Math 131P – Partial Differential Equations I

András Vasy, Autumn 2012: SYLLABUS, AS OF DECEMBER 8, 2012

September 25. Introduction and Diffusion-type problems (Lessons 1 and 2)
September 27. Boundary conditions for diffusion-type problems and
Derivation of the heat equation (Lessons 3 and 4)
October 2. Separation of variables (Lesson 5)
October 4. Transforming nonhomogeneous BCs into homogeneous ones and Solving
more complicated problems by separation of variables (Lessons 6 and 7)
October 9. Solving nonhomogeneous PDEs (eigenfunction expansions) (Lesson 9)
October 11. Transforming hard equations into easier ones and Integral
transforms (Sine and cosine transforms) (Lessons 8 and 10)
October 16. Fourier series and transform (Lesson 11)
October 18. The Fourier transform and its application to PDEs and
The Laplace transform (Lessons 12 and 13)
October 23. Duhamel’s principle and The convection term $u_x$ in diffusion
problems (Lessons 14 and 15)
October 25. Midterm
October 30. The one-dimensional wave equation (hyperbolic equations) and
The d’Alembert solution of the wave equation (Lessons 16 and 17)
November 1. More on the d’Alembert solution and Boundary conditions associated
with the wave equation (Lessons 18 and 19)
November 6. The finite vibrating string (standing waves) (Lesson 20)
November 8. The vibrating beam (4th order PDE) and
Dimensionless problems (Lessons 21 and 22)
November 13. Classification of PDEs (canonical form of the hyperbolic equation)
(Lesson 23)
November 15. The wave equation in two and three dimensions (free space) (Lecture 24)
November 27. First order equations (the method of characteristics) (Lesson 27)
November 29. Interior Dirichlet problem for a circle and The Dirichlet problem
in an annulus (Lessons 33 and 34)
December 4. The vibrating drumhead (The wave equation in polar coordinates)
(Lesson 30)
December 6. Systems of PDE and Nonlinear first order equations (conservation
equations) (Lessons 28 and 29)

Note: The schedule is still subject to change.