

MATH-123(b)

Geometry

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Cursus	Sem.	Type
Civil Engineering	BA2	Obl.

Language of teaching	English
Coefficient	3
Session	Summer
Semester	Spring
Exam	Written
Workload	90h
Weeks	14
Hours	3 weekly
Lecture	2 weekly
Exercises	1 weekly
Number of positions	

Summary

The course provides an introduction to the study of curves and surfaces in Euclidean spaces. We will learn how we can apply ideas from differential and integral calculus and linear algebra in order to "measure shapes".

Content

Topics to be covered in this course include:

- tangent vectors, vector fields, moving frames
- planar and space curves and their geometric properties
- surfaces and notions of curvature
- (Euclidean) isometries

Learning Prerequisites**Required courses**

Analysis I, Linear Algebra

Important concepts to start the course

Fundamental notions from differential and integral calculus and linear algebra.

Learning Outcomes

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

- Link concepts from calculus to geometric properties of curves and surfaces
- Describe relevant examples of curves and surfaces
- Visualize geometric transformations in the plane and in three-dimensional space
- Carry out a range of computations which may be applicable to engineers
- Demonstrate effective use of fundamental notions involving curves and surfaces

Teaching methods

Lectures and exercise classes.

Assessment methods

Written exam.

Supervision

Office hours	No
Assistants	Yes
Forum	No

Resources

Bibliography

The following are good books which are also available through the EPFL library:

- (English translation) *Differential Geometry of Curves and Surfaces* by S. Kobayashi.
- (English translation) *Differential geometry of curves and surfaces* by M.P. do Carmo.
- (In French) *Cours de géométrie* by M. Troyanov.
- (Chapter 3) *Tensor Analysis and Elementary Differential Geometry for Physicists and Engineers* by H. Nguyen-Schäfer and J-P Schmidt.
- (Chapters 19 and 20) *Geometric Methods and Applications: For Computer Science and Engineering* by J. Gallier.

Ressources en bibliothèque

- [Differential Geometry of Curves and Surfaces / Kobayashi](#)
- [Differential geometry of curves and surfaces / de Carmo](#)
- [Cours de géométrie / Troyanov](#)
- [Tensor Analysis and Elementary Differential Geometry for Physicists and Engineers / Nguyen-Schäfer](#)
- [Geometric Methods and Applications / Gallier](#)

Notes/Handbook

There will be (handwritten) lecture notes.

Moodle Link

- https://go.epfl.ch/MATH-123_b