Course Syllabus

VM508

Introduction to Soft Matter Physics

Fall 2018

Course Description:

Soft matter includes almost all matter that is either soft or liquid in nature, or has structure on nanometer length scales. Examples range from water to jelly to cement. Soft matter is a highly interdisciplinary field, and much of our research is conducted in collaboration with chemists, biologists, or engineers. This course introduces the basic knowledge, some well-known research methods and technologies in soft matter physics. It attempts to give an overview of the various aspects of the physics of soft condensed matter – including droplets, colloids, supramolecules, and liquid crystals, etc. It is expected that this course will be helpful to students of applied science and engineering using soft matter in their design, fabrication, modeling or simulation.

Instructor:

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Office: Room 510, Longbin BLDG

Office hour: 12:30 – 1:30 pm on Monday and Wednesday, or by appointment

Reference Book (Author, Book Title, Publisher, Publication Year, ISBN):

- R.A.L. Jones: Soft condensed matter. Science Press, 2008, ISBN: 978-7-03-022126-1.
- L. Zhou: Introduction to soft matter physics. Fudan University Press, 2011, ISBN: 978-7-309-07712-4.
- M. Doi: Soft Matter Physics. Oxford University Press, 2013, ISBN: 978-0-19-965295-2.

Lecture

Students are expected to attend every lecture.

Quiz

Quizzes will be given in class. They are to help you gauge your progress.

Homework

Homework assignments will be given in the form of problem sets. Each assignment will have a due date, by which it should be handed over for grading. Late assignment return will be not accepted.

Project

An individual project will be assigned before the first midterm exam. A project report and presentation are required for evaluation.

Exam

There will be two midterm exams and a final exam.

Grading Policy (Assignments %, Project, Exams, etc.)**:**

Homework (20%)
Quiz (10%)
Project (10%)
Midterm Exam 1 (20%)
Midterm Exam 2 (20%)
Final Exam (20%)

Honor Code Policy:

The rules for observing the Honor Code in this course are quite simple: you must never show any other student your written work. You are allowed to talk about the course work (the weekly assignments), but may not communicate in writing. For example, it is OK to tell another student “I solved this

differential equation by substituting as for a homogeneous equation." It is not OK to actually show another student the written calculations of how you did this. Of course, during exams, no communication of any kind (verbal or written) is allowed!

Note

The syllabus is subjected to change if necessary.

Teaching Schedule:

Week	NO.	Date	Lectures and Exams	Comments
1	1	September 10	Introduction and overview	
	2	September 12	Fundamentals I	
2	3	September 17	Fundamentals II	
	4	September 19	Fundamentals III	
3		September 24		Holiday
	5	September 26	Droplets	
4		October 1		Holiday
		October 3		Holiday
5	6	October 8	Colloidal dispersions I	
	7	October 10	Colloidal dispersions II	
6	8	October 15	Ionic soft matter I	
	9	October 17	**Midterm exam I** (Lecture 1 – 7)	
7	10	October 22	Ionic soft matter II	
	11	October 24	Granular materials	
8	12	October 29	Liquid crystals I	
	13	October 31	Liquid crystals II	
9	14	November 5	Amphiphiles	

	15	November 7	Non-equilibrium soft matter: morphology and rheology under fields	
10	16	November 12	**Midterm exam II** (Lecture 8 - Amphiphiles)	
	17	November 14	Non-equilibrium soft matter: electrorheological effects	
11	18	November 19	Non-equilibrium soft matter: irreversible adsorption I	
	19	November 21	Non-equilibrium soft matter: irreversible adsorption II	
12	20	November 26	Machine learning in soft matter physics	
	21	November 28	Guest lecture I	
13	22	December 3	Guest lecture II	
	23	December 5	**Project Defense**	
14	24	December 10	**Final Exam**	