Finite element analysis pdf exam

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Stanford University Fall 2001 ME235A Finite Element Analysis Professor Peter M. Pinsky Welcome to the ME235A web site for the Fall 2001 quarter! Announcements The take home final exam will be available for pickup at 9:00 am Monday (Dec. 10) outside Prof. Pinsky's office. It will be due Wednesday (Dec.12) by 10:30 a.m. There will be a drop-in box outside Prof. Pinsky's office for the finished exams. Problem set #7 (the last problem set) is due Dec. 7 (Fri). There will not be a lecture this Friday, and we will have classes next week as usual. Problem set #6 is due Dec. 3 (Mon). Computing assignment #2 is now available for download and will be due Nov. 28 (Wed). The due date for problem set #5 has been changed to Nov. 19 (Mon). There are some changes to the problems as well. See below for the problems. There will be an extra class this Friday (Nov. 9) due to Prof. Pinsky being away next week. Next week, the Monday (Nov. 12) class is cancelled, and on Wednesday (Nov. 14), there will be a guest lecture. The midterm is due Nov. 5 (Mon). Computing assignment #1 is due Nove. 7 (Wed). See below for problem statement and files. Problem set #4 is due Oct. 31 (Wed). Problem set #3 is due Oct. 24 (Wed). Problem set #2 is due Oct. 17 (Wed). Problem set #1 is due Oct. 10 (Wed). The course text book is now available at the bookstore. You will automatically be included in the ME235A class mailing list when you register for the class on Axess. Please register ASAP so that you don't miss out on any course information. Assignments Reading Assignment Lecture 1 (Sep. 26) : 1.1 - 1.4 Lecture 2 (Oct. 1) : 1.5 - 1.7 Lecture 3 (Oct. 3) : 1.8 Lecture 4 (Oct. 8) : 1.9 - 1.10 Lecture 5 (Oct. 10) : 1.10 Lecture 6 (Oct. 15) : 1.10 Lecture 7 (Oct. 17) : 1.10 - 1.16 Lecture 8 (Oct. 22) : 1.10 - 1.16 Lecture 9 (Oct. 24) : 2.1 - 2.3 Lecture 10 (Oct. 29) : 2.1 - 2.6 Lecture 11 (Oct. 31) : 2.1 - 2.6 Lecture 12 (Nov. 5) : 2.1 - 2.6 Lecture 13 (Nov. 7) : Ch 2 Lecture 14 (Nov. 9) : Ch 2 Lecture 15 (Nov. 19) : Ch 3 Lecture 16 (Nov. 21) : 3.1 - 3.7 Lecture 17 (Nov. 26) : 3.1 - 3.7 (3.8 - 3.10) Lecture 18 (Nov. 28) : Ch 3 Problem Set #1 (due Oct. 10) Exercise 1 on page 7 Exercise 1 on page 22 Additional problem as described in class (see here for problem statement) Solution to problem set 1. Problem Set #2 (due Oct. 17) Exercise 1 on page 36. Solution to problem set 2 Problem Set #3 (due Oct. 24) Exercise 2 on page 46 Page 49, a and b only Solution to problem set 3 Problem Set #4 (due Oct. 31) Exercise 1 on page 63 Exercise 2 on page 64 Exercise 1 in page 68 Solution to problem set 4 Computing Assignment #1 (due Nov. 7) The problem statement is here. Download files. Problem Set #5 (due Nov. 19) Exercises 1, 2 on page71 Exercise 1 on page75 Exercise 8 (parts i and ii only) on page 107 Exercise 1 on page 81 Exercise 2, 3, 4 on page 82 Exercise 5 on page 83 Exercise 1 on page 87 Exercise 1 on page 91 Exercise 1 on page 98 Solution to problem set #5. Computing Assignment #2 (due Nov. 28) The problem statement is here. Download files. Problem Set #6 (due Dec. 3) Exercise 6 on page 84 Exercise 1 on page 114 Exercise 1 on page 123 Exercise 1 on page 128 Exercise 2, 3, 4 on page 130 Exercise 1, 2, 3 on page 135 Solution to problem set #6. Problem Set #7 (due Dec. 7) Exercise 1 on page 142 Exercise 3, 4 on page 145 Exercise 1 on page 156 Exercise 2 a - d on page 157 Solution to problem set #7. Course Overview ME235A Introduces fundamental concepts and technologies of primal finite element methods for linear elliptic boundary value problems. Topics covered include : overview of finite element method for a one-dimensional