SYLLABUS

Technical wave physics 7.5 credits F7028T

Teknisk vågfysik

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2022-02-14

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LULEÅ TEKNISKA UNIVERSITET

Technical wave physics 7.5 credits F7028T

Teknisk vågfysik

Second cycle, F7028T

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Fysik	Physics

Entry requirements

Bachelor in Engineering Physics.
Required previous knowledge:
- Basic wave physics corresponding to F0005T, Physics 2
- Deepened knowledge about wave phenomena corresponding to F0048T, Optics and Photonics
- Basic understanding of linear systems and signal processing corresponding to S0001E, Signal Analysis
- Basic understanding of Electro-magnetism corresponding to F0007T, Electromagnetic Field Theory
- Basic understanding of Continuum mechanics corresponding to F0030T, Continuum Mechanics
- Skills in Matlab programming corresponding to M0032M, Functions of Several Variables and Computer Tools
- Good knowledge in English, equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

The overall objectives of the course are to provide students with a fundamental understanding of the origin of waves in many of the branches of physics together with an ability to address, model and solve such problems using different analytical and numerical tools. The course gravitates around optical waves and various metrological applications.

After passing the course the student should have the ability to:

Knowledge and Understanding

- Describe physical material models based on basic wave phenomena.
- Motivate solution strategies in classical wave theory utilizing the general diffraction integral.
- Evaluate effects of randomness in wave theory.
- Relate the origin of non-linear effects to different physical phenomena.
- Make quantitative conclusions about different types of measurement methods.

Skills and Abilities

- Formulate solutions to different wave technical problems.
- Adapt and modify numerical tools to solve wave technical problems.
- Demonstrate an ability to present problems and solutions orally.
- Demonstrate an ability to summarize in writing a problem and its solution in a structured and convincing manner.

Judgement and Approach

- Defend the model and approach chosen for a given problem.
- Relate the results obtained to the problem and models chosen.

Contents

- Free and forced oscillations
- Coupled oscillations
- General properties of one-dimensional waves
- Polarized waves; mechanical and electromagnetic waves
- Diffraction theory and imaging
- Methods to detect phase
- Waves at boundaries
- Confined waves
- Spatial and temporal coherence
- Static and dynamic properties of speckles
- Non-linear waves
- The Raman effect and Raman spectroscopy

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 consists of lectures, discussions and seminars. To reach the expected study results, the student is required to put in a significant amount of individual work centered around the problems that are part of the course and that make up the foundation for the examination. Solutions to raffled out problems are discussed and presented orally at the seminars and solved problems are summarized in writing in a portfolio that is submitted at the end of the course.

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 is examined orally through participation and presentation at tree seminars.

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 Engineering Sciences and Mathematics

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0002	Seminars	G U 3 4 5	7.5	Mandatory	A15	

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 Niklas Lehto, Programme Director 2022-02-14

Syllabus established

by Department of Applied Physics and Mechanical Engineering 2010-02-20