University of Texas at Tyler - Department of Civil Engineering
CENG 3325 Structural Analysis
Spring 2020

Instructor:	Dr. Michael Gangone	Office Hours:
	RBS 1009	M/W: 9AM-10:30AM
	(903) 565-5872	TUES: 9:30AM – 11AM
	mgangone@uttyler.edu	or by appointment

Lectures:
Tuesday/Thursday: 8:00 AM-9:20AM, RBS 1031

Course Website:
Canvas will be used to manage the course material for the semester. There you will find homework assignments, solutions, handouts and other material pertaining to the class. **Please check there regularly.**

Catalog Description:
Introduction to structural requirements, structural systems and specifications of loads; analysis of statically determinate and indeterminate structures using equations of equilibrium, moment distribution and energy methods; determination of design forces in the structural components including shear force and bending moment; and brief introduction to the direct stiffness method.

Learning Objectives:
1. Develop an organized approach to solving structural analysis and design problems.
2. Understand the structural behavior of simple beams subjected to basic loading conditions.
3. Analyze determinate and indeterminate beams.
4. Understand the structural behavior of frames subjected to basic loading conditions.
5. Analyze determinate and indeterminate frames.
6. Understand the structural behavior of trusses subjected to basic loading conditions.
7. Analyze determinate and indeterminate trusses.
8. Apply equilibrium to solve structural analysis problems.
9. Apply approximate methods in structural analysis.
10. Apply the Force (Flexibility) Method to solve structural analysis problems.
11. Apply Displacement (Stiffness) Methods to solve structural analysis problems.
12. Design simple structural members using real design loads and the Load and Resistance Factor Design Codes.
13. Use spreadsheets and math solving problems as tools to perform the mathematical operations required in structural analysis.
14. Use the SAP 2000 finite element program as a tool to analyze and design trusses, beams and frames.

Prerequisite:
CENG/MENG 3306: Mechanics of Materials

Required Text: Any structural analysis textbook

Recommended Text:
Structural Analysis, Hibbeler 10th Edition, Pearson Prentice Hall, Upper Saddle River, NJ, 2012. ISBN-13: 978-0-13-461067-2

Tentative Outline:

COURSE SCHEDULE - SUBJECT TO REVISION CENG 3325.001 Spring 2020					
Lesson No.	**Date**	**Topic**	**Lesson Material (Hibbeler 10th edition)**	**Homework Assigned**	**Assignment Due**
		Week 1			
1	1/14	Review: Shear/Moment Diagrams, Determinancy, Equilibrium		HW1 Assigned (Not Collected)	
2	1/16	Stability and Determinancy	2.3-2.6	HW2 Assigned	
		Week 2			
3	1/21	ASCE 7-10 Loads	ASCE 7-10, 1.3-1.4	Project Assigned	
4	1/23	Load Paths, ASD vs. LRFD	2.1-2.2	HW3 Assigned	HW2 Due
		Week 3			
	1/27	**CENSUS DATE**			
5	1/28	Truss stability and determinancy	3.1-3.2	HW4 Assigned	
6	1/30	Method of joints and sections and zero force members	3.3-3.5		HW3 Due
		Week 4			
7	2/4	Shear and Moment Intro, Shear/Moment Functions	4.2-4.3	HW5 Assigned	HW4 Due
8	2/6	Shear/Moment Functions, V&M for frames	4.4	HW6 Assigned	
		Week 5			
9	2/11	SAP2000 Lab 1			HW5 Due
10	2/13	Approximate Deflected Shapes: Beams/Frames	7.1		HW6 Due
		Week 6			
11	2/18	Geometry from Elastic Curve-Double Integration	7.2-7.3	HW7 Asssigned	
12	2/20	Virtual work (1) Trusses	8.1-8.4	HW8 Assigned	Project Due
		Week 7			
13	2/25	Virtual work (2) Beams and Frames	8.7		HW7 Due
14	2/27	SAP2000 Lab 2			HW8 Due
		Week 8			
15	3/3	Force Method Intro	9.1-9.4	HW9 Assigned	
	3/5	**EXAM 1**			
		SPRING BREAK: 3/9-3/14			
		Week 9			
16	3/17	Force Method: Beams and Frames	9.4-9.5		
17	3/19	Force Method: Trusses	9.6	HW10 Assigned	
		Week 10			
18	3/24	Approximate Analysis (1) Vertical	12.3	HW11 Assigned	HW9 Due
19	3/26	Approximate Analysis: Portal Method	12.4		HW10 Due
		Week 11			
	3/30	**LAST DAY TO WITHDRAW FROM CLASSES**			
20	3/31	Introduction to stiffness method	10.1-10.2		HW11 Due
21	4/2	Slope deflection method - beams	10.1-10.3	HW12 Assigned	
		Week 12			
22	4/7	Direct Stiffness Intro	15.2-15.4	HW 13 Assigned	HW 12 Due
	4/9	**EXAM 2**			
		Week 13			
23	4/14	Direct Stiffness (2)	15.4	HW14 Assigned	
24	4/16	Influence Lines (1)	6.1-6.3	HW15 Assigned (Not collected)	HW 13 Due
		Week 14			
25	4/21	Influence Lines (2)			HW 14 Due
26	4/23	Final Exam Review			
		FINAL EXAM 4/28 (8:00am-10:00am)			

