

MATH-478

**Dispersive PDEs**

Krieger Joachim

Cursus	Sem.	Type
Ing.-math	MA2, MA4	Opt.
Mathématicien	MA2	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Oral
Workload	150h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Lecture	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Remark**

Cours donné en alternance tous les deux ans

**Summary**

This course will give an introduction to some aspects of nonlinear dispersive partial differential equations. These are time evolution problems that arise in many contexts in physics, such as quantum mechanics, electrodynamics, fluid motion and relativity.

**Content**

The course is aimed to be self-contained, introducing the necessary technical tools along the way.

1. Introduction. What are dispersive equations? How do they arise?
2. Technical Background: Fourier Analysis & Sobolev Spaces
3. Linear Dispersive Equations
4. Semilinear Equations
  - 4.1 Local Theory
  - 4.2 Criticality and Scaling
  - 4.3 Global Theory
  - 4.4 Advanced Topics / More Technical Background
5. Quasilinear Equations
  - 5.1 Method of Spacetime Resonances
  - 5.2 Advanced Topics

**Learning Prerequisites****Required courses**

A solid foundation in analysis (including measure theory and functional analysis) is necessary. Advanced topics such as harmonic analysis would be helpful, but are by no means required.

**Assessment methods**

Active participation in the exercise sessions

Oral final examination

Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communique aux étudiants concernés.

**Resources****Moodle Link**

- <https://go.epfl.ch/MATH-478>