

Partial Differential Equations, Part I

Forskarskolan i matematik och beräkningsvetenskap, HT 2008

Vladimir Tkachev

Course material:

[E] Lawrence C. Evans. Partial Differential Equations, AMS, Providence, RI. Series: Graduate Studies in Mathematics, Vol. 19, 1998.

[M] Robert C. McOwen, Partial Differential Equations, Methods and Applications, Publisher: Prentice Hall/Pearson Education, Inc., Upper Saddle River, New Jersey 07458 Year: 2003 (Second Edition)

No	Date	Time	Place	Topics of lectures	Literature
1	Sept 23	13:15	2345	1 st order PDE: General theory, characteristics, initial/boundary conditions	M: 11-25; E: 18-19, 91-100
2		15:15		1 st order PDE: fully non-linear equations, conservation laws, weak solutions	M: 15-29; E: 136-145
3	Sept 24	10:15	2345	Various applications. Hamilton-Jacobi equations.	E: 110-120;
4		13:15		Hopf-Lax formula	E: 121-129
5	Sept 25	10:15	2244	Principles of weak and generalized solutions for general PDE	M: 59-70,76-77; E: 293-296
6		13:15		Elements of functional analysis, I: introduction, basic functional spaces. Hilbert spaces.	
7	Sept 26	10:15	2345	Elements of functional analysis, II: Linear operators. Approximating subspaces. Introduction into finite elements.	
8	Oct 7	13:15	2345	Sobolev spaces, I: motivation, definition, basic properties.	M: 165-167, 181-185, E: 239-249
9	Oct 8	10:15	2344	Weak solutions of the Poisson and Stokes equation	M: 173-179
10		13:15		Existence of weak solutions, applications to the Dirichlet problem	M: 179-180, E: 297-301
11	Oct 9	10:15	2344	Sobolev spaces, II: Sobolev inequalities.	M: 186-192; E: 261-269
12		13:15		General elliptic equations, I: existence theorem	M: 245-252, 268-275; E: 297-308
13	Oct 10	10:15	2344	Maximum principles. Elliptic equations	M: 261-266; E: 326-332
14	Oct 21	13:15	2344	General elliptic equations, II: a priori estimates and regularity	M: 268-275, 253-260; E: 308-325
15	Oct 22	10:15	2245	Linear diffusion: parabolic maximum principles	M: 327-331; E: 367-376
16		13:15		Local existence and regularity for parabolic equations	M: 333-339; E: 353-357
17	Oct 23	10:15	2344	Linear evolution: Galerkin's approximations	M: 351-354; E: 277-279, 349-357
18		13:15		Systems of conservations laws, I	M: 302-315; E: 136-146, 567-578
19	Oct 24	10:15	2344	Systems of conservations laws, II	M: 315-326; E: 146-157; 579-598