

# MAE 1312-004: Engineering Statics

Spring 2016

**Instructor(s):** Sheikh Fahad Ferdous

**Office Number:** 323H Woolf Hall

**Office Telephone Number:** (817) 272-2561 (voice)

**Email Address:** sheikh@uta.edu

**Office Hours:** 2:00 pm – 3:30 pm; Tuesday (or, by appointment)

**Time and Place of Class Meetings:** WH 208, Woolf Hall (WH)

**Tu Th 5:30 pm – 6:50 pm**

**Course Website:** <https://elearn.uta.edu/>

**Description of Course Content:** A study of forces and force systems, resultants and components of force systems, forces due to friction, conditions of equilibrium, forces acting on members of trusses and frame structures, centroids and moments of inertia. Vector and index notation introduced.

**Course Prerequisites:** MAE 1104, MATH 1426, and PHYS 1443.

**Textbooks:** R.C.Hibbeler, Engineering Mechanics-Statics, 13th Edition,

*The text book will be used as reference, and for some reading and homework assignments.*

**Student Learning Outcomes:** By the end of this course students should be able to:

Use different systems of units and transform between them

- Express forces in terms of vectors and scalars
- Manipulate these forces using various operations from vector calculus
- Develop the equations of equilibrium for a set of forces acting on a system
- Model the system and forces through a free body diagram
- Find the moment of a force and describe its physical meaning
- Find equivalent force systems
- Analyze the internal forces in structural systems
- Model and analyze the forces of friction and gravity
- Calculate the moments of inertia

There will be around 10 homework assignments, two midterm exams and one final exam.

## Course Grading Policy:

1 <sup>st</sup> Midterm	100 (25%)
2 <sup>nd</sup> Midterm	100 (25%)
Homework	60 (15%)
Final Exam	140 (35%)
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Semester Total points	400 (100%)

<b>Tentative Grading Scale</b>	<b>Letter Grade</b>
340 or above ( $\geq 85\%$ )	A
300 – 339 (75% to $\leq 85\%$ )	B
260 – 299 (65% to $\leq 75\%$ )	C
220 – 259 (55% to $\leq 65\%$ )	D
000 – 220 ( $\leq 55\%$ )	F

**Important Dates:**

**1<sup>st</sup> Midterm: Tuesday, February 23, 2016, 5:30 pm – 6:50 pm.**

Syllabus: All class materials, solved problems, homework and reading assignments that are covered to date.

**2<sup>nd</sup> Midterm: Tuesday, March 29, 2016, 5:30 am – 6:50 am.**

Syllabus: All class materials, solved problems, homework and reading assignments that are covered between 1<sup>st</sup> midterm and to date.

**Homework:** Assigned weekly during the **Tuesday/Thursday** class and due before the next **Tuesday/Thursday** class unless otherwise stated.

**Final Exam: On the date scheduled by the University during the Final Exam Period.** Covers all class materials including homework, solved problems, reading assignments and midterm exams.

**Note:**

- All students **MUST** check blackboard and UTA email periodically. All HWs, announcements and course related information will be made available to Blackboard only.
- **NOT CHECKING MAVMAIL OR BLACKBOARD NOTICES IS NOT AN EXCUSE FOR “I WAS NOT INFORMED”**
- All homework assignments should be prepared on instructor-approved papers and turned in with a coversheet. The template for the coversheet will be uploaded to Blackboard before the 1<sup>st</sup> HW assignment is due.
- Homework turned in **LATE** will receive a 20% penalty per day until solution for that Homework is posted. Solutions to HWs will be posted within one week from the due date.
- No **LATE** home work will be accepted after the solution is made available to students. [NO EXCEPTIONS]
- 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 instructor’s discretion, students will be required to reschedule the missed exams at the earliest time possible.

