

MAE 4344 - 001 Spring 2016 339 COBA

Instructor: Kent L. Lawrence **Office:** 300D Woolf Hall

Office Hours: 2:00-3:00 TTh or by appointment or other times I'm in the office & free. **Phone:** 817.272.2019

Academic Office: Room 204 Woolf Hall, PO Box 19023, UTA, 76019 **Email:** lawrence@uta.edu

Web sites:

<https://www.uta.edu/profiles/kent-lawrence>

<http://mae.uta.edu/~lawrence>

GTA: Office: Office Hours:

Course Prerequisites: MAE 3319 and MAE 3242.

Required Textbook: Kent L. Lawrence, *ANSYS Workbench Tutorial, Release 14*, SDC Publications, 2012, ISBN: 978-1-58503-754-4

Additional material will be placed on the course web site and Mavspace to supplement text material.

Course Description: This course consists of a study of the principles of computer-aided engineering in mechanical and aerospace engineering. Parametric, feature-based solid modeling, kinematics & dynamics of assemblies and finite element modeling for design are considered.

Course Learning Goals/Objectives: Course goals include development of an understanding of the basics of computer aided engineering and its use in mechanical & aerospace engineering practice.

Tentative Schedule

Week 1 - CAE Introduction; Review Feature-Based Parametric Solid Modeling

Week 2 - Solid Mechanics, Solid Modeling **WorkSheet**

Week 3 - FEM Fundamentals, ANSYS APDL Trusses, MATLAB

Week 4 - ANSYS Workbench Tutorial Chapters 1-5, **Quiz**

Week 5 - ANSYS Workbench Chapter 6 Wizards and Tools

Week 6 - ANSYS Workbench Chapter 7 Heat Transfer and Thermal Stress
EXAM 1

Week 7 - ANSYS Workbench Chapter 8 Surface and Lines Models

Week 8 - ANSYS Workbench Chapter 9 Natural Frequencies & Elastic Buckling

Week 9 - ANSYS Workbench Chapter 10 Nonlinear Problems **Project Proposal Due**

Week 10 - Multi-Body Kinematics & Dynamics **EXAM 2**

Week 11 - Multi-Body Kinematics & Dynamics

Week 12 - ANSYS APDL Plane Stress/Strain

Week 13 - ANSYS APDL Axisymmetric and Three Dimensional Problems
Proj Progress Report Due

Week 14 - Dynamics

Week 15 - **EXAM 3**, Project Presentations

Week 16 > - **Project Presentations**

As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. – Kent L Lawrence

Specific Course Requirements

Quizzes: throughout semester

Examinations: Exam 1, Exam 2, Exam 3, Final

Major Assignments

Homework: As Assigned

Worksheets: As Assigned

Labs: None

Research Papers: Project Documentation Slides

Excused Missed Exams & Quizzes: See instructor to schedule.

Makeup Work: HALF credit will be deducted for unexcused late homework. Late work that is excused can receive up to full credit if submitted within 72 hrs of due date.

FULL credit will be deducted for sloppy, results only, no units, scribble in the margins papers. This applies to exams as well.

Do not engage in separate homework submissions, grade evaluations or negotiations with our Teaching Assistant.

Course Evaluation & Final Grade:

Final Average Grade: Homework & Worksheets & Quizzes - 25%, Exams - 25%, Project 25%, Final Exam- 25%

All grades will be posted on **Blackboard**.

Letter Grades A > 89% of full credit, B > 79%, C > 69%, D > 59%, F below 60%.

The **semester project:** A two person team is to develop the complete engineering documentation of an actual mechanical device. (That is, reverse engineering.) The item should have at least five distinct parts that are assembled to constitute it. Estimate the loads that act on the device when in service and perform a stress analysis of at least one critical part. Estimate the factor of safety for its operation. Use the assembly for deflection and/or frequency calculations, but be careful about stress estimates on assemblies. Analyze the critical individual components instead. Prepare an assembly model. Show assembled and exploded views of the device. Include a kinematics analysis and animation or an animation of the assembly process. You can pick the project; however, each team is to do a different project. The Project Consists of four items: 1. Proposal, 2. Progress Report, 3. Report, 4. Presentation. The project is a **key assignment**. Key assignments are used for assessment in order to collect input for improvement of the MAE program.

Student Evaluation of Teaching: Conducted near end of semester.

