Optics- and Radar-based Observations 7.5 credits F7003R

Optik- och radarbaserad observationsteknik

Course syllabus admitted: Spring 2016 Sp 4 - Present

DECISION DATE
2016-01-11

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Optik- och radarbaserad observationsteknik

Second cycle, F7003R

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Rymd- och atmosfärsvetenskap	Space Technology

Entry requirements

Courses of at least 90 credits at first cycle including the following knowledge/courses. Basic knowledge in mathematics, electromagnetism, Matlab programming. Courses in mathematics (M0018, M0031), physics (F1-3) and electronics for engineers are recommended.

Selection

The selection is based on 30-285 credits

Examiner

Victoria Barabash

Course Aim

The student shall acquire knowledge about technical aspects of radar and optical systems as well as their scientific applications for geospheric research. This is shown by capability to describe and explain physical and technical principles of the radar and optical systems as well as capability to use these systems in order to plan and perform scientific experiments in space.

The student shall show capability to critically and independently formulate the problems as well as perform technical calculations for radar and optical systems within the given time frame. This is done via problem solving. The student shall be able to motivate, plan and perform scientific experiments with these systems during the practical work. The student shall be able to critically select and evaluate relevant scientific and technical information within the subject via the literature survey. Ability and skills to present own results and arguments during international events are evaluated via report writing in English. The student shall demonstrate social skills and be able to effectively work in a group during the practical work.

The student shall have insight about technical possibilities and limits as well as human responsibility for the way of their using. This is shown via evaluation of the relevant technological and ethic aspects.

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Contents

Introduction to the radar systems. Radar equation. Radar targets. Information from the radar signals. Fundamentals of coherent and incoherent radar systems. Configuration of the radar system and optimisation. Radar hardware incl. antennas, transmitter, receiver. Signal processing and data analysis. Radar systems applications for space research.

Radiometry. Fundamentals of optical measurements. Optical technology. Overview of imaging detectors, intensifiers and filtres. Calibration. Scientific and technological applications.

In order to run the radar experiment specific software for EISCAT radar system is used. To work with the radar data processing a program MATLAB is used.

Realization

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

Lectures, project work and assignments that consider theoretical aspects, training in experimental techniques and technical report writing in English.

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. Written examination, assignments, project. In order to pass the course it is required that examination and obligatory tasks are completely satisfactory. The final grade reflects the results obtained during compulsory moments of the course. The grading system for the course is: excellent (5), very good (4), , satisfactory (3),.

Overlap

The course F7003R is equal to F7013R, RYM011

Literature. Valid from Spring 2016 Sp 4

Mark A. Richards, James A. Scheer, William A. Holm, Principles of Modern Radar, Vol.1, Scitech Publisging Inc., 2010, ISBN 978-1-891121-52-4

Röttger, The Instrumental Principles of MST Radars and Incoherent Scatter Radars and the Configuration of Radar System Hardware, Handbook for Map, Vol. 30, International School on Atmospheric Radar, p.54-113, 1989.

U. Brändström, The Auroral Large Imaging System Design, Operation and Scientific Results, IRF Scientific Report 279, 2003, ISSN: 0284-1703, ISBN: 91-7305-405-4.

Additional:

M. Skolnik, Introduction to Radar Systems, 3rd edition, 2001, McGraw-Hill International Editions, ISBN 007-118189-X.

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Course offered by

Department of Computer Science, Electrical and Space Engineering

Items/credits

Number	Type	Credits	Grade
0005	Project work	2	U G#
0007	Written exam	3.5	G U 3 4 5
0008	Assignment work	2	U G#

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 2016-01-11

Syllabus established

by Hans Weber 2010-02-11

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