



Faculty of Science

## ASTM32, Astronomy: Master's Degree Project, 60 credits

*Astronomi: Examensarbete för 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 2020-05-31. The syllabus comes into effect 2020-05-31 and is valid from the spring semester 2021.

### General information

The course is a compulsory course for second-cycle studies for a Degree of Master of Science (120 credits) in astrophysics.

*Language of instruction:* English

Supervision can be in Swedish if both the student and supervisor agree on this. The other course components are in English.

*Main field of study*      *Specialisation*

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

### Learning outcomes

The aim of the course is that the student through an independent project shall show knowledge, understanding, competence, skills, judgement and approach in accordance with the requirements for obtaining a Degree of Master of Science (120 credits) in astrophysics at Lund university.

The intended learning outcomes for the course are linked to the aims in the programme syllabus of the Master's programme in astrophysics at Lund University, as follows:

1 - 2, 6 are interim targets against intended learning outcome 1a in the programme syllabus.

3 - 5, 19 are interim targets against intended learning outcome 6 in the programme syllabus.

7 is interim target against intended learning outcome 1b in the programme syllabus.

8 is interim target against intended learning outcome 2 in the programme syllabus.

9 - 10, 15 - 17 are interim targets against intended learning outcome 3 in the programme syllabus.

11 - 13, 18 are interim targets against intended learning outcome 4 in the programme syllabus.

14 is interim target against intended learning outcome 5 in the programme syllabus.

20 is interim target against intended learning outcome 7 in the programme syllabus.

21 is interim target against intended learning outcome 8 in the programme syllabus.

### **Knowledge and understanding**

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

1. demonstrate knowledge and understanding in astrophysics, including both broad knowledge and considerably in-depth knowledge in the subject of the students own Master's thesis.
2. independently describe the status of current research in the research field within which degree project has been carried out.
3. account for what a conflict of interest is and give an account of how conflicts of interest can be handled when, for example, evaluating applications for observation time or funding.
4. describe the ethical aspects of astronomical and astrophysical research that have or can have an impact on humans and the environment.
5. give examples of what scientific misconduct is and give an account of the systems that exist at Lund University and in Sweden to deal with scientific misconduct.

### **Competence and skills**

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

6. discuss their own research project in relation to ongoing research in their own field as well as the subject of astronomy in general.
7. show specialised methodological knowledge in their chosen area of investigation.
8. integrate knowledge and understanding acquired during the programme in their own degree project and acquire new knowledge and understanding as an integral part of a research project.
9. under supervision, plan and within given time frames carry out a longer research project (i.e. the degree project), including setting up intermediate goals and revising the plan after self-reflection.
10. plan, carry out and complete assignments during shorter periods of time.
11. in both national as well as international contexts, in writing clearly present and discuss their conclusions and the arguments that form the basis for them in dialogue with different groups.
12. in both national as well as international contexts, orally clearly present and discuss their conclusions and the arguments that form the basis for them and put them in a larger context.
13. use constructively given feedback on their own presentations.
14. in a reflecting and methodological way identify their own need of acquiring knowledge and development

### **Judgement and approach**

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

15. lead a critical discussion of a specific research question.
16. formulate research questions to be examined critically, independently and creatively.
17. identify different ways to develop their ability to contribute to the development of knowledge and to evaluate it.
18. take into account and evaluate constructively given feedback on their own

presentations.

19. identify a conflict of interest on their own part.

20. identify and discuss the possibilities and limitations of science, its role in society and the responsibility of individuals for how it is used.

21. analyse their own need of acquiring knowledge and need for development related to the their own general aims with the education.

## Course content

The course consists partly of an independent project that has been chosen among the projects that are offered in the Master in astrophysics, and partly components that focus on specific intended learning outcomes. A list of projects that are offered in the Master in astrophysics is provided by the coordinator for the programme.

The project can be observational, technical or theoretical. Normally, the project is linked to the current research that is carried out at the department.

The components of the course are:

- A supervised degree project in a chosen, specialised research area. The degree project consists of several components, including definition of research questions, problem-solving, literature search, literature survey, methodological and technical aspects. All are required to be able to solve the research task that is made under supervision.
- Writing and revision of their own study plan.
- Implementation of three seminars.
  - At the beginning of semester three, seminar 1 is held
  - At the beginning of semester four, seminar 2 is held
  - The final seminar is given at the end of semester four
- Short, informal presentations of their own work and the results of others at suitable times during the course.
- Mini workshops that address the intended learning outcomes 3, 4, 5, 14, 19, and 21.
- Writing of self-reflections, work with constructive feedback (both giving and taking) as well as popular science text.

## Course design

The teaching takes place through the implementation of a project work in a subject that the student chooses based on a presentation of projects that are offered during the time the student is following the programme. Teaching in the form of supervision, which is provided by a teacher or other person that is especially familiar with the subject area in question. A supervisor that does not have the competence equal to a Docent or who have not previously supervised a student in the Master's programme in astrophysics, are given special support from the coordinator and/or an appointed mentor/assistant supervisor. Normally, the degree project requires certain specialised studies and a survey of the literature. The course may include experimental parts in the form of laboratory work and observational exercises. Collection of required observation data can take place at another observatory.

In addition, a number of compulsory components in the form of seminars, short informal presentations and mini workshops that, for example, deal with academic honesty, conflicts of interest, ethical aspects on astronomy and astrophysics, ethical aspects on science in general as well as popular science writing and ones own

development.

At the beginning of the course, the student and the supervisor together establishes an individual study plan that contains a definition of the project work and a time plan, which also contains the compulsory components that belong to the course. The plan is approved by the coordinator.

The student will give three seminars during the course. The first one only to their fellow students on the program (and the coordinator who takes care of the arrangement). The second seminar is given to fellow students and their own supervisor who listens in to support the student's development in describing and explaining their own research project. In connection with these two seminars, the students also give each other formative oral and written feedback that is used for self-reflection and to improve their own achievements. It is compulsory to participate in the feedback sessions. Seminars 1 and 2 do not contribute to the grade on the course.

Normally, in addition to supervision, the astronomical seminar and at least one other activity in the weekly schedule during the course is included. Which activity or activities an individual student participates in, is regulated in the individual study plan and can vary over time. The coordinator helps the supervisor and student to identify appropriate activities, so that the study plan satisfies the intended learning outcomes.

During the course, the student leads discussions of their own work as a natural part of the supervision. In addition, the student gives short, informal presentations of their own project and the results of others to a wider audience (see under examination) to fulfil the intended learning outcomes 6, 10, 12 and 15. The coordinator helps the supervisor and student to identify an appropriate number of short, informal presentations and when and where they are given so that the study plan satisfies the intended learning outcomes.

The intended learning outcomes 3, 4, 5, 14, 19, 21 are introduced and examined via mini workshops. Active participation is required for the grade pass.

A draft of the final report is required when semester three ends and semester four starts. This draft must be of such quality that the examiner and coordinator can decide that it is reasonable that the student can complete their work by the end of semester four. If that is not the case, then an alternative study plan has to be established in consultation with the supervisor, student and coordinator.

Before the final presentation, the student, together with their supervisor, has to review their work based on the intended learning outcomes in this course syllabus and/or in the qualifications for a Master's degree (120 credits) in the Higher Education Act. They must also verify with the coordinator that all compulsory course components specified in the individual study plan have been completed, or that there is a plan established to finish them in the near future.

## **Assessment**

The course ends with a written report and an oral presentation of the degree project.

The written report shall normally be written in English. The report has to include a popular science description intended for a wider audience, which normally also is written in English.

The oral presentation takes place in the form of an open seminar in the presence of the examiner, committee member, programme coordinator and supervisor.

Examination of intended learning outcomes 1-21: Note that all intended learning outcomes must be met to pass the course and that several intended learning outcomes are examined together.

- The written final report examines intended learning outcomes: 1, 2, 7, 8, 10, 11, 16, 17
- The oral final presentation examines intended learning outcomes: 2, 7, 8, 12, 17
- The popular science description examines intended learning outcomes: 11, 20
- The implementation of seminars 1 and 2 and the subsequent self-reflection after formative feedback, examines intended learning outcomes: 13, 17, 18
- By using formative feedback from fellow students and self-reflection, the following intended learning outcome is assessed: 8
- The draft to the written final report examines intended learning outcomes: 8, 17
- Through short, informal presentations, lead discussions of their own work and the results of others examines intended learning outcomes: 6, 10, 12, 15
- Active participation in the mini workshops examines intended learning outcomes: 3, 4, 5, 14, 19, 21
- Establishment and revision (after self-reflection) of their own study plan examines intended learning outcomes: 9, 14
- Through a report from the supervisor, the following intended learning outcome is examined: 14

The short, informal presentations and discussions should normally be given to a wider audience consisting of researchers and students also from other subareas than the student's own. The number of presentations and when they are given is regulated in the individual study plan.

The written report must be submitted to the examiner, committee member and coordinator, in a version that admits examination, at least two weeks before the seminar. Before that, the report has to be checked by the supervisor. 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

To pass the entire course, it is required to pass the written and oral presentation of the degree project and to pass the compulsory course components.

The compulsory components (see list under The Examination of the Course) are given the grades Failed or Passed.

The final grade is decided by a combination of the implementation of the degree project, the written report and the oral presentation of the degree project. In addition, the student's ability to work independently and to formulate the problem are also included in the assessment.

The examining committee consists of examiner and committee member. The examiner is normally a teacher with Docent competence. The grade must be accompanied by a written justification. The programme coordinator acts as chair person but does not participate in the decision on the grade. The coordinator gives support to the examiner and committee member, so that the grading is adapted to the fulfilment of the intended learning outcomes of the course in accordance with the grading criteria

that are presented at the start of the course. When necessary, the supervisor can be asked concerning aspects of the work that are difficult to assess only via the written and oral reports, for example how independently the student has carried out the work. The supervisor cannot be examiner for their own student.

If the examiner assesses that the written report, as submitted, cannot be approved, then the student shall be given the possibility to supplement the project report for renewed assessment.

If the examiner assesses that the oral presentation cannot be approved, then the student shall be given the possibility to give a new oral presentation for assessment.

If the project report or the presentation does not meet the intended learning outcomes of the course after this renewed assessment, then the examiner can, in consultation with the coordinator, decide to fail the project. This can imply that a new project is required, so that all learning outcomes can be fulfilled.

### **Entry requirements**

For admission to the course, the student must meet the requirements for admission to the Master programme in astrophysics and have completed at least 22.5 credits in the Master programme in astrophysics. The courses may not be part of the applicant's Bachelor's degree.

### **Further information**

The course may not be credited towards a degree together with ASTM31 Astronomy: Master's Degree Project, 60 credits.