Faculty of Science

# ASTC01, Astronomy: Astrobiology - Conditions and possibilities for life in the Universe, 7.5 credits

*Astronomi: Astrobiologi - förutsättningar och möjligheter för liv i universum, 7,5 högskolepoäng*

**First Cycle / Grundnivå**

## Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2007-03-01 to be valid from 2007-07-01, autumn semester 2007.

## General Information

The course is an elective course for first-cycle studies for a Degree of Master of Science (120 credits) in astrophysics.

*Language of instruction:* English and Swedish
If needed, the course is given in English.

| *Main field of studies* | *Depth of study relative to the degree requirements* |
|---|---|
| Physics | G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements |

## Learning outcomes

Upon completion of the course, the student should have acquired skills to apply a perspective from astronomy and geosciences, in describing methods for mapping of environments within, and outside our solar system, where there might exist preconditions for the existence of life; to apply a perspective from biology, in describing how life has developed on Earth, and in studying its limits, e.g., the most extreme environments that terrestrial life can endure. The student should
be able to give a general account of

- the earliest traces of life on Earth Theories of the origin of life. terrestrial life under extreme relations
- the evolution of other planets and of their atmospheres. The planet Mars: its evolutionary history and properties; climate changes, seasonal variations and their

causes; the differences versus the Earth
- impacts of meteorites and asteroids; biological effects concerning the extinction or modification of species. Possible transfer of microorganisms between planets in the solar system. The need for quarantine on Earth for extraterrestrial samples and protection of other celestial bodies against contamination from Earth
- planets around other stars (exoplanets) and current methods to find and study these. Future ground-based and spaceborne experiments. Construction of space probes to search for life in the solar system
- mechanisms for global climate changes. The Earth's future billions of years from now. Possible artificial climate changes on other planets
- the search for extraterrestrial intelligence. Interstellar communication and the feasibility of interstellar spaceflight. Possible sociological and other consequences of the discovery of extraterrestrial life and/or of extraterrestrial intelligence
- historical perspectives: Shifting thoughts about extraterrestrial life throughout the times

have received training in

- interdisciplinary approaches within astrobiology as a distinctly multidisciplinary subject
- literature searches within research topics close to current research frontlines. Oral, written and computer-based presentation of an independent project.

## Course content

The course describes those planets and those among their moons in the solar system that can be envisioned to have (or have had, or will have) physical and/or chemical preconditions to develop life. The development of the earliest lifeforms on Earth, and extreme environments for present-day life on the bottom of the oceans, around hot springs, deep underground, in permafrost, or in radioactive environments. Design of space probes is described, as well as experiments to study biologically relevant environments on other planets. Analysis of extraterrestrial material in the laboratory, and risks for spreading organisms between different planets. Current and planned instruments and methods to find and to study planets around other stars. Development over geological ages of different planets together with their host star; of their atmospheres and climates. Finally, the search for intelligent life in the Universe, and possible philosophic and other consequences of a possible discovery thereof.

## Course design

The teaching consists of lectures, laboratory sessions, group work and project work. Participation in laboratory sessions, exercises and project work are compulsory. It is possible to locate the project work to other institutes, also outside Lund.

## Assessment

The examination consists of laboratory reports and project work, as well as a written test at the end of the course. Students who do not pass the regular exam are offered a re-exam shortly after the regular exam.

*Subcourses that are part of this course can be found in an appendix at the end of this document.*

## Grades

Marking scale: Fail, Pass, Pass with distinction.
To pass the entire course, a passed examination, approved laboratory reports, a passed project report and participation in all compulsory parts are required.
The final grade is determined by weighing the results in the different parts of the course.

## Entry requirements

The prerequisites required for admission to the course are: at least 60 credits of approved courses within the faculties of either science, technology and/or medicine. Earlier studies in astronomy or biology are not presumed.

## Further information

The course cannot be credited towards a degree together with AST221 Astrobiologi 5p.

## Subcourses in ASTC01, Astronomy: Astrobiology - Conditions and possibilities for life in the Universe

Applies from H13

0711 Project Work and Exercises, 2,5 hp
Grading scale: Fail, Pass, Pass with distinction
0712 Theory, 5,0 hp
Grading scale: Fail, Pass, Pass with distinction

Applies from H07

0701 Astrobiology, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction