MSE-425 **Soft matter**

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

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	

Remark

In 2022-2023, this course will be given in Autumn 2022

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 presented within the last two weeks of the semester and one written examination. The student project counts for 25% the examination for 75% of the final grade.

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