LTTO.00.011 Introduction to Space Technology
2020/2021 autumn regular studies

Faculty/Department | Tartu Observatory (LTTO)
Amount of credits (1 ECTS=26 hours) | 3 ECTS
Duration in semesters | 1
Final assessment | differentiated (A, B, C, D, E, F, not present)
Syllabus credits | 3 ECTS
Lecturers | Joosep Kivastik (responsible), Mihkel Pajusalu
Languages of instruction | English
Minimum number of attendants | 5
Maximum number of attendants | 40
Study levels | bachelor's studies, master's studies, doctoral studies, bachelor's and master's integrated studies
Forms of teaching and learning and no of hours | lectures: 32 independent work (including e-learning): 46
Web-based learning | Partially
Study period (in weeks) | 1-16

Curricula containing this course
- Computer Science (2476) bac. 2018/2019

Objectives
The aims of the course are:
- to raise the competence of Estonian industry and scientific institutes in the field of space technology by introducing this topic to the future workforce;
- to explain and popularize the field of space research, European Space Agency space programmes and the role of Estonian membership.

Learning outcomes
At the end of the course the participants will:
- know the most important technological milestones of the space history;
- know the main applications of space technology and their benefits for Estonia and the world;
- know principles of space mission planning;
- know the technology used for space research (satellites, launchers, etc.) and instruments (radiometers, telescopes, radars);
- know the possible opportunities for Estonia in space industry and research.

Brief description
This introductory course is meant for students interested in space technology and space research. The course gives an overview of the history of space exploration in the World and in Estonia, as well as future perspectives. Most important space technology components, instruments and their work principles are presented. Both peaceful and military use of space applications are discussed. During the course, students will design their own mission.

Groups
Mark Limit of attendants Lecturers
Schedule
03.09.2020 lecture - Introduction of lecturers and students.
Planned learning outcomes.
Structure and schedule.
Evaluation of the learning outcomes.
Introduction to space.
Space research history.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>10.09.2020</td>
<td>lecture - Space mission design. ESTCube-1 (Hendrik Ehrpais)</td>
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<tr>
<td>17.09.2020</td>
<td>lecture - ESTCube-2</td>
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<td>Comet Interceptor</td>
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<td>Theia</td>
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<td>24.09.2020</td>
<td>seminar - Team project idea presentations.</td>
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<td>Team formations.</td>
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<td>01.10.2020</td>
<td>lecture - Communications and Ground station (Janis Dalbins)</td>
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<td>Attitude determination and orbit control system (Hendrik Ehrpais)</td>
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<td>08.10.2020</td>
<td>lecture - Power and propulsion. (Mihkel Pajusalu)</td>
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<td>Satellite Mechanics (Silvar Muru)</td>
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<td>15.10.2020</td>
<td>practical session - Excursion to Tartu Observatory: Tour to telescopes and stellarium (Tõnis Eenmäe)</td>
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<td>and tour to space technology laboratories (Ayush Jain). Leaving the Physicum at 10:30 and returning to Tartu around 13:30.</td>
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<td>22.10.2020</td>
<td>lecture - Astrobiology (Mihkel Pajusalu)</td>
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<td>29.10.2020</td>
<td>seminar - Midterm review of course projects (student presentations)</td>
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<tr>
<td>05.11.2020</td>
<td>lecture - Astrophysics (Tõnis Eenmäe)</td>
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<td>12.11.2020</td>
<td>lecture - Remote sensing (Kaupo Voormansik)</td>
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<td>19.11.2020</td>
<td>lecture - Moon Rovers</td>
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<td>Quantum Physics in space.</td>
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<td>Deadline for course project reports DELIVERY</td>
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<td>03.12.2020</td>
<td>lecture - Project reports and presentation. Each group presents for 20 minutes and we will have 15 minutes for Q&amp;A by committee. Report on the group work at the end of the presentation</td>
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<tr>
<td>10.12.2020</td>
<td>lecture - Backup lecture for project presentations.</td>
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**Lecture materials and course home page**

*Web-based learning environment*

https://moodle.ut.ee

*Compulsory study materials*

Materials will be available on Moodle.

*Recommended study materials*

During the course, student groups will chose a course project topic and the literature will depend on the topic.

**List of independent works and their instructions**

- Lecture feedback.
- Course project.

**Assessment methods and criteria**

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<tr>
<th>home work</th>
<th>Kodutööd õigeaegselt esitatud, sooritus postiivne</th>
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Requirements to be met for final assessment

- Participation in the course project.

To obtain final grade, the following is required

1. Reflections 40%
2. Course project 60%

Options for taking tests/exams at later date

- It is possible to retake the final exam one time near the end of the semester.
- The deadline for the retaking of the exam is the start of the next semester.
- With the approval of the dean, it is possible to apply for a two week extension to the exam deadline.

**Other information**
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