

# Module: Elective Courses Theoretical Physics

Module No.: ECThPhysics

## Course: Advanced Quantum Theory

Course No.: physics606

| Category | Type                   | Language | Teaching hours | CP | Semester |
|----------|------------------------|----------|----------------|----|----------|
| Required | Lecture with exercises | English  | 3+2            | 7  | WT       |

### Requirements for Participation:

#### Preparation:

Theoretical courses at the Bachelor degree level

#### Form of Testing and Examination:

Requirements for the module examination (written examination): successful work with exercises

#### Length of Course:

1 semester

### Aims of the Course:

Ability to solve problems in relativistic quantum mechanics, scattering theory and many-particle theory

### Contents of the Course:

Born approximation, partial waves, resonances  
 advanced scattering theory: S-matrix, Lippman-Schwinger equation  
 relativistic wave equations: Klein-Gordon equation, Dirac equation  
 representations of the Lorentz group  
 many body theory  
 second quantization  
 basics of quantum field theory  
 path integral formalism  
 Greens functions, propagator theory

### Recommended Literature:

L. D. Landau, E.M. Lifschitz; Course of Theoretical Physics Vol.3 Quantum Mechanics (Butterworth-Heinemann 1997)  
 J. J. Sakurai, Modern Quantum Mechanics (Addison-Wesley 1995)  
 F. Schwabl, Advanced Quantum Mechanics. (Springer, Heidelberg 3rd Ed. 2005)