

MATH-343

Mathematical mechanical biology

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Cursus	Sem.	Type
Mathematics	BA5	Opt.

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

Summary

The course will be split into three parts which will respectively cover bio-filaments, bio-membranes and morphoelasticity.

Content

- statistical mechanics of different chains of growing complexity.
- classical rod mechanics (Kirchhoff and Cosserat).
- Geometry of surfaces and its application to mechanics.
- Fluid bio-membranes.
- Axisymmetric Membranes and Shells in linear and nonlinear elasticity.
- Growth of rods.
- A brief introduction to classical nonlinear elasticity.
- Volumetric growth.

Keywords

nonlinear elasticity
growing bodies
bio-filaments
bio-membranes

Learning Prerequisites**Required courses**

Analysis I-III
Physics I

Recommended courses

Physics II

Learning Outcomes

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

- Develop models of different systems in the framework of continuum mechanics.
- Solve typical problems related to mechanics and growth.
- Propose well motivated approximations.

Expected student activities

Besides attending the lecture and exercise sessions (which are both recommended albeit not compulsory), the curious students will be strongly encouraged to also do some home reading.

Assessment methods

oral 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

Virtual desktop infrastructure (VDI)

No

Websites

- <http://mathgeomsrv2.epfl.ch/teaching/MathematicalMechanicalBiology/>