Lecture Structure

1 Preliminaries (Chapter 5 in [9]).
   - Sobolev spaces.
   - Inequalities.
   - Bochner spaces.
   - Compactness arguments. Papers: [26].

2 Linear parabolic equations (Chapter 7 in [9] and Chapter 6 in [9]).
   - Weak formulation (continuous variational formulation), regularity of solution.
   - Semigroup theory.
   - Rothe method, backward-Euler - Galerkin FE approximations/MFEM.
   - Stability and error estimates (Galerkin FE and MFEM).

3 Non-linear parabolic equations (different sources)
   - Weak solutions, regularity.
   - Fixed point theorems (Chapter 9 in [9]).
   - Stability and error estimates (Galerkin FE and MFEM). Papers: [3, 2, 25, 5].
   - Linearization methods.

4 Degenerate parabolic equations (different sources).
   - Weak formulation (continuous variational formulation), regularity of solution. Papers: [1, 24].
   - Numerical approximations (Galerkin FE and MFEM).
   - Stability and error estimates, Kirchhoff’s transformation and Green’s operator. Papers: [16, 17, 21, 24, 19].
   - Linearization methods. Papers: [18, 15, 22]
5 Coupled elliptic and parabolic equations (different sources).
   – Reactive transport in porous media [11, 12, 14, 20, 23].
   – Poromechanics (Biot’s model). Papers: [13, 7, 4, 6].

References


