

Module No.	Title of Module
10-MAT-MPDG2	<b>Advanced Differential Geometry II</b>

Recommended for 3rd semester of Int. Master Program Math. Phys.

Duration 1 Semester

Frequency Every Winter Semester

Course types (1) Lecture „Advanced Differential Geometry II" (4 SWS) = 60 h in class + 90 h individual studies = 150 h  
(2) Seminar „Advanced Differential Geometry II" (2 SWS) = 30 h in class + 120 h individual studies = 150 h

Workload 10 LP = 300 h

Aims After successful participation, the students are able to understand research articles in this specialisation area of Differential Geometry. They can represent and explain their knowledge on concepts and terms in written form and orally on specific problems; can solve typical model problems themselves and justify their approach as well as extent their expertise independently with the use of reference literature.

Contents Contents belong to one of the specific fields of Differential Geometry:

- Riemannian Geometry, or
- Symplectic Geometry / Hamiltonian Systems, or
- Global Geometric Analysis

To a) belong e.g.:

- Riemannian comparison theory, distance functions, volume comparison, Ricci splitting theorem, rigidity theorems
- Closed geodesics: existence and geometric properties

To b) belong e.g.:

- Existence, invariants and obstructions of symplectic manifolds
- Symplectic reduction, momentum map, Hamiltonian systems
- Symplectic capacities, non-squeezing theorem,
- Symplectic rigidity
- Methodology of J-holomorphic curves and their modul spaces, Floer theory

To c) belong e.g.:

- Geometry of spinors
- Differential operators: Construction and spectral geometry of Dirac and Laplace operators, Weitzenböck technique

Lectures and seminars will be held in English. Students' performance has to be in English as well.

Prerequisites None

Literature	<p>H. Hofer, E. Zehnder, Symplectic Invariants and Hamiltonian Dynamics, Birkhauser, 1994</p> <p>J. Jost, Riemannian Geometry and Geometric Analysis, Springer, 7th ed., 2017</p> <p>H.B. Lawson, M.L. Michelsohn, Spin Geometry, Princeton Univ. Press, 1989</p> <p>P. Petersen, Riemannian Geometry, Springer, 3rd ed., 2017</p> <p>D. McDuff, D. Salamon: Introduction to Symplectic Topology, Oxford Univ. press, 3rd ed., 2017</p> <p>D. McDuff, D. Salamon: J-holomorphic Curves and Symplectic Topology, AMS, Providence, 2012</p>
Examinations	<p>Oral exam of 25 min</p> <p>Oral lecture (60 min.) + written report (4 weeks).</p>
Requirements	<p>attendance at lecture „Advanced Differential Geometry II“ (4 SWS)</p> <p>participation in seminar „Advanced Differential Geometry II“ (2 SWS)</p>