Home Work and Exam Procedures

Homework submissions

Submit your work unfolded, stapled in the upper left corner with a COVER SHEET. In the **upper third** of your **COVER SHEET** put the following information:

Your Name - Last, First

MAE 4344

Date

Assignment Number

Use one side of the paper only. Include the date, your initials and page number in the upper right corner of **ALL pages**.

Use the **Insert Note** option in Creo / SolidWorks and the **Print Preview** option in ANSYS to include your name, the date, and the assignment number on the graphics output of ALL your work.

>>>>> TUTORIALS: Submit only the calculated output quantities and graphics that result from completing the tutorials. No problem statement is required.

For your Solid Modeling work, submit only a **wire frame plot** (hidden lines grayed or dashed) of the final version of the part(s) for the exercise. Dimensions are only needed for the assignments in which engineering working drawings are being created.

>>>>> ENGINEERING PROBLEMS: Provide a statement of the problem to be solved. (Restate the problem to demonstrate your understanding of what is required. Don't just cut the statement from our assignments page and paste it into your solution.) Indicate what is **given** and what is to be **found**. Include a good **sketch** that shows the geometry with dimensions, units, materials and their properties, loads,

supports, axis systems used, and when appropriate, member cross section shapes and dimensions.

Documentation of FEM models should show **loads, boundary conditions, a plot of the mesh** employed and documentation of the **material properties** used.

The **results** should be summarized and any relevant conclusions drawn. If you are comparing an FEM solution to another known solution (theoretical or experimental), make a clear statement (per cent error or difference) of how the results compare.

Present your results first using the units of the problem definition and then in the alternative set of units commonly used in engineering, e.g. **von Mises Stress A = 250 MPa = 36,260 psi.**

In short, your work should stand alone; that is, another engineer should be able to reproduce your work using only the write-up you prepare. Failure to follow these guide lines will result in a significant loss of credit.

See – **ANSYS > Sample Solution Format** for problem solution examples
<http://mae.uta.edu/~lawrence/ansys/solutions/solutions.htm>

Also see course Mavspace file **Homework Format Requirements.**

See **ANSYS > Sample Solution Format** for problem solution examples
http://mae.uta.edu/~lawrence/mae4344/syllabus/Home_Work_Format.pdf

Each engineering assignment should be considered an engineering task and documented accordingly. Work neatly, using one side of the paper only. Number, date, and put your initials in the upper right hand corner of each page. When the assignment calls for computer solution of problems, be sure to use the computer generated output to support your results not as a substitute for a report of your effort.

Provide a problem statement indicating what is known and what is to be found. Include a good sketch that shows dimensions, units, materials and their properties, loadings, supports, axis systems used, and when appropriate, member cross section shapes and dimensions.

FEM models should show loadings, boundary conditions, the type of element(s) used, the FEM program used, important node and element numbers.

The results should be summarized separately from the supporting calculations and any relevant conclusions drawn. If you are comparing an FEM solution to another known solution, make a clear statement of how the results compare using per cent error or per cent difference calculations. Be sure to include the input data you used. If you are solving a series of problems, one set of input data is probably sufficient.

Remember, your work should stand alone; that is, another engineer should be able to reproduce your results using only the write-up you prepare. See also Home Work Format on Mavspace.

Worksheets are short in-class problems solved by a two-person team.

Quizzes are short individual in-class exams.

Worksheets & Quizzes are each worth **3 times as** much as one homework problem.

Schedules

Unless otherwise noted, homework is due at the **beginning of the class period on the due date.**

Exams

All exams will be closed book, closed note exams. Makeup exams due to excused absences will be scheduled before the last week of the semester.

Attendance and Drop Policy: Students are **expected to arrive on time and to attend all classes and exams.** Please advise the instructor by email if you must miss a class and provide the reason. The Drop Policy is consistent with the University drop schedule; the student must be passing to receive a W/P. Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way

through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).

Disability Accommodations: UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including *The Americans with Disabilities Act (ADA)*, *The Americans with Disabilities Amendments Act (ADAAA)*, and *Section 504 of the Rehabilitation Act*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the **Office for Students with Disabilities (OSD)**. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364.

Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671.

Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Title IX: *The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos. For information regarding Title IX, visit www.uta.edu/titleIX.*

Academic Integrity: Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at <http://www.uta.edu/universitycollege/resources/index.php>

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active

even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

If you also wish to receive mail at another email address, join the mae4344 **LISTSERVE** See menu item 'Join Mail List'.
(<http://mae.uta.edu/~lawrence/mae4344/mae4344.htm>)

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures

Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is found by turning right upon exiting COBA 339. Another exit is

located to the left. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial **911**. Non-emergency number 817-272-3381