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**Modulbezeichnung:** Quantum Transport in Nanosystems (PW) 5 ECTS  
 (Quantum Transport in Nanosystems)

Modulverantwortliche/r: Michael Thoss  
 Lehrende: Michael Thoss

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|------------------------|-----------------------|----------------------|
| Startsemester: SS 2017 | Dauer: 1 Semester     | Turnus: unregelmäßig |
| Präsenzzeit: 60 Std.   | Eigenstudium: 90 Std. | Sprache: Englisch    |

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**Lehrveranstaltungen:**

Quantum Transport in Nanosystems (SS 2017, Vorlesung, 2 SWS, Michael Thoss)  
 Quantum Transport in Nanosystems (Exercise class) (SS 2017, Übung, 2 SWS, Michael Thoss)

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**Inhalt:**

**Contents**

Modern techniques allow the fabrication of structures and devices in the range of nanometers, such as semiconductor quantum dots, atomic wires or single-molecule contacts. In these systems, the mean free path of electrons is often significantly smaller than the dimension of the structure. As a result, charge and heat transport properties differ significantly from that of macroscopic systems. Quantum mechanical tunneling processes and interference effects influence the transport properties and phenomena such as ballistic transport, conductance quantization or Coulomb blockade are observed.

This lecture course introduces theoretical concepts and methods used to describe quantum transport in nanosystems. After an introduction into the topic and a brief recapitulation of macroscopic transport theories, we first discuss Landauer theory, which describes transport as a scattering problem. Then advanced methods for transport in interacting systems will be discussed. The theoretical methods are applied to analyze physical mechanisms and transport phenomena in nanostructures.

**Lernziele und Kompetenzen:**

**Learning goals and competences:**

Students

- explain the relevant topics of the lecture
  - apply the methods to specific examples
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**Studien-/Prüfungsleistungen:**

Quantum Transport in Nanosystems (Prüfungsnummer: 941400)

(englische Bezeichnung: Quantum Transport in Nanosystems)

Prüfungsleistung, mündliche Prüfung, Dauer (in Minuten): 30

Anteil an der Berechnung der Modulnote: 100%

weitere Erläuterungen:

Masterstudierende mit Studienbeginn ab Sommersemester 2015 können Prüfungen in deutscher Sprache nur mit Genehmigung des Prüfungsausschussvorsitzenden ablegen.

Prüfungssprache: Englisch

Erstablesung: SS 2017, 1. Wdh.: SS 2017 (nur für Wiederholer)

1. Prüfer: Michael Thoss

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