MSE-425 **Soft matter**

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Cursus	Sem.	Type
Materials Science and Engineering	MA2, MA4	Obl.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	3 weekly
Exercises	1 weekly
Number of positions	

Summary

The first part of this course encompasses the assembly of molecules into micro- and macroscopic materials and the influence of the structure of the resulting materials on their properties. The second part will focus on the production of colloids and their assembly into superstructures.

Content

Assembly of organic molecules:

- Repetition of intramolecular forces
- Self-assembly in liquids
  - Thermotropic liquid crystals
  - Lyotropic liquid crystals
    - Micelles
    - Vesicles
- Self-assembly at liquid-solid interfaces
  - Brushes
  - Polyelectrolytes
- Molecules in bulk
  - Polymers
  - Gels

Colloids:

- Emulsions
- Foams
- Stabilization of colloids
- Assembly of colloids into superstructures

Keywords

soft materials, self-assembly, organic molecules, polymers, colloids

Learning Outcomes

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

- Design molecules that assemble into a desired superstructure
- Predict the influence of changes in the structure of molecules on their self-assembly behavior
- Estimate the influence of the structure of soft materials on their properties
- Modify surfaces to impart a desired functionality to them
- Design stable emulsions and dispersions
- Design colloids with a tunable interparticle interaction
- Design microscopic materials made from colloidal buildling blocks

Teaching methods

Exercises will be incorporated into the lectures

Expected student activities

Solving exercises
Each student will do one project and orally presents it to the class.

Assessment methods

One student project, one written examination

Supervision

Office hours	No
Assistants	Yes
Forum	No

Resources

Bibliography

Soft Condensed matter, Richard A. L. Jones, Oxford Master Series in Condensed Matter Physics

Ressources en bibliothèque

- Soft Condensed Matter / Jones