First Class: January 19, 2016  
Census Date: February 03, 2016  
Spring Break: March 14-18, 2016  
Last day to drop class: April 01, 2016  
Last day of class: May 03, 2016  
Final Exam: May 10, 2016

**Attendance Policy:** Students are strongly recommended to attend each class.

**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>.

**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. 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.

**Woolf Hall 406 Computer Teaching Lab Policies:**

1. WH 406 must be officially reserved for all events including classroom instructions due to the limited classroom space equipped with computers and scheduling logistics. Please see Lanie or Janet for reservation.
2. WH 406 is a computer teaching lab. Faculty and Instructors must be present while students occupy this room. When an instructor leaves the room, students are to leave WH 406 as well. Instructors should encourage students to use WH 320 if needed after class is over. The computer lab in WH 320 is available for MAE student access 24/7.
3. WH 406 doors are not to be propped open. Propped doors are considered a security breach by the UTA Police Department and a hazard violation by the Fire Inspector.
4. Food, drink, and tobacco products are prohibited in WH 406.

## Course Schedule

Date	Day	Lecture	Topic	Note
19-Jan-16	Tuesday	Lecture 1	<b>Chapter 1</b> <ul style="list-style-type: none"> <li>• Introduction.</li> <li>• Mechanics.</li> <li>• Fundamental Concepts.</li> <li>• Units of Measurements.</li> </ul>	
21-Jan-16	Thursday	Lecture 2	<ul style="list-style-type: none"> <li>• The International System of Units.</li> <li>• Numerical Calculations.</li> <li>• General Procedure for Analysis.</li> </ul>	
26-Jan-16	Tuesday	Lecture 3	<b>Chapter 2</b> <ul style="list-style-type: none"> <li>• Scalars and Vectors.</li> <li>• Vector Operations.</li> <li>• Vector Addition of Forces.</li> <li>• Addition of a System of Coplanar Forces.</li> </ul>	HW 1 Assigned
28-Jan-16	Thursday	Lecture 4	<ul style="list-style-type: none"> <li>• Addition of a System of Coplanar Forces.</li> <li>• Cartesian vectors.</li> <li>• Addition of Cartesian vectors.</li> </ul>	
02-Feb-16	Tuesday	Lecture 5	<ul style="list-style-type: none"> <li>• Position Vectors.</li> <li>• Force Vector Directed Along a Line.</li> <li>• Dot Product.</li> </ul>	HW 1 Due HW 2 Assigned
04-Feb-16	Thursday	Lecture 6	<b>Chapter 3</b> <ul style="list-style-type: none"> <li>• Condition for the equilibrium of a Particle.</li> <li>• The Free Body diagram.</li> </ul>	
09-Feb-16	Tuesday	Lecture 7	<ul style="list-style-type: none"> <li>• Coplanar Force Systems.</li> <li>• Three-Dimensional Force Systems.</li> </ul>	HW 2 Due HW 3 Assigned
11-Feb-16	Thursday	Lecture 8	<b>Chapter 4</b> <ul style="list-style-type: none"> <li>• Moment of a Force-Scalar Formulation.</li> <li>• Cross Product.</li> <li>• Moment of a Force-Vector Formulation.</li> <li>• Principal of Moments.</li> </ul>	
16-Feb-16	Tuesday	Lecture 9	<ul style="list-style-type: none"> <li>• Moment of a Force about a Specified Axis.</li> <li>• Moment of a Couple.</li> <li>• Simplification of a Force and Couple System.</li> </ul>	HW 3 Due
18-Feb-16	Thursday	Lecture 10	<ul style="list-style-type: none"> <li>• Further Simplification of a Force and Couple System.</li> <li>• Reduction of a Simple Distributed Loading</li> <li>• Review for MT Exam 1</li> </ul>	
23-Feb-16	Tuesday	<b>Mid-Term Exam 1</b>	<b>*** EXAM ***</b>	
25-Feb-16	Thursday	Lecture 11	<b>Chapter 5</b> <ul style="list-style-type: none"> <li>• Conditions for Rigid Body Equilibrium.</li> <li>• Free Body Diagram.</li> <li>• Equations for Equilibrium.</li> </ul>	HW 4 Assigned
01-Mar-16	Tuesday	Lecture 12	<ul style="list-style-type: none"> <li>• Two and Three Force Members.</li> <li>• Free Body Diagram.</li> </ul>	
03-Mar-16	Thursday	Lecture 13	<ul style="list-style-type: none"> <li>• Equations of Equilibrium.</li> <li>• Constraints and Statical Determinacy.</li> </ul>	HW 4 Due HW 5 Assigned

