

**Secondary Area of Specialization**

**Statistical and Biological Physics**

Module No.: MN-P-PN-StatBio

status quo 08.05.2012

|                | HPW | estimated effort (h) | credit points |
|----------------|-----|----------------------|---------------|
| Lecture Course | 4   |                      |               |
| Problem Class  | 2   |                      |               |
| <b>Total</b>   | 6   | 240                  | 8             |

**Contents**

The lecture program includes core courses and specialized courses.

1. Core courses:
  - Introduction to Biophysics (4+2 hpw): Introduction to molecular cell biology; Physico-chemical principles of self-organization; Mechanical forces in molecular and cellular biology; Photophysics; Signal transduction in nerve cells; Genetic networks and decision making; Physical methods for analysis of biological molecules and processes
  - Physical biology (4+2 hpw): Statistics of the genome; sequence analysis and sequence alignment; evolutionary theory and population genetics; theory of bio-molecular networks
  - Statistical physics of soft matter and biomolecules (4+2 hpw): Colloids, polymers and amphiphiles; biopolymers and proteins; membranes; physics of the cell
  - Statistical physics far from equilibrium (4+2 hpw): Transport and growth processes; stochastic methods; pattern formation far from equilibrium
  - Disordered systems (4+2 hpw): Disorder average; replica methods; percolation; localisation; glassy dynamics
2. Spezialized courses according to the university calendar, e.g.:
  - Computational soft matter physics (2 SWS)
  - Population genetics for physicists (3 SWS)
  - Information theory and statistical physics (2 SWS)
  - Probability theory and stochastic processes (3 SWS)

**Literature**

Recommendations for the individual courses will be posted on the department web pages.

**Organization**

Students may take either one of the four core courses, or one spezialized course of 3 hpw combined with the Master course Advanced Statistical Physics. If the latter option is chosen, the Master course Advanced Statistical Physics cannot be credited as mandatory theory course or as part of the credit for another module.

**Examinations**

The module is passed by passing an oral examination covering the topics of the attended course. To be admitted to the exam, students must actively participate in the problem sessions (including the solution of homework problems).

The grade given for the module is equal to the grade of the oral examination.

**Aims**

Participation in one of the core courses exposes the students to an active subfield of contemporary statistical physics. Due to the interdisciplinary character of the subfields, the acquired concepts and methods can be applied in other fields such as solid state physics or astrophysics. The students thus benefit from this course in the work on their master project, as well as in their future professional career within or outside of physics.

**Prerequisites for Participation**

None

**Prerequisites**

Theoretical physics at the level of the bachelor courses in physics; participation in the Master course Advanced Statistical Physics is recommended.

**Frequency**

At least one core course is offered every summer term. At least one specialized course is offered every term.

**Soft Skills**

None

**Use in Other Courses of Study**

As elective subject in other M.Sc. programs

**Coordinators**

J. Krug, M. Lässig, T. Nattermann, G. Gompper