Exams:
There will be 2 midterm examinations and one final examination. The exams are **TENITATIVELY** scheduled for:

Exam 1: Thursday March 5th
Exam 2: Thursday April 9th
Final Exam: Tuesday April 28th (expected)

Exams dates may be moved up or pushed back depending on the progress of the lectures. Exams are closed book. You can use a calculator and instructor approved reference material. *Solutions to exams will NOT be posted on Canvas*. No make-up exams will be given except for medical or other similar hardships where advanced arrangements are made with the instructor; or in case of non-selective medical emergencies with appropriate physician's note or documentation. Other than circumstances described above, failure to take the exam at the scheduled time will constitute a grade of zero in the exam.

Professional Practice:
Your professional practice grade will be broken down into multiple components. (1) 10% of the 25% percentage points will be based on your attendance at **4 ASCE student technical meetings** (cookout and game night events do not count) throughout the spring semester. Example of valid meetings include guest speakers, field trips, or any other technical meeting from either organization. (2) 10% of the 25% will be based on the number of homework assignments you submit on time following the correct homework format listed below. (3) The remaining 5 percentage points is based upon your attendance and participation in the class.

Homework:
Homework will be assigned on a regular basis (see homework schedule). Homework is due on the date outlined in the schedule at the beginning of lecture. **You will need to upload your homework as a single pdf file to canvas no later than 11 am on the date it is due.** No late homework will be accepted except for unusual circumstances. Homework will not be graded in the traditional sense. You will find that all homework solutions are posted on Canvas so you will be able to check your own work before submitting the assignment. You will be given full credit for submitting your homework on time and following the correct homework format. Homework should be submitted on engineering paper. Solutions should be presented in a clear methodical manner. Follow the "homework submission guidelines" when completing your assignment. Solutions which are not clearly presented will **NOT** receive credit.

Homework Submission Guidelines (Professionalism Requirements):
1. Homework should be submitted using letter size (8 ½ x 11") paper. Engineering paper is preferred but plain white paper is allowed if you have no access to engineering paper.
2. The header of the first page should include the following:
    a. Name of Student
    b. Student Number
    c. Course Number and Name
    d. Homework Number
3. There should be no more than 2 problems per page. This is to ensure that there is enough space on the paper for the grader to add comments.
4. Multiple sheets should be stapled at the top left corner of the page.
5. The submitted papers should be free of frail edges, stains, smudges and wrinkles.
6. All problems should include:
    a. Problem Number
    b. A diagram of the problem (draw all free body diagrams when necessary)
    c. A set of given quantities
    d. A set of unknown quantities

e. A set of assumptions

7. All numbers and writing should be clear and readable.

8. When required to produce a graph, use a computer program such as excel or matlab to generate the plot. Do not draw it by hand!

