

Module description

Module title					Abbreviation	
Topological Quantum Physics					11-TQP-161-m01	
Module coordinator				Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics				Faculty of Physics and Astronomy		
ECTS	Meth	ethod of grading Only after succ. co		mpl. of module(s)		
6	nume	rical grade				
Duration		Module level	Other prerequisite	Other prerequisites		
1 semester		graduate				
Contents						

The course is aimed at Masters students pursuing either experimental or theoretical work in their thesis. Depending on the lecturers emphasis, it is meant to provide an introduction to topological superconductors and insulators assuming only "Quantum mechanics II" (11-QM2) as a prerequisite. The contents may include:

- 1. Introduction to superconductivity (including BCS theory)
- 2. Majorana fermions and topological superconductors in 1D (Kitaev wires)
- 3. Topological superconductors in two dimensions (2D) (including Majorana edge states and non-Abelian statistics)
- 4. Integer quantum Hall effect and Chern insulators (Haldane model, Jackiw-Rebbi solitons and edge states)
- 5. Berry's phase and Chern invariants
- 6. Time reversal symmetry and topological insulators in 2D
- 7. Topological insulators in 3D

Intended learning outcomes

In-depth understanding of the topological concepts of Quantum Physics relevant to current research projects of Condensed Matter Physics at the University of Würzburg.

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

V(3) + R(1)

Module taught in: German or 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)

written examination (approx. 90 to 120 minutes) or oral examination of one candidate each (approx. 30 minutes) or oral examination in groups (groups of 2, approx. 30 minutes per candidate) or project report (approx. 8 to 10 pages) or 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.

Assessment offered: In the semester in which the course is offered and in the subsequent semester Language of assessment: German and/or English

Allocation of places

Additional information

Workload

180 h

Teaching cycle



Module description

$\textbf{Referred to in LPO I} \ \ (\text{examination regulations for teaching-degree programmes})$

__

Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Nanostructure Technology (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

JMU Würzburg • generated 20.10.2023 • Module data record 123912