**Course MAE 3316/4314**

**Spring 2016**

**TTh 9:30-10:50**

**Life Science Room 100**

**Instructor:** Richard L. Bennett, Ph.D.

**Office Hours:** 8:30-9:30 **:** 817.272.2019

**Academic Office:** Room 204 Woolf Hall**,** PO Box 19023, UTA, 76019

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**Course Prerequisites:** C or better in each of the following: MAE 2312, MAE 2323, MAE 3360, and MATH 3330.

**Required Textbook:** *Fundamentals of Structural Dynamics, 2nd Ed*, Roy R. Craig & Andrew J Kurdila, John Wiley, 2006.

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

**Course Description:** Natural frequencies, steady harmonic and transient response of complex structures are studied using traditional and finite element methods. Computational aspects of these problems are discussed.

**Course Learning Goals/Objectives:** Course goals include development of an understanding of: the basics of mechanical vibration and structural dynamics and the application to mechanical and structural systems.

**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://wweb.uta.edu/aao/fao/>).

**Disability Accommodations:** UTArlington 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](http://www.uta.edu/disability) or calling 817-272-3364.

**Counseling and Psychological Services, (CAPS)** [www.uta.edu/caps/](http://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](http://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*](http://www.uta.edu/hr/eos/index.php)*. For information regarding Title IX, visit* [www.uta.edu/titleIX](http://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](mailto:resources@uta.edu), or view the information at http://www.uta.edu/universitycollege/resources/index.php

**Tentative Schedule**

**Week 1:** - Introduction, Free Vib SDOF, Matlab, Chapters 1,2,3: 1.1-1.6, 2.1-2.3, 3.1,3.2

**Week 2:** - Harmonic Response, State Space Form Chapter 3: 3.1-3.2 ;

**Week 3:** - Harmonic Response, Transient Response State Space Notation Simulink, Chapters 3,4,5: 3.5, 4.1-4.3, 4.6, 5.1, 5.2, 5.5

**Week 4:** - Transient Response, Chapter 6: 6.2-6.3, Simulink, See also Appendix E & MATLAB on course web site. EXAM 1

**Week 5:** - Two Degree of Freedom Systems, mass coupling, stiffness coupling Chapters 8 & 9: 8.1, 8.3; 9.1,9.2,9.4,9.6.

**Week 6:** - Two Degree of Freedom Lagrange Method,

**Week 7:** - Continuous Systems, Wires & Bars Chapters 12&13: 12.1,12.2; 13.1-13.3

**Week 8:** - Continuous Systems Elastic Beams , EXAM 2

**Week 9:** - Multi DOF Systems, Chapter 15:15.1, MATLAB

**Week 10:** - Modal methods, Eigen Values, modal damping

**Week 11:** -Finite Element Methods, Element matrices, mass matrices Mode Superposition, Chapter 14

**Week 12:** - Global matrices, Transfer matrices, Structural damping, modal coupling EXAM 3

**Week 13:** - Aeroelasticity, airfoils, steady state Frequency Domain Methods,

**Week 14:** - Vibration reduction, Frequency Domain, Time Domain

**Week 15:** - Review FINAL EXAM

*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. – Richard L. Bennett*

**Specific Course Requirements**

**Examinations:** Exam 1, Exam 2, Exam 3, Final   
**Major Assignments**   
**Homework:** Assigned weekly   
**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 Grade Average:** Each Exam 25%

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

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

**Student Evaluation of Teaching:** Conducted near end of semester.

**Home Work and Exam Procedures**

**Homework**

**Homework will be assigned weekly, but not turned in on a weekly basis. All exams (including Final Exam) will include at least one previously homework problem that must be turned in with the classroom exam paper. The handed in homework problem will have equal weight as the problems in the classroom exam.**

**Homework submissions**

Submit your homework unfolded, stapled in the upper left corner. Include the following information in the upper right quadrant of the first page:

**Your Name - Last, First**   
**MAE 3316 / 4314**   
**Date**   
**Course Assignment Number and, if applicable, text problem number(s).**

Each 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.

**Exams**

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

**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 an address other than MavMail, join the mae4314 **LISTSERVE** See menu item 'Join Mail List'. (http://mae.uta.edu/~lawrence/mae4314/me5311.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 NH 109. 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