

SYLLABUS

Space Communication 7.5 credits R7021R

Rymdkommunikation

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2021-02-16

Space Communication 7.5 credits R7021R

Rymdkommunikation

Second cycle, R7021R

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Rymdteknik	Space Technology

Main field of study

Space Technology

Entry requirements

Functions of Several Variables (M0055M), Circuit Theory (E0003E), Electronics (E0007E) or similar qualifications. Good knowledge in English equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

The aim of the course is to extend and deepen the student's knowledge of digital and analogue communication systems with an emphasis on space communications. On completion of the course the student shall have the skills and knowledge to be able to:

1. Describe an overview of the forms of communication systems used for scientific satellites and spacecraft, communication satellites, broadcast satellites and for the Telemetry, Tracking and Control (TT&C) of spacecraft;
2. Identify the technologies and requirements of the various parts of each of the above systems;
3. Perform an analysis of a communication system or part of a communication system to determine items of the performance such as the signal to noise ratio, the bit error rate, the capacity, the link utilization and the link budget;
4. Describe and make calculations and measurements on a number of techniques used to translate signals in the frequency domain, to perform modulation and de-modulation and to form a number of channels through a communication system;
5. Describe the principles of multiple access to communication satellites and to capacity assignment;
6. Describe a number of methods used for forward and for backward error correction;
7. Cooperate with colleagues in undertaking practical projects and measurements and writing technical reports in English.

Contents

The course will cover:

1. An overview of satellite and spacecraft communication systems;
2. The conversions of signals and data into forms suitable for transmission over lines, optical fibres, waveguides and radio links;
3. An introduction to information theory and capacity;
4. Frequency translation, analogue and digital modulation, theory and systems;
5. Noise, noise sources, noise figure, factor and temperature, system values and bit error rate;
6. Antenna, arrays, polar diagrams, and gain;
7. Link budgets.

Realization

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

The teaching on the course consists of lectures, demonstrations and practical exercises and technical report writing. The students are also required to write two papers on subjects that form part of the syllabus but are not included in lectures.

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. To pass the course the student must have had their practical work, technical reports and papers approved and in combination with the exam mark gained a grade 3 or above.

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.

Overlap

The course R7021R is equal to E7002R

Course offered by

Department of Computer Science, Electrical and Space Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0002	Laboratory work	U G#	3	Mandatory	A14	
0003	Written exam	G U 3 4 5	4.5	Mandatory	A21	

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 2014-02-14