### Module title

**Physics of Complex Systems**

### Abbreviation

11-PKS-Int-201-m01

### Module coordinator

Managing Director of the Institute of Theoretical Physics and Astrophysics

### Module offered by

Faculty of Physics and Astronomy

### ECTS

6

### Method of grading

Only after succ. compl. of module(s)

### Duration

1 semester

### Module level

graduate

### Contents

1. Theory of critical phenomena in thermal equilibrium
2. Introduction into the physics out of equilibrium
3. Entropy production and fluctuation
4. Phase transitions away from equilibrium
5. Universality
6. Spin glasses
7. Theory of neural networks

### Intended learning outcomes

In-depth knowledge of concepts and methods essential for a thorough understanding of collective phenomena in complex many-body systems. Thorough understanding of the concepts of entropy, entropy production and universality. Ability to appreciate the central importance of symmetries. Ability to perform research tasks in the field of complex systems.

### Courses

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<tr>
<th>Type</th>
<th>Number of weekly contact hours</th>
<th>Language</th>
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<tbody>
<tr>
<td>V</td>
<td>2</td>
<td>English</td>
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### Module taught in

English

### Method of assessment

a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes).

If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.

Language of assessment: English

Assessment offered: In the semester in which the course is offered and in the subsequent semester

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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### Module appears in

Master's degree (1 major) Physics International (2020)