

**Semester** Fall 2020

**Course Number** Technical Elective  
**Course Title** Computer Aided Engineering

**Instructor** Professor Ping C. Sui, Ph.D  
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**Teaching Assistant** Zhang Ze  
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**Office Hours** Thursday 10:00AM-11:30AM

**Lecture Time/Room** Tuesday 8:15-11:00  
Zone3-105

**Prerequisites** Engr 0135 Statics and Mechanics of Materials 1  
Engr 0145 Statics and Mechanics of Materials 2  
MESE1028 Mechanical Design 1 (Recommended)

**References** ANSYS Workbench User's Guide  
([https://ansyshelp.ansys.com/account/secured?returnurl=/Views/Secured/corp/v201/en/wb2\\_help/wb2\\_help.html%23wb2\\_help](https://ansyshelp.ansys.com/account/secured?returnurl=/Views/Secured/corp/v201/en/wb2_help/wb2_help.html%23wb2_help) )

ANSYS Mechanical User's Guide  
([https://ansyshelp.ansys.com/account/secured?returnurl=/Views/Secured/corp/v201/en/wb\\_sim/ds\\_Home.html](https://ansyshelp.ansys.com/account/secured?returnurl=/Views/Secured/corp/v201/en/wb_sim/ds_Home.html))

ANSYS Element Reference  
([https://ansyshelp.ansys.com/account/secured?returnurl=/Views/Secured/corp/v201/en/ans\\_elem/Hlp\\_E\\_LIBRARY.html](https://ansyshelp.ansys.com/account/secured?returnurl=/Views/Secured/corp/v201/en/ans_elem/Hlp_E_LIBRARY.html))

**Course Description** This course is a 3 credit hour class.

The learning objective of the course is to provide students the knowledge of applying FEA technique in structural analysis of mechanical components. The ultimate goal is for students to develop a proper protocol while using FEA to assess the failure risks of a mechanical component.

The teaching will consist the following elements:

- hands-on training of using ANSYS Mechanical for structural analysis,
- frequent discussions for validity of the developed FEA model, and
- Interpretation of FEA analysis results and risk assessment against presumed failure modes.

Course Outline	Practice Models	Homework/Assignment
0. Course Introduction		Reading Assignment 01
01. Introduction of Finite Element Analysis		
02. Introduction of ANSYS Workbench (WB)		Reading Assignment 02
03. ANSYS WB Mechanical Basics	0301 Uniaxial Tensile Test	HW01 Uniaxial Tensile

03A. Failure Assessment		Test
04. General Pre-processing/Post-processing	0401 Coordinate System 0402 Named Selection	HW02
05. Mesh Control in ANSYS Mechanical	0501 Hex/Tet Mesh Control 0502 Convergence Test	HW03
06. Error Estimation and Stress Singularity	0601 2D Triangular Plate Simulation 0602 2D Simulation (Stress Concentration)	HW04
07. Static Structural Analysis (Loads and Supports)	0701 2D Triangular Plate Simulation 0702 Round Bar (Moment/Torque) 0703 Bearing Bar	HW05
08. Remote Displacement and Force	0801 Remote Force Behavior Control 0802 Beam Bending + Axial Tension	HW06
09. Line Modeling for Beam Analysis	0901 Cantilever Beam	HW07
10. Line Modeling for Truss Analysis	1001 2D Truss Analysis	HW08
11. Connection Modeling Using Contacts	1101 Bearing-Pin Contact Analysis 1102 Press-Fit Cylinders	HW09
12. Submodeling		HW10
13. Modal Analysis		HW11
14. Thermal Modeling		HW12

Homework	<p>Problem sets will be distributed each week after the class. Each problem set is designed to build upon the material covered in the preceding lectures and recitations.</p> <p>Homework assigned in a particular class is due at 8 AM on the day of the next class period, unless otherwise posted. <u>Late HW will not be accepted.</u></p>
Exams	<p>No midterm and final exams.</p> <p>Replaced by four section exams given throughout the semester. The section exams will be in-class and hands-on type of testing to benchmark individual's proficiency in conducting a mechanical analysis using ANSYS Mechanical.</p> <p>All section exams will be comprehensive.</p> <p><u>No make-up will be given for the missing exam.</u> Exams missed due to unpredictable events will be dealt with on a case-by-case basis.</p>
Final Project	<p>Each student will select a mechanical system of their own interest and work independently to conduct structural analysis using the learned ANSYS knowledge.</p> <p>Each student will submit a brief proposal to introduce the modeled system as well as to outline their project objective, technical approach and expected outcome.</p> <p>Tentative proposal deadline: Nov 12, 2020.</p> <p>Final project will be graded per technical challenges of the modeled problem, modeling skills, analysis details, and final report quality.</p>
Grades	<p>Homework/Lab Assignment: 30%</p> <p>Section Exams: 50%</p> <p>Final Project: 20%</p>

Grades will be assigned per following scales:

附件：等级成绩和百分成绩、绩点对照表

字母等级	A	A-	B+	B	B-	C+	C	C-	D+	D	F
中文等级	优秀		良好		中等		合格			不合格	
百分制	100-90	89-85	84-80	79-76	75-73	72-70	69-66	65-63	62-61	60	<60
绩点	4	3.7	3.3	3	2.7	2.3	2	1.7	1.3	1	0

Class Attendance

Students are expected to attend every class period.

Early is on time, on time is late. As a courtesy to your fellow classmates, be punctual and arrive no later than the class starting time.

Academic Honesty

All of us are equally responsible for ensuring a fair and positive learning environment.

Students are permitted to discuss homework assignments together, but should do their own work when preparing a problem solution.

All exams are to be completed without unauthorized assistance. Any student caught cheating on an assignment or exam will receive disciplinary action, up to and including receiving a grade of "F" for the course.