EE-737

Introduction to wave scattering

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Cursus	Sem.	Type
Photonics		Opt.

Language of teaching	English
Credits	2
Session	
Exam	Term paper
Workload	60h
Hours	**14**
Courses	14
Number of positions	**50**

Frequency

Every 3 years

Remark

Next time: 2027

Summary

This advanced theoretical course introduces students to basic concepts in wave scattering theory, with a focus on scattering matrix theory and its applications, in particular in photonics.

Content

A. The S matrix (basic definitions and examples)
B. Properties of the S matrix (flux conservation, time-reversal, reciprocity, scattering time, particle-like states, Wigner-Smith operators)
C. Resonant scattering (coupled mode theory, time-bandwidth product, quality factor, bound states in continuum)
D. Scattering networks (eigenvalue problem, external port scattering, eigenmodes)
E. Topological scattering properties (homotopy of unitary operators, topological networks)
F. Free field electromagnetic scattering, if time allows

Note

Course based on blackboard-style lectures and course notes written by the instructor. A basic knowledge of wave phenomena and linear algebra is required.

Keywords

scattering, wave phenomena

Resources

Notes/Handbook

Lecture notes will be made available for the students in due time.

Moodle Link

- https://go.epfl.ch/EE-737