

Statistical and Biological Physics

Module No.: MN-P-SP-StatBio, MN-P-PN-StatBio, MN-P-WaMa

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Course: Computational Soft Matter Physics

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Category	Type	Language	Teaching Hours	CP	Semester
Specialized Course	Lecture	English	2+1	4.5	WiSe

Requirements for participation:

Statistical Mechanics on the bachelor level

Type of module examinations:

Oral Examination or Term Paper

Duration of the course:

1 semester

Aims of the course:

Monte Carlo and Molecular Dynamics simulations are universal tools to investigate the behavior of complex many-particle systems. They are particularly important to study soft-matter systems, because thermal fluctuations compete here with direct interactions to determine the properties of polymers, colloids or membranes in solution. The same methods can be employed to study biological systems on the cellular level.

Contents of the course:

- Monte Carlo simulations
- Molecular Dynamics simulations
- Colloids, (bio)polymers, membranes, self-assembly
- Advanced hydrodynamics simulation techniques
- Lattice-Boltzmann, Dissipative Particle Dynamics, and Multi-Particle Collision Dynamics

Recommended literature:

D. Frenkel and B. Smit, Understanding Molecular Simulation (Academic Press, San Diego, 1996).
K. Binder and D. W. Heermann, Monte Carlo Simulation in Statistical Physics (Springer-Verlag, Berlin, 1988).