NumPDE course, Skoltech, Term 3, 2016

Midterm study guide

For the midterm you should be able to:

1. Finite differences (FD)
    - write down basic FD approximations to differential operators, equations, and boundary/initial conditions
    - determine the order of approximation (and prove)
    - judge whether an initial-value problem is stable (or for what parameters it is stable)
    - understand how to implement FD on a computer
2. Finite elements (FE)
    - fomulate a (boundary-value problem for a) PDE in a weak form
    - formulate a FE problem, finite element space (piecewise linear functions)
    - write down the stiffness matrix in simple cases
    - understand how to implement FE on a computer
3. Spectral methods (SM)
    - formulate a spectral method for a given PDE
    - write down the stiffness matrix (i.e., the left-hand side matrix) in simple cases
    - understand how to implement SM on a computer