9. The **final answer should be boxed** and at the bottom of the problem.

Mini-Project:

This course requires one mini-project that will essentially require a time commitment of approximately double a typical homework assignment. The mini-projects will be completed in groups. More detail will follow as the semester progresses.

Grades:

Professional Practice = 25%
- *Assignments = 10%*
- *Attendance at Technical Meetings = 10%*
- *Class Participation = 5%*

Mini-Project = 5%
Midterm Exams (2) = 40%
Final Exam = 30%

Grade Scale:

A:	90-100
B:	80-89
C:	70-79
D:	60-69
F:	<60

If necessary, I reserve the right to adjust the grade scale at the end of the semester to your benefit.

****NOTE:** There will be no makeup work or extra credit allowed/granted at the end of or during the semester unless allowed/granted to everyone by the instructor. All assignments must be turned in at the appropriate time to receive credit.

Laptops/PDAs/MP3 players/Cell Phones or other electronic devices:

- The use of any electronic device, except an approved calculator, is not permitted during exams. Your exam will be collected and your grade will be a zero if you are caught using a non-approved electronic device/calculators. Any instances of a calculator inappropriately used during an exam will be the basis of alleging Academic Misconduct and may result in Failing (F) of the course at the determination of the course's instructor or the basis for a recommendation for expulsion from the University. Any Calculator used during an exam in this course must meet the requirements stated within the policy below.

Calculator Policy:

Only NCEES approved calculators will be permitted during tests and your test will be collected and your grade will be a zero if you are using a non-approved calculator.

The approved calculators include the following: (Please check the NCEES website for a complete listing, www.ncees.org/exams/calculator-policy/. Examples include but are not limited to:

- Hewlett Packard – HP 33s, HP 35s, and no others

- Casio – All FX 115 models
- Texas Instruments – All TI 30X or TI-36X models.
- If you are unsure about your calculator, it is your responsibility to check with the instructor for approval.

At the discretion of the course instructor, any calculator not meeting the requirements stated (especially in the case of a graphing calculator) may be used but only after an inspection of the device and a clearing of all the memory within the device, performed for the instructor at a time immediately prior to the exam. At any time during the exam your calculator is subject to a random search by the instructor. Failure or refusal to clear all memory or to surrender your calculator to search will disqualify you from the exam immediately, unless you can produce a calculator meeting the requirements as stated above.

Final day to withdraw:
The final day to withdraw from the course without penalty is **March 30th**

Census dates:
The university requires that instructors to report the attendance to the register at various points in the semester. Therefore, on **January 23rd** I will be taking attendance. Please make sure you are there for class on that date or notify ahead if you will not be there.

UT Tyler Honor Code: Every member of the UT Tyler community joins together to embrace: Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.

Academic Misconduct: Plagiarism of homework and cheating on examinations will be interpreted as academic misconduct and will not be tolerated. Please refer to the University of Texas at Tyler current Undergraduate Catalog for academic policies and Manual of Policies and Procedures for Student Affairs (MOPPS, Chapter 8) regarding academic integrity, cheating and plagiarism. Academic dishonesty will not be tolerated. Ignorance of the rules and policies provides no protection from the consequences.

Collection of Student Work:
Throughout the semester I will collect student work (best, average, and worst) for the ABET outcomes notebooks. This will require me to make a copy of your work, keep your original and return a copy of the graded work to you. I will not draw attention as to what level of work you accomplished.

Students Rights and Responsibilities: To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link:
http://www.uttyler.edu/wellness/StudentRightsandResponsibilities.php

Grade Replacement/Forgiveness and Census Date Polices: Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment

Services Center or at http://www.uttyler.edu/registrar. Each semester's Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.

Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.

