EPFL

MATH-305	**Sobolev spaces and elliptic equations**
	Nguyên Hoài-Minh

Cursus	**Sem.**	**Type**
Mathematics	BA5	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Written
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

This is an introductory course on "Linear Elliptic Partial Differential Equations".

Content

1, Harmonic functions. Mean value properties. Fundamentai solutions. Green's identities, Maximum principles. Caccioppoli's inequality.
2. Sobolev spaces. Soiobev's inequality, Poincare's inequality, Reillich-Kondrachov's inequality. Trace theorems.
3. Dirichlet problems. Existence and uniqueness of weak solutions. Lax-Milgram's theorem and compactness arguments. Maximum's principle. A connection with variational method.
4, Neumann problems. Existence and uniqueness of weak solutions. Lax-Milgram's theorem and comptactness arguments. A connection with variational method.
5. Mixed boundary problems, An example.
6. Separation of variables. Solving Laplace's equations in a ball and in a circular. Three spheres inequality.
7. Laplace equation in unbounded domains.

Learning Prerequisites

Required courses

The students are strongly recommended to have sufficiently knowledge on real analysis, theory of integrations. Having taken a functional analysis course will be an advantage.

Important concepts to start the course

By the end of the course, the student must be able to:
. Apply basic theory to solve several problems in sciences
. Analyze partial dilforential equations

Teaching methods

The course is given during the first 7 weeks with 5 hours ex-cathedra and 3 hours of exercises.

Assessment methods

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