Syllabus for August 2016 Qualifying Examination of
Math 5172 - Finite Element Analysis

References:
[R2] Claes Johnson: Numerical solution of PDEs by the Finite Element method, Dover 2009,

Part I All topics in Lecture notes 1-18 and 20.

Part II Chapters 1, 2, 3, 4, 8 of [R2]:
• Sections 1.1 - 1.7. Weak solution. Poincare inequality. Cauchy inequality. Sobolev norm. Finite element solution is the projection of exact solution on Vh
• Sections 2.1- 2.4 Variational formulations, weak solutions, Galerkin approximation Existence of Finite Element solution. V-elliticity.
• Sections 3.1-3.3 Constructions of finite element spaces (solution spaces).

Part III Chapters 6, 7 of [R3]: Shape functions on Rectangular elements (triangular elements), respectively. Construction of stiffness matrices and local load vectors by using the reference element approach. How to impose non-homogeneous essential boundary conditions. How to impose Neumann or mixed boundary conditions.
• Section 6.1 Shape functions for quadrilaterals
• Section 6.2 Shape functions for Triangles
• Section 6.3 Mapping functions
• Section 6.4 Integration Procedures
• Section 7.1 Computation of Element Stiffness Matrices
• Section 7.2 Computation of element (local) Load vectors