Module	***Asymptotic Methods***
Code	740..
Instruction language	English
ECTS credits	4
Credit hours	3
Duration	1 semester
Cycle	irregular
Coordinator	Dean of Physics studies
Lecturer	Dr. Maxim Efremov
Allocation to study programmes	Physics M.Sc., elective module, 1st or 2nd semester Wirtschaftsphysik M.Sc., elective module, 1st – 3rd semester
Formal prerequisites	None
Recommended prerequisites	None
Learning objectives	The aim of this special lecture series is to provide students with a Bachelor or Master degree with advanced mathematical tools to solve different problems faced by physicists, engineers, and applied mathematicians. Each method is illustrated by both well-known and completely new examples of physics problems appeared within classical and quantum mechanics.
Syllabus	Methods include but are not limited to: • approximate solutions of transcendental equations, • asymptotic calculus for integrals and sums, • the saddle-point and contour integration methods, • the WKB method and its generalizations for differential equations of different types, • the methods of averaging.
Literature	• N.G. de Bruijn, Asymptotic methods in analysis (Dover, 2010) • C.M. Bender and S.A. Orszag, Advanced asymptotic methods for scientists and engineers: asymptotic methods and perturbation theory (Springer, 1999) • A.H. Nayfeh, Perturbation methods (Wiley, 2007) • E.J. Hinch, Perturbation methods (Cambridge University Press, 1995)
Teaching and learning methods	Lecture (2 hours per week) Exercise (1 hours per week)
Workload	30 hours lecture (attendance time) 15 hours exercise (attendance time) 75 hours self-study and exam preparation Total: 120 hours
Assessment	Written or oral examination. Form and scope of the examination is determined and notified by the lecturer at the beginning of the course.
Examination	Written

Grading procedure	The module grade is the examination grade.
Basis for	Research in the field of Quantum Information and Technologies