**Module title**  
Bosonisation and Interactions in One Dimension

**Abbreviation**  
11-BWW-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**  
numerical grade

**Only after succ. compl. of module(s)**  
--

**Duration**  
1 semester

**Module level**  
graduate

**Other prerequisites**  
--

### Contents

1. Instability of Fermi systems in one dimension (1D)  
2. Abelian bosonisation and Luttinger liquids (spinless fermions, correlation functions, models with spin, renormalization group, and the sine-Gordon model).

The below mentioned topics will be presented in different years:

3. Interacting fermions on a lattice (Hubbard model, t/J model, transport properties)  
4. Bethe ansatz  
5. Spin-1/2 chains  
6. Disordered systems  
7. Non-abelian bosonisation and the WZW model (Kac-Moody algebras, Sugawara construction, Knizhnik-Zamolodchikov equation, applications of the WZW model)

### Intended learning outcomes

Familiarity with the peculiarities of one-dimensional (1D) electron systems. Acquisition of the theoretical tools to understand experimentally relevant features including disorder effects and transport in 1D.

### Courses

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

V (3) + R (1)

Module taught in: English

### 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 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

--

### Additional information

--

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--

### Module appears in

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