08-Mar-16	Tuesday	Lecture 14	<b>Chapter 6</b> <ul style="list-style-type: none"> <li>• Simple Trusses.</li> <li>• The Method of Joints.</li> </ul>	
10-Mar-16	Thursday	Lecture 15	<ul style="list-style-type: none"> <li>• Zero-Force Members.</li> <li>• The Method of Sections.</li> </ul>	HW 5 Due HW 6 Assigned
			<b>*** SPRING BREAK ***</b>	
22-Mar-16	Tuesday	Lecture 16	<ul style="list-style-type: none"> <li>• Space Trusses.</li> <li>• Frames and Machines.</li> </ul>	
24-Mar-16	Thursday	Lecture 17	<ul style="list-style-type: none"> <li>• Review of Problems for Mid-Term 2</li> </ul>	HW 6 Due
29-Mar-16	Tuesday	<b>Mid-Term Exam 2</b>	<b>*** EXAM ***</b>	
31-Mar-16	Thursday	Lecture 18	<b>Chapter 7</b> <ul style="list-style-type: none"> <li>• Internal Loadings Developed in Structural members.</li> <li>• Shear and Moment Equations and Diagrams.</li> </ul>	HW 7 Assigned
05-Apr-16	Tuesday	Lecture 19	<ul style="list-style-type: none"> <li>• Relations between Distributed Load, Shear, and Moment.</li> <li>• Cables.</li> </ul>	
07-Apr-16	Thursday	Lecture 20	<b>Chapter 8</b> <ul style="list-style-type: none"> <li>• Characteristics of Dry Friction.</li> <li>• Problems Involving Dry Friction.</li> <li>• Wedges.</li> </ul>	HW 7 Due HW 8 Assigned
12-Apr-16	Tuesday	Lecture 21	<ul style="list-style-type: none"> <li>• Frictional Forces on Screws.</li> <li>• Frictional Forces on Flat Belts.</li> <li>• Frictional Forces on Collar Bearings, Pivot Bearings, and Disks.</li> </ul>	
14-Apr-16	Thursday	Lecture 22	<ul style="list-style-type: none"> <li>• Frictional Forces on Journal Bearings.</li> <li>• Rolling Resistance.</li> </ul>	HW 8 Due HW 9 Assigned
19-Apr-16	Tuesday	Lecture 23	<b>Chapter 9</b> <ul style="list-style-type: none"> <li>• Center of Gravity, Center of Mass, and the Centroid of a Body.</li> <li>• Composite Bodies.</li> </ul>	
21-Apr-16	Thursday	Lecture 24	<ul style="list-style-type: none"> <li>• Theorems of Pappus and Guldinus.</li> <li>• Resultant of a General Distributed Loading.</li> <li>• Fluid Pressure.</li> </ul>	HW 9 Due HW 10 Assigned
26-Apr-16	Tuesday	Lecture 25	<b>Chapter 10</b> <ul style="list-style-type: none"> <li>• Definitions of Moments of Inertia for Areas.</li> <li>• Parallel-Axis Theorem for an Area.</li> <li>• Radius of Gyration of an Area.</li> </ul>	
28-Apr-16	Thursday	Lecture 26	<ul style="list-style-type: none"> <li>• Moments of inertia for Composite Areas.</li> <li>• Product of Inertia for an Area.</li> <li>• Moments of Inertia for an Area about Inclined Axis.</li> </ul>	HW 10 Due
03-May-16	Tuesday	Lecture 27	<ul style="list-style-type: none"> <li>• Mohr's Circle for Moments of Inertia.</li> <li>• Mass Moment of Inertia.</li> <li>• Review for Final Exam.</li> </ul>	
10-May-16	Tuesday		<b>*** FINAL EXAM ***</b>	

*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. –Sheikh F Ferdous*