Department of Mechanical Engineering
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MENG 4326 – Finite Element Analysis
Course Syllabus

Semester / Year	Spring 2025
Catalog Description	A required introductory course providing undergraduate engineering students with fundamentals of finite element (FE) concepts, analysis, and applications in real-world problems. A software package will be selected for use a learning support tool, which also provides students with a marketable skill. The course includes a project as a major component.
Prerequisites	MENG 3401 – Thermodynamics, MENG 3309 Mechanical Systems Design (pre-requisite or co-requisite)
Section Number	030
Instructor Name	Dr. Ermias G. Koricho
Contact Information	Email: ekoricho@uttyler.edu Phone: _____ Office:_ A220_____
Class Type / Instruction Mode / Location	Face-to-face / Lecture / HEC 0A216
Class Time	Tu/Th 5:00 PM – 6:20 PM
Office Hours	M/F 11:00 AM – 12:00 PM, Tu 2:00 PM – 3 PM or by appointment
No. of Credits	3 credits (Lecture)
Required Textbook & Resources	• Finite Element Analysis: Theory and Application with ANSYS – Saeed Moaveni • Finite Element Simulations with ANSYS Workbench 24: Theory, Applications, Case Studies – Huei-Huang Lee • Students taking courses in Mechanical Engineering (ME) are expected to have a laptop at their disposal. For more details, refer to the Student Laptop Policy at the Department of Mechanical Engineering https://uttyler.smartcatalogiq.com/en/2022-2023/Catalog/College-of-Engineering
Optional References	• Analysis of Machine Elements Using SolidWorks Simulation 24 – S.S. Nudehi and J.R. Steffen
Additional Rules and Requirements	AI tools are allowed to support students' learning and productivity, provided that their use aligns with academic integrity standards. When required, students must disclose their use of AI.
Evaluation Method	**Grading System:** Assignments 30% (Lab HW 10%, Lecture HW 8%, Lab assignment report 12%) Quizzes 5% Midterm Exam 17.5 % Final Exam 17.5 % Final Project 30%
Grading Policy / Scale	Letter grades, scale: A: 90 – 100; B: 80 – 89; C: 70 – 79; D: 60 – 69; F: < 60
Important Events / Dates	Census date: 01/27/2025 First drop for non-payment: 01/21/2025 Exam date: Mid-term (March 6, 2025), Final Exam (April 29, 2025)

	Spring Break: 03/17/2025-03/21/2025 Last date to withdraw from one or more 15-week courses: 03/31/2025
Attendance / Makeup policy / other rules	Regular attendance is imperative if you want to do well in this course. Therefore, regular attendance is highly recommended. In case you have to miss a class, it is your responsibility to keep up with the class work and be informed of all announcements made in the class on HomeWorks, tests etc. No makeup exams will be authorized without providing an official document showing that your absence is in line with university rules.
Course Learning Objectives / ABET & PEOs Relation	By the end of this course, students will be able to: 1. Demonstrate an understanding of the fundamental concepts and general steps of the finite element analysis (FEA). 2. Apply science and math concepts using FEA tools to identify, formulate and solve engineering problems. 3. Apply FEA techniques to engineering design with broader considerations. 4. Select and integrate FEA for the appropriate part in the design process to support and justify design decisions with broader considerations.
Tentative Topics / Course Plans	**Topical Outline:** **<u>For Theory Classes (45 minutes per week)</u>** From Finite Element Analysis, Theory and Application with ANSYS, 4th Edition, book: 1. Chapter 1: a. Introduction to Finite Element Formulation approaches **b.** One-dimensional structural analysis, heat transfer and fluid flow problems 2. Chapter 4: Axial Members, Beams and Frames **a.** Members under axial loading **b.** Finite Element Formulation of Beams 3. Chapter 5: One Dimensional Elements 4. Chapter 7: Two-Dimensional Elements 5. Chapter 13: Three-Dimensional Elements **<u>For Laboratory Classes (</u>***<u>Selected illustrative examples will be done in each chapter</u>***<u>)</u>** From Finite Element Simulation with ANSYS Workbench 24: Theory, Application, Case Studies Book 1. Chapter 1: Introduction a. Case Study: Pneumatically Actuated PDMS Fingers b. Structural Mechanics: A Quick Review c. Finite Element Methods: A Concise Introduction d. Failure Criteria of Materials 2. Chapter 2: Sketching 3. Chapter 3: 2D Simulations 4. Chapter 4: 3D Solid Modeling 5. Chapter 5: 3D Simulations 6. Chapter 6: Surface Models 7. Chapter 7: Line Models 8. Chapter 8: Optimization 9. Chapter 9: Meshing 10. Chapter 10: Buckling and Stress Stiffening 11. Chapter 11: Modal Analysis 12. Chapter 12: Transient Structural Simulations

	13. Chapter 13: Nonlinear Simulations 14. Chapter 14: Nonlinear Materials 15. Chapter 15: Explicit Dynamics 16. Group projects (Last Five Weeks) a. Project Assignment b. Theoretical Modeling c. Finite Element Analysis d. Inferences and conclusion e. Report i. Problem Definition ii. Modeling iii. FEA features iv. Results and Discussion v. Conclusion f. Presentation (15 plus 5 minutes) i. Problem ii. FEA Challenges iii. Discussion iv. Conclusion v. Question and Answer
University Policies	https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf