Module No.	Title of Module
10-MAT-MPAN1	**Advanced Analysis 1 – Partial differential equations**

Recommended for	2nd semester of International Master Program Math. Phys.
Duration	1 Semester
Frequency	Each Summer Semester
Course types	(1) Lecture „Partial differential equations " (4 SWS) = 60 h in class + 90 h individual studies = 150 h (2) Seminar „Partial differential equations" (2 SWS) = 30 h in class + 120 h individual studies = 150 h
Workload	10 LP = 300 h
Aims	The students know the essential, fundamental concepts of the theory of partial differential equations. The students are able to apply their knowledge to concrete problems orally or in written form, to work on and solve simple model problems and explain their procedure.
Contents	Essential contents comprise e.g.: - theory of distributions and Sobolev spaces - notion of weak solutions of elliptic PDEs with existence statements, energy method and Fredholm alternative - regularity of elliptic PDEs: in the interior and boundary - Eigenvalues and eigenfunctions of elliptic operators - Existence and regularity of weak solutions for parabolic and hyperbolic differential equations - Semigroup theory for time-dependent problems Lectures and seminars will be held in English. Students' performance has to be in English as well.
Prerequisites	None
Literature	L.C. Evans: Partial Differential Equations, 2nd ed., AMS 2010 D. Gilbarg, N. Trudinger: Elliptic Partial Differential Equations of Second Order, Springer 2001 R. Ziemer: Weakly Differentiable Functions, Springer 1989 O.A. Ladyzhenskaya: The Boundary Value Problems of Mathematical Physics, Springer 1985
Examinations	Oral Exam (25 min.) Oral lecture (60 min.) + written report (4 weeks).
Requirements	attendance at lecture „Partial differential equations 1“ (4 SWS) participation in seminar „Partial differential equations 1“ (2 SWS)