

SYLLABUS

Radiative transfer 7.5 credits F7001E

Strålningstransfer

Course syllabus admitted: Autumn 2023 Sp 1 - Present

**DECISION DATE
2021-02-16**

Radiative transfer 7.5 credits F7001E

Strålningstransfer

Second cycle, F7001E

Education level
Second cycle

Grade scale
G U 3 4 5

Subject
Rymdteknik

Subject group (SCB)
Space Technology

Main field of study

Space Technology

Entry requirements

Basic knowledge in mathematics equivalent to 22.5 credits, for example, three of Differential Calculus M0047M, Linear Algebra and Calculus M0048M, Linear Algebra and Differential Equations M0049M, Multivariable analysis M0055M. Basic physics corresponding to 22.5 credits, for example, three of the F0004T Physics 1, Physics 2 F0005T, 3 F0006T Physics, Electromagnetic Field Theory F0007T, Atmospheric Physics F7004R. Knowledge in optics is advantageous.

Good knowledge in English equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

Knowledge and understanding

The student shall acquire knowledge of physical principles that determine radiation transport in atmospheres, the behavior of radiation at surfaces and the radiation budget of a planet. After passing the course, the student should be able to explain and describe these physical principles, both qualitatively and quantitatively describe them and to evaluate their significance from a holistic perspective.

Competence and Skills

After the course the student should be able to describe which processes determine radiation transmission in different spectral regions and how the radiation reacts to changes in components that determine radiation transmission in transmissive media and on surfaces, including general radiation transport, scattering processes, polarization and advanced processes. The student must be able to motivate, plan and carry out scientific experiments, which is demonstrated through a laboratory work where the student must describe radiation transmission processes and model them with the help of radiation transmission models. The student should be able to describe and analyze different radiation parameters, their variability and sensitivity. The student should be able to handle spectral radius data, visualize them and apply different methods of analysis and apply the processes with a simple model.

Judgement and approach

Students should be able to discuss the importance of different parameters and conditions for radiation transport in view of correlations between different parameters. These are shown by evaluating related issues. The student must be able to present analysis and results within the framework of the given exercises.

Contents

The course covers equations describing radiation, radiative transfer equations (Beer's law, Schwarzschildt equation), Scattering processes (Mie, Rayleigh), Properties and processes of spectral regions (UV/VIS, IR, FIR, Microwave), Interaction between surfaces and radiation, radiative transfer for selected special spectroscopic processes.

Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

The course consists of classical lectures, seminars, homework assignments in which students among others are introduced to work with a radiative transfer model. Depending on the circumstances, a different realization of the course can be required. Guest teachers from research groups. Upcoming public discussions and new findings and observations within radiative transfer are discussed.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided. The course grade will be determined by the student's home work assignments with theoretical and practical character. Additionally, an individual assessment of the participation during the discussions of the assignments will be considered.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Course offered by

Department of Computer Science, Electrical and Space Engineering

Modules

| Code | Description | Grade scale | Cr | Status | From period | Title |
|------|--------------------|-------------|-----|-----------|-------------|-------|
| 0003 | Assignment reports | G U 3 4 5 | 7.5 | Mandatory | S19 | |

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

Last revised

by Jonny Johansson, HUL SRT 2021-02-16

Syllabus established

by Jonny Johansson, HUL SRT 2017-02-15