model problem including the weak, Galerkin and matrix forms, error analysis and superconvergence; extension of the finite element method for heat equation and elasticity in two and three space dimensions; element formulations and data structures; analysis of errors and convergence of approximation; treatment of constraints and variational crimes. For computing assignments, students will work with and extend a simple but effective finite element code using Matlab and use the Matlab PDE Toolnox for convenient pre- and post-processing features. ME235B Treats the development and analysis of finite element methods for linear parabolic (time-dependent heat equation), linear hyperbolic (structural dynamics) and eigenvalue (free vibration and stability) problems. ME235C Introduction to finite element formulations for nonlinear elliptic, parabolic and hyperbolic problems; methods for solving nonlinear algebraic systems. Staff Professor : Peter M. Pinsky pinsky@stanford.edu Phone : 3-9327 Office Hours : Tues 2:00 - 4:00, Thur 2:00 - 3:00 TA : Jee Rim jrim@stanford.edu Office : Durand 266 Phone : 3-8104 Office Hours : Tues 4:15 - 6:15, Fri 1:00 - 3:00 Grader: To be announced MW 2:15 - 3:30 McCullough 122 Text (Required) The Finite Element Method : Linear Static and Dynamic Finite Element Analysis Thomas J. R. Hughes, Dover, 2000 Other Reading The Finite Element Method, Zienkiewicz and Taylor, two volumes, McGraw-Hill, 2000 Computational Differential Equations, Eriksson et al., Cambridge, 1996 An Analysis of FEM, Strang and Fix, Prentice-Hall, 1974 FEM for Elliptic Problems, Ciarlet, North-Holland, 1978 Mathematical Theory of FEM, Brenner and Scott, Springer, 1994 Numerical Solution of PDE by FEM, Johnson, Cambridge, 1990 Finite Element Procedures, K-J Bathe, Prentice-Hall, 1996 Concepts and Applications of FEM, Cook et al., Wiley, 1988 Prerequisites Elementary calculus and linear algebra. Knowledge of Matlab is helpful but not essential (see Matlab tutorial). Matlab Help Matlab 6.1 is available in the unix machines in Sweet Hall and Terman. Type matlab at the command prompt. Matlab is also availble in the Macintosh computers in Terman. Find it under the math applications folder. A tutorial for matlab can be found here. For residential computing, you will need an x-server program that will enable you to open an x-window on your screen. Otherwise, you won't be able to display the graphs. There is a software MI/X that you can try out for 15 days (if you are a Mac user, it is completely free). Washington University Department of Mechanical, Aerospace and Structural Engineering MASE 5510 Finite Element Analysis Fall semester, 2009 Time: M-W-F 5:30-7:00 (Make-up class, when necessary; Fridays) Location: Sever Hall 102 Instructor: Barna A. Szabó (Jolley Hall 203, 935-6352, szabo@wustl.edu) TA: Sebastian Nervi (sebastian.nervi@esrd.com) Grader: Sam Wigth (sfw2@cec.wustl.edu) Text: B. Szabó and I. Babuška, An Introduction to Finite Element Analysis (manuscript). Laboratory reference: StressCheck Version 8.0.1. Documentation is available on CD. Scope: Students are expected to master the theoretical foundations of finite element analysis (FEA) and must demonstrate that they are able to solve practical problems of moderate complexity with FEA methods. Catalog description: Basic concepts. Generalized formulations. Construction of finite element spaces. Extensions. Shape functions. Parametric mapping, numerical integration. Mass matrices, stiffness matrices and load vectors. Boundary conditions. Modeling techniques. Computation of stresses, stress resultants and natural frequencies. Control of the errors of approximation. Term paper project: Students are expected to solve