The Census Date is the deadline for many forms and enrollment actions that students need to be aware of. These include:

- Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes, adding a new class, dropping without a "W" grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid

State-Mandated Course Drop Policy: Texas law prohibits a student who began college for the first time in fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date).
Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

Disability/Accessibility Services: In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) the University of Tyler at Texas offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including non-visible a diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit https://hood.accessiblelearning.com/UTTyler and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with Cynthia Lowery, Assistant Director Student Services/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at http://www.uttyler.edu/disabilityservices, the SAR office located in the University Center, # 3150 or call 903.566.7079.

Student Absence due to Religious Observance: Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second class meeting of the semester.

Student Absence for University-Sponsored Events and Activities: If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

Social Security and FERPA Statement: It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

Emergency Exits and Evacuation: Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services

Student Standards of Academic Conduct: Disciplinary proceedings may be initiated against any student who engages in scholastic dishonesty, including, but not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

i. "Cheating" includes, but is not limited to:
   - copying from another student's test paper;
   - using, during a test, materials not authorized by the person giving the test;
   - failure to comply with instructions given by the person administering the test;
   - possession during a test of materials which are not authorized by the person giving the test, such as class notes or specifically designed "crib notes". The presence of textbooks constitutes a violation if they have been specifically prohibited by the person administering the test;
   - using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program;
   - collaborating with or seeking aid from another student during a test or other assignment without authority;
   - discussing the contents of an examination with another student who will take the examination;
   - divulging the contents of an examination, for the purpose of preserving questions for use by another, when the instructors has designated that the examination is not to be removed from the examination room or not to be returned or to be kept by the student;
   - substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment;

- paying or offering money or other valuable thing to, or coercing another person to obtain an unadministered test, test key, homework solution, or computer program or information about an unadministered test, test key, home solution or computer program;
- falsifying research data, laboratory reports, and/or other academic work offered for credit;
- taking, keeping, misplacing, or damaging the property of The University of Texas at Tyler, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct; and
- misrepresenting facts, including providing false grades or resumes, for the purpose of obtaining an academic or financial benefit or injuring another student academically or financially.

ii. "Plagiarism" includes, but is not limited to, the appropriation, buying, receiving as a gift, or obtaining by any means another's work and the submission of it as one's own academic work offered for credit.

iii. "Collusion" includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.

iv. All written work that is submitted will be subject to review by SafeAssignTM, available on Canvas. UT Tyler Resources for Students
- UT Tyler Writing Center (903.565.5995), writingcenter@uttyler.edu
- UT Tyler Tutoring Center (903.565.5964), tutoring@uttyler.edu
- The Mathematics Learning Center, RBN 4021, this is the open access computer lab for math students, with tutors on duty to assist students who are enrolled in early-career courses.
- UT Tyler Counseling Center (903.566.7254)

UT Tyler a Tobacco-Free University: All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors.
Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products.
There are several cessation programs available to students looking to quit smoking, including counseling, quitlines, and group support. For more information on cessation programs please visit www.uttyler.edu/tobacco-free.

Campus Carry: We respect the right and privacy of students 21 and over who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at http://www.uttyler.edu/about/campus-carry/index.php

Prepared by: Michael V. Gangone, Ph.D.
Associate Professor
Department of Civil and Environmental Engineering

