# AE 5339

# Structural Aspects of Design

**Spring 2017**

**Instructor:** Ashfaq Adnan

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**Faculty Profile:** <https://www.uta.edu/mentis/public/#profile/profile/view/id/6013>

**Office Hours:** by appointment

**Section Information:** AE 5339-001/002

**Time and Place of Class Meetings:** Room NH 105: Nedderman Hall

Tuesday-Thursday 2:00 pm - 3:20 pm

**Description of Course Content:** This graduate level course will cover analytical methods of structural analysis and failure theories that are used in design analysis. The course also provides analytical methods for fatigue life assessment.

**Textbooks:**

Advanced Strength and Applied Elasticity-4th Edition by Ansel C. Ugural and Saul K. Fenster

Fundamentals of Metal Fatigue Analysis by Bannantine, Comer and Handrock

**Student Learning Outcomes:**

After the completion of this course, students should be able to:

* Analyze stresses and strains developed in a deformable body
* describe the elastic behavior of materials from their stress-strain curves;
* understand 2-D elasticity and solve boundary value problems associated with non-uniform elastic deformation.
* Apply material failure theories to design load bearing structures.
* Analyze bending, torsional and buckling loads in beams and bars.
* Apply fracture mechanics theories in structural design.
* Understand role of fatigue loading in structural design.

**Course Content and Schedule**: The topics listed below will be covered during this course.

### **Part I: Structural Analysis**

Chapter 1: Analysis of Stress (1 week)

Chapter 2: Strain, Stress/Strain Relationship (1 week)

Chapter 3: 2-D Problems in Elasticity (1½ weeks)

Chapter 4: Criteria for Material Failure (½ week)

Chapter 5: Analysis of Beam-Bending (1½ weeks)

Chapter 6: Torsion of Prismatic Bars (1 week)

Chapter 7: Axisymmetrically Loaded Members (½week)

Chapter 8: Energy Methods (½ week)

Chapter 9: Elastic Stability (½ week)

#### **Part II: Fatigue and Fracture Mechanics Analysis**

Chapter 10: Fatigue Considerations in Structural Design (1 week)

Chapter 11: Fracture Mechanics Application in Structural Design (1 week)

Chapter 12: Notched Sensitivity (1 week)

Chapter 13: Variable Amplitude Loading in Fatigue (1 week)

Final Review (1 week)

Mid-term exams and Solution (1 week)

Final Exam (1 week)

Spring Break (1 week)

Total 16 weeks

*Disclaimer: 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. –Ashfaq Adnan*

**Course Policy**

There will be HW assignments, midterm exam and final.

* + **Homework:** Assigned during the Tuesday classes and due dates are defined in the assignment.
  + **Midterm:** Tentative schedule – March 21, 2017
  + **Final Exam:** May 9, 2017, 2.00 pm to 4.30 pm.

**Note:**

**1st day of class: January 17, 2017**

**Spring Vacation: March 13-18, 2017**

**Last day to drop class: March 31, 2017**

**Last day of Class: May 5, 2017**

* Homework turned in late (after 5.00 pm of the due date) will receive a 20% penalty per week until solution is posted. No late home work will be accepted after the solution is posted. UTA regulations permitting, missed midterms and/or final exams can only be rescheduled when missed due to major health problems or circumstances beyond the student’s control. With instructions discretion, students will be required to reschedule the missed exams at the earliest time possible.

**Course Grading Policy**: Final numerical grade for each student will be determined based on his/her total earned points on a scale from 0 to 500. The total earned points for each student will be computed by adding points obtained by the student from midterm exam, homework assignments and final exam.

**Point Distributions:**

Homework 125

Midterm 175

Final Exam 200

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Total points 500

The final letter grade for each student will be determined from his/her final numerical grade according to the following ranges:

**Tentative Grading Scale Letter Grade**

420 or above A

365-419 B

300-364 C

250-299 D

249 or below F

**Attendance:** At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students’ academic performance, which includes establishing course-specific policies on attendance. *As the instructor of this section, I strongly recommended attending each class. I will take attendance sporadically*. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients “begin attendance in a course.” UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Blackboard. This date is reported to the Department of Education for federal financial aid recipients.

**Drop Policy:** 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/>).

**Americans with Disabilities Act:** The University of Texas at 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)*. 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 that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. 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.

**Academic Integrity:** Students enrolled in this course 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 [www.uta.edu/resources](http://www.uta.edu/resources).

**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>.

**Campus Carry:** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>

**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 located [insert a description of the nearest exit/emergency exit]. 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 individuals with disabilities.

**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