an engineering problem of moderate complexity by the finite element method. Prerequisite: At least one course in Strength of Materials. Credit: 3 units. Homework: Homework assignments must be prepared in a neat and legible manner and submitted on standard 8-1/2" x 11" paper. The due date for homework assignments is shown on page 3. Homework assignments submitted late will be graded, however only half of the score will be credited. Some homework assignments will require the use of an FEA software product. Any FEA software product may be used for this purpose, however instruction and technical support will be provided for StressCheck (V8.0 on Windows operating systems) only. StressCheck will be made available to registered students for the duration of the course, free of charge. A minimum of 512 MB RAM is required. StressCheck will be accessible through the Center for Engineering Computing. Term paper: A term paper is required. Students are expected to present their term paper in a form that conforms to generally accepted professional standards. Detailed instructions will be provided. Examinations: One mid-term examination (80 min.) and two quizzes (25 min. each) will be administered during the semester. The final examination will cover the entire course. All examinations will be open book and open notes. In the case of unexcused absence the score will be recorded as zero. Grading: Final grades will be based on homework scores; the scores of the examinations (quizzes, mid-term and final), and the term paper score. The following weights will be assigned: Homework assignments: 20%; quizzes and exams: 40%; term paper: 40%. Office hours: 4:30-5:30 M-W or by appointment. Help sessions: Lopata Hall 202 from 5:30 to 7:00 T-T by appointment only (e-mail sebastian.nervi@esrd.com to set an appointment). Lecture Notes: Chapters 1&2, Chapter 3, Chapter 4, Chapter 5, Chapter 6, Chapters 7&8, Chapter 9 , Appendices A&B , Appendix C Video Download: 3d Cantilever Beam Video Stresscheck Manual: click here Assignments: Lab Assignment #1 Sample Midterms (with solutions): Midterm_2004 Midterm_2008 Sample Final (with solutions): Final_2001 Sylabus (pdf Rev. 11/18/09) MASE 5510 Finite Element Analysis Date Topic Reading Exercises Due Date 9 14 16 21 23 28 30 Oct. 5 7 12 14 19 21 26 28 Nov. 2 4 9 11 16 18 23 25 30 Dec. 2 7 9 11 Introduction to finite element analysis Outline of FEM in 1D Outline of FEM in 1D Labor day Outline of FEM in 1D Outline of FEM in 1D Outline of FEM in 1D Outline of FEM in 1D Review and Quiz 1 Laboratory session 1 Heat transfer – an overview Linear elasticity – an overview Generalized formulations in 2D & 3D Elastostatic models (1) Elastostatic models (2) Mid-term examination Laboratory session 2 Finite element spaces Finite element spaces Regularity Rates of convergence Rates of convergence Post-solution methods Dimensional reduction - Beams Thanksgiving break Dimensional reduction - Plates Dimensional reduction - Shells Review Reading period Final examination 3:30-6:30 Chapter 1 2.1 2.2 2.3 2.4, 2.5.1. 2.5.2 2.5.3 to 2.5.5 2.5.6 to 2.5.8 2.5.9, 2.6.1 to 2.6.4 Chapter 2 3.1, 3.2, 3.3 3.4, 3.4.1 to 3.4.3 4.1, 4.2 4.3, 4.3.1 4.3.2, 4.4 Ch. 3 and part of Ch. 4 5.1 thru 5.4 5.5 thru 5.7 6.1, to 6.3 6.4 7.1 to 7.5 8.1 8.2 8.3 2.1.1, 2.1.2 2.2.2, 2.2.3 2.3.3, 2.3.4 2.4.3, 2.5.2 2.5.7, 2.5.10 2.5.12, 2.5.15 2.5.16, 2.5.20 Lab assignment 3.1.1, 3.2.9 3.4.3, 3.4.10 4.1.3, 4.2.1 4.3.1, 4.3.2 4.3.10, 4.4.4 Term paper 5.4.1, 5.4.4 5.6.1, 5.7.1 6.3.2, 6.3.3 6.4.1, 6.4.2 None 7.3.6 8.1.8 8.2.5 None 9/9 9/14 9/16 9/21 9/23 9/28 10/5 10/21 10/12 10/14 10/19 10/21 10/28 12/7 11/9 11/11 11/16 11/18 11/23 12/2 12/7

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