COURSE SCHEDULE - SUBJECT TO REVISION

CENG 3325.001 Spring 2020

Lesson No.	Date	Topic	Lesson Material (Hibbeler 10th edition)	Homework Assigned	Assignment Due
		Week 1			
1	1/14	Review: Shear/Moment Diagrams, Determinancy, Equilibrium		HW1 Assigned (Not Collected)	
2	1/16	Stability and Determinancy	2.3-2.6	HW2 Assigned	
		Week 2			
3	1/21	ASCE 7-10 Loads	ASCE 7-10, 1.3-1.4	Project Assigned	
4	1/23	Load Paths, ASD vs. LRFD	2.1-2.2	HW3 Assigned	HW2 Due
		Week 3			
	1/27	**CENSUS DATE**			
5	1/28	Truss stability and determinancy	3.1-3.2	HW4 Assigned	
6	1/30	Method of joints and sections and zero force members	3.3-3.5		HW3 Due
		Week 4			
7	2/4	Shear and Moment Intro, Shear/Moment Functions	4.2-4.3	HW5 Assigned	HW4 Due
8	2/6	Shear/Moment Functions, V&M for frames	4.4	HW6 Assigned	
		Week 5			
9	2/11	SAP2000 Lab 1			HW5 Due
10	2/13	Approximate Deflected Shapes: Beams/Frames	7.1		HW6 Due
		Week 6			
11	2/18	Geometry from Elastic Curve-Double Integration	7.2-7.3	HW7 Asssigned	
12	2/20	Virtual work (1) Trusses	8.1-8.4	HW8 Assigned	Project Due
		Week 7			
13	2/25	Virtual work (2) Beams and Frames	8.7		HW7 Due
14	2/27	SAP2000 Lab 2			HW8 Due
		Week 8			
15	3/3	Force Method Intro	9.1-9.4	HW9 Assigned	
	3/5	**EXAM 1**			
		SPRING BREAK: 3/9-3/14			
		Week 9			
16	3/17	Force Method: Beams and Frames	9.4-9.5		
17	3/19	Force Method: Trusses	9.6	HW10 Assigned	
		Week 10			
18	3/24	Approximate Analysis (1) Vertical	12.3	HW11 Assigned	HW9 Due
19	3/26	Approximate Analysis: Portal Method	12.4		HW10 Due
		Week 11			
	3/30	**LAST DAY TO WITHDRAW FROM CLASSES**			
20	3/31	Introduction to stiffness method	10.1-10.2		HW11 Due
21	4/2	Slope deflection method - beams	10.1-10.3	HW12 Assigned	
		Week 12			
22	4/7	Direct Stiffness Intro	15.2-15.4	HW 13 Assigned	HW 12 Due
	4/9	**EXAM 2**			
		Week 13			
23	4/14	Direct Stiffness (2)	15.4	HW14 Assigned	
24	4/16	Influence Lines (1)	6.1-6.3	HW15 Assigned (Not collected)	HW 13 Due
		Week 14			
25	4/21	Influence Lines (2)			HW 14 Due
26	4/23	Final Exam Review			
		FINAL EXAM 4/28 (8:00am-10:00am)			

ASSIGNMENT SCHEDULE - SUBJECT TO REVISION

CENG 3325.001 - Spring 2020

Homework No.	Topic	Homework Assigned	Assignment Due
1	Review: Shear and Moment Diagrams	January 14, 2020	NOT COLLECTED
2	Determinancy, Stability and Reactions of Beams and Frames	January 16, 2020	January 23, 2020
3	Loads and Load Path	January 23, 2020	January 30, 2020
4	Stability, Determinancy, and Axial Member Forces of Trusses	January 28, 2020	February 4, 2020
5	Shear and Moment Functions and Diagrams for Beams	February 4, 2020	February 11, 2020
6	Shear and Moment Functions and Diagrams for Frames	February 6, 2020	February 13, 2020
7	Double Integration Method for Beam Deflection	February 18, 2020	February 25, 2020
8	Virtual Work - Beams, Frames and Trusses	February 20, 2020	February 27, 2020
9	Force Method - Beams and Frames	March 3, 2020	March 24, 2020
10	Force Method - Trusses	March 19, 2020	March 26, 2020
11	Approximate Analysis - Vertical Analysis and Portal Method	March 24, 2020	March 31, 2020
12	Slope Deflection Method - Beams	April 2, 2020	April 7, 2020
13	Direct Stiffness Method - Beams	April 7, 2020	April 16, 2020
14	Essay Response - The Use of FEA in Structural Analysis	April 14, 2020	April 21, 2020
15	Influence Lines - Determinate Beams	April 16, 2020	NOT COLLECTED

Project	Topic	Assigned	Due
Project	Load Path	January 21, 2020	February 20, 2020

Exam	Lessons and Homework	Date
Exam 1	Lessons 1-14, Homework 1-8	March 5, 2020
Exam 2	Lessons 15-19, Homework 9-11	April 9, 2020
Final	Comprehensive (All lessons and homework)	April 28, 2020