

MAT234: PARTIAL DIFFERENTIAL EQUATIONS

About the course: Many natural phenomena lead to equations involving a function of several variables and its partial derivatives. These are called Partial Differential Equations (in short, PDEs) and are important in natural sciences, engineering disciplines, finance, and pure mathematics. This introductory course to PDEs aims to provide the student a good understanding of the basic methods and fundamental theories of this field of mathematical analysis.

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Lectures: Monday 14:15-16:00, Tuesday 12:15-14:00 (both in room π^4 , 4th floor RFB)

Tutor: Arnaud Eychenne, *e-mail:* arnaud.eychenne@uib.no

Tutorials: Friday 10:15-12 (room δ (4a9f), 4th floor RFB)

Textbooks:

- (1) L.C. Evans, *Partial Differential Equations*, American Mathematical Society, 2nd ed., 2010.
- (2) W.A. Strauss, *Partial Differential Equations*, Wiley, 2nd ed., 2008.

Curriculum (tentative):

- (1) Definitions, classifications, examples, initial and boundary conditions, well-posedness
- (2) ODEs refresher, function spaces, inequalities
- (3) The transport equation
- (4) Laplace's equation
- (5) The heat equation
- (6) The wave equation
- (7) Nonlinear first-order PDEs, complete integrals
- (8) Method of characteristics
- (9) Conservation laws
- (10) Fourier transform and Schrödinger's equation
- (11) Cauchy-Kovalevskaya Theorem
- (12) Generalized functions, Sobolev spaces
- (13) Weak solutions, second-order elliptic equations

Evaluation:

- One mandatory assignment (this does not carry a mark, however one has to get the mandatory assignment approved in order to sit at the final exam)
- Final exam