Scope of course: Finite element methods for both steady state and time-dependent partial differential equations. Goal of course: Even though all of the fundamental topics in finite elements will be covered by this course, the main goal is not to cover as many advanced topics as possible, but a thorough understanding of the finite element methods in both practice and theory, the capability to independently implement them to obtain a unified finite element package for all types of partial differential equations, the capability to understand and modify existing finite element packages, and the capability to efficiently self-study other finite element methods which cannot be covered by this one-semester course. Style of course: For each type of partial differential equation covered in this course, we will introduce the corresponding finite element methods step by step in a unified framework, which will eventually provide a unified finite element package for all types of partial differential equations. Starting from the mesh generation and the construction of the finite element basis functions, we will derive the weak formulation, discretization formulation and matrix formulation, discuss the advantages/disadvantages and the implementation issues, have guided coding practice, and carry out the numerical analysis in class. In order to illustrate how to apply the finite element methods in practice, applications of these methods will be also discussed, including those in my research. After class, the homework and the take-home exams, which are in project format, will provide you opportunities to apply the methods and analysis you learn in class and the code you obtain through the guided coding. And the independent study will provide you experience on self-studying other finite element methods and the existing packages by using the learning technique introduced in this course. At the end of the class the students are expected to have a thorough understanding of finite elements and their own finite element packages. Text: Understanding and Implementing the Finite Element Method by M. S. Gockenbach, Society for Industrial and Applied Mathematics, Philadelphia, PA, 2006. Questions? Feel free to contact m