## Module description

Module title					Abbreviation
Disordered Systems					11-UGS-131-m01
Module coordinator				Module offered by	
Managing Director of the Institute of Theoretical Physic and Astrophysics				Faculty of Physics and Astronomy	
ECTS	Method of grading		Only after succ. compl. of module(s)		
4	numerical grade				
Duration Module level		Other prerequisites			
1 semester		graduate	Certain prerequisites must be met to qualify for admission to as- sessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be con- sidered a declaration of will to seek admission to assessment. If stu- dents have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for as- sessment into effect. Students who meet all prerequisites will be admit- ted to assessment in the current or in the subsequent semesters.		

Part 1: Part 1 discusses systems of interacting electrons with random potentials or random interactions with the help of quantum statistical methods which are introduced in a separate lesson. The students learn to calculate transport properties, magnetic instabilities and phase transitions as well as competing orders. Part II: Part II covers non-linear partial differential equations, which also describe systems far beyond equilibrium and systems with random inhomogeneity. Where applicable, exact solubility in a space dimension will be covered; otherwise and in more than one space dimension, diagram methods and renormalisation groups are applied, which will be introduced separately. As a methodological development of the methods of the course Mathematics 3, the path integral method is derived for classical and quantum mechanical models and differential equations (e.g. Feynman-Kac method).

## Intended learning outcomes

The students acquire insights into the calculability of the behaviour of physical and non-physical models with random parameters. They learn to construct diagram developments for specific models, both for Hamiltonian systems and non-equilibrium differential equations. They understand why physical laws describing the behaviour of non-ordered systems are often times simpler and how a new order arises from disorder. They learn to differentiate between quantum mechanical uncertainty and random uncertainty as well as between disorder and chaos.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + R (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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## Teaching cycle

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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## Module appears in

Master's degree (1 major) Physics (2010) Master's degree (1 major) Physics (2011) Master's degree (1 major) FOKUS Physics (2010) Master's degree (1 major) FOKUS Physics (2011)

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