Second Semester Area A—CAM Option

CSE 386D/M 383D, Methods of Applied Mathematics II

1. The Fourier Transform

1.1. The L^1 Theory
1.2. The Schwartz Space Theory
1.3. The L^2 Theory
1.4. The $\mathcal{S}'$ Theory
1.5. Some Applications

2. Sobolev Spaces

2.1. Definitions and Basic Properties
2.2. Extensions from Ω to $\mathbf{R}^d$
2.3. The Sobolev Embedding Theorem
2.4. Compactness
2.5. The H^s Sobolev Spaces
2.6. A Trace Theorem
2.7. The $W^{s,p}(\Omega)$ Sobolev Spaces

3. Boundary Value Problems

3.1. Second Order Elliptic Partial Differential Equations
3.2. A Variational Problem and Minimization of Energy
3.3. The Closed Range Theorem and Operators Bounded Below
3.4. The Lax-Milgram Theorem
3.5. Application to Second Order Elliptic Equations
3.6. Galerkin Methods
3.7. Green's Functions

4. Differential Calculus in Banach Spaces

4.1. Differentiation
4.2. Fixed Points and Contractive Maps
4.3. Nonlinear Equations
4.4. Higher Derivatives
4.5. Extrema

5. The Calculus of Variations

5.1. The Euler-Lagrange Equations
5.2. Constrained Extrema and Lagrange Multipliers
5.3. Lower Semi-Continuity and Existence of Minima