MSE-425 **Soft matter**

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Cursus	Sem.	Type
Materials Science and Engineering	MA1, MA3	Obl.

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

Summary

The first part of the course is devoted to the self-assembly of molecules. In the second part we discuss basic physical chemical principles of polymers in solutions, at interfaces, and in bulk. Finally, we look at colloids and emulsions.

Content

- Self-assembly in liquids
  - Thermotropic liquid crystals
  - Lyotropic liquid crystals
    - Micelles
    - Vesicles

- Polymers
  - In solution
  - At solid-liquid interfaces
  - In bulk

- Colloids
  - Stabilization of nanoparticles
  - Formation and stabilization of emulsions

Keywords

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

Learning Prerequisites

Recommended courses

Physical chemistry of polymeric materials

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 colloids with a tunable interparticle interaction
- Design microscopic materials made from colloidal buildling blocks
- Design stable emulsions and dispersions

Teaching methods

Exercises will be incorporated into the lectures

Expected student activities

Solving Exercises on a weekly basis
Presentation of a challange: This includes an oral presentation and a written report

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
- Polymer Chemistry / Lodge