Examensarbete II - masterexamen, 60 högskolepoäng*  
**Second Cycle / Avancerad nivå**

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### **Details of approval**

The syllabus was approved by Study programmes board, Faculty of Science on 2022-06-08. The syllabus comes into effect 2022-06-08 and is valid from the spring semester 2023.

### **General information**

The course is an elective course for second-cycle studies for a Degree of Master of Science (120 credits) in physics. The alternatives are FYSM33 (30 credits), FYTM05 (30 credits) or FYSM63 (60 credits).

*Language of instruction:* English

*Main field of study*      *Specialisation*

Physics                      A2E, Second cycle, contains degree project for Master of Arts/Master of Science (120 credits)

### **Learning outcomes**

The overall purpose of the course is that the student independently should conduct a scientific project within a well-defined sub-field of physics.

#### **Knowledge and understanding**

On completion of the course, the students shall be able to:

1. describe, use and explain physical theories and their principles including the scientific foundations,
2. use and apply the methods of physics in an advanced way,
3. describe current research issues in a sub-field of physics,
4. in detail describe and explain a specialisation within a sub-field of physics.

#### **Competence and skills**

On completion of the course, the students shall be able to:

5. critically and systematically integrate knowledge within physics,
6. analyse, assess and deal with complex phenomena, issues and situations within physics even with limited information,
7. critically, independently and creatively identify and formulate issues within physics,
8. plan and using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as to evaluate this work,
9. orally clearly present and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences both nationally and internationally,
10. in writing clearly present and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences both nationally and internationally,
11. participate in research or development work within the field of physics or work independently in other qualified activities

### **Judgement and approach**

On completion of the course, the students shall be able to:

12. identify, discuss and make assessments considering relevant scientific, social and ethical aspects of physics and ethical aspects of research and development work,
13. identify and discuss the possibilities and limitations of physics, its role in society and the responsibility of the individual for how it is used,
14. identify, discuss and plan their own need for further knowledge,
15. identify different ways to develop their skills in physics or other fields.

### **Course content**

The student chooses, in consultation with the supervisor and examiner, an independent degree project corresponding to 60 credits. The project can be experimental or theoretical. The project can either be linked to current scientific projects at the department or to problems within the subject area at companies or other departments within or outside the university. If the project is carried out outside the department, there also has to be a supervisor from the department. Proposals on degree projects are, for example, posted on the course website.

### **Course design**

The degree project requires a survey of the literature and specialised studies. Furthermore, a number of compulsory course elements in the form of teaching sessions, seminars and other exercises are included that cover, for example, scientific, academic, and popular communication including both written and oral presentation, discussion and feedback.

The project shall correspond to forty weeks of qualified full-time studies. During the project, guidance is given by a qualified supervisor with, on average, at least approximately one hour per week during the semester which the course is given if the project is done on full-time. Otherwise the amount of supervision is adjusted in proportion to the study pace. If the project is carried out outside the department or the supervisor does not have the competence equal to a docent, then another supervisor that fulfills this requirement will be appointed by the department.

At the beginning of the course, the student and the supervisor has to register the degree project with the course coordinator. A plan that contains a definition of the project, an analysis of the problem and a time plan shall be attached to the registration. The plan is written by the student in consultation with the supervisor. The plan has to be approved by the course coordinator.

During the implementation of the degree project, at least one progress report is required, circa half way through the planned project time that is done together with the course coordinator and the supervisor at a halftime meeting. In connection with this the student also presents the progress of the project in the form of a shorter seminar. At the halftime meeting there is also a follow up of the original plan for the projects and it is adjusted when needed.

The degree project is presented in the form of a thesis report in English, with a popular description in Swedish or English. The degree project is also presented orally in English, at a public seminar for discussion, criticism and analysis. Before the presentation, the student, together with the supervisor, shall review the degree project based on the expected learning outcomes in this course syllabus.

## Assessment

The examination and the compulsory course elements, which are required to pass the course, consists of the following (the learning outcomes that the different parts can examine are given within brackets):

- an approved time plan that is established in the beginning of the project (outcome 1 and 7),
- participation in all compulsory course elements (prepare for outcome 9 and 10),
- a progress report, in the form of a halftime meeting, that is requested and approved by the course coordinator (outcome 3-4, 7-8, 10-11, 14),
- an oral part-time seminar, that is approved by the course coordinator (outcome 3-4, 7-9, 11, 14),
- a written scientific thesis report about the project (outcome 1-8, 10-15),
- an oral presentation of the project, before an examination committee consisting of the examiner and at least one assessor who is an expert in the field. Supervisors have the right to attend and voice their opinion when the examination committee meets to decide the grade (outcome 1-9, 11-15),
- a popular science description of the project (outcome 10, 12-13).

The written report has to be submitted to the examiner, in a version that admits examination, at least two weeks before the seminar. If not, the oral presentation will be delayed with 5-7 weeks or by special agreement. Before the report is sent to the course coordinator, it has to be checked by the supervisor. The department is responsible for making copies of the report according to the requirements of the university and the faculty. After final approval, the student is responsible for archiving the report in the system supplied by the university.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

## Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction

The final grade is determined by combining the results in the different parts of the examination. The examiner decides the grade in consultation with the examination committee. The supervisor has the right to attend and voice their opinion at the meetings of the examination committee. If the examiner assesses that the degree project can not be approved, the student shall be given possibility to supplement the project for renewed assessment within approximately 5-7 weeks. According to the

rules of the Faculty of Science, such a prolongation may lead to that only the grade Pass is possible, if the total time is prolonged with more than 20%. If the degree project does not satisfy the learning outcomes for the course after this renewed assessment, the examiner can decide to fail it. This can imply that a new project is required, so that all learning outcomes can be fulfilled.

Grading criteria shall be available at the department at the beginning of the course.

## **Entry requirements**

For admission to the course it is required to have knowledge equivalent to English 6/B, a Bachelor's degree in physics and in addition 45 credits of physics at an advanced level including knowledge equivalent to: FYSN21, Quantum physics in research and society, 7.5 credits, FYSN17, Quantum mechanics, 7.5 credits and one of the course packages for biological physics or theoretical physics in accordance with the course requirements in the current program syllabus for a Master of Science in Physics. For a degree project in theoretical particle physics knowledge corresponding to FYTN18, Theoretical particle physics, 7.5 credits is also required.

## **Further information**

The course replaces FYTM04 Theoretical Physics: Master's Degree Project II, 60 credits, and cannot be counted towards a degree together with that course.

The course is given by the Department of Astronomy and Theoretical Physics, Lund University.

See also the rules and recommendations for degree projects at the faculty of Science (Dnr N 2011/130).