MATH-207(c) **Analysis IV (for EL, GM, MX)**

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Cursus	Sem.	Type
Electrical and Electronical Engineering	BA4	Obl.
HES - EL	E	Obl.
HES - GM	E	Obl.
Materials Science and Engineering	BA4	Obl.
Mechanical engineering	BA4	Obl.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Lecture	2 weekly
Exercises	2 weekly
Number of positions	

Summary

This course serves as an introduction to the theory of complex analysis, Fourier series and Fourier transforms, the Laplace transform, with applications to the theory of ordinary and partial differential equations. These tools play an integral role in most branches of science and engineering.

Content

Complex analysis

- Definitions and examples of complex functions.
- Holomorphic functions.
- Cauchy-Riemann equations.
- Complex integrals and Cauchy formulas.
- Series of Laurent.
- Residue theorem.

Laplace's analysis

- Laplace transforms.
- Fourier transforms.
- Applications to ordinary differential equations.
- Applications to partial differential equations.

Keywords

Complex analysis, holomorphic functions, Fourier series, Laplace transform

Learning Prerequisites

Required courses

Linear Algebra, Analysis I, Analysis II, Analysis III

Important concepts to start the course

- Usual derivatives and derivation rules

- Common primitives and integration techniques (integration by parts, substitution)
- Taylor series and analytic functions
- Complex numbers (definitions, Euler's identity, complex exponential)
- Fourier series and transforms
- Linear differential equations

Learning Outcomes

By the end of the course, the student must be able to:

- State the fundamental properties of holomorphic functions and the Laplace and Fourier transform.
- Use these properties to solve an array of problems.
- Choose the appropriate set of tools to address questions involving ordinary and partial differential equations.

Transversal skills

- Assess progress against the plan, and adapt the plan as appropriate.
- Demonstrate the capacity for critical thinking
- Demonstrate a capacity for creativity.
- Access and evaluate appropriate sources of information.

Teaching methods

2h lectures + 2h exercises

Expected student activities

Active participation in the regular classes, working on the problem sheets before the exercise sessions.

Assessment methods

Written exam
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.

Supervision

Office hours	No
Assistants	Yes
Forum	No

Resources

Bibliography

B. Dacorogna et C. Tanteri, Analyse avancée pour ingénieurs, PPUR 2018.
Resources at the library:
http://library.epfl.ch/en/beast?isbn=2-88914-565-4

Moodle Link

- https://go.epfl.ch/MATH-207_c