

University of Texas at Tyler - Department of Civil Engineering
CENG 4314/5314 Advanced Structural Analysis
Fall 2022

Instructor: Dr. Michael Gangone
RBS 1009
(903) 565-5872
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Office Hours:
M/W/F: 9 am – 10:30 am
Thurs: 2 pm – 3:30 pm
or by appointment

Lectures:
Online through Canvas

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

Catalog Description:
This course builds upon the material covered in Structural Analysis 1 to develop a better understanding of structural behavior. Matrix analysis methods, including an introduction to finite elements are developed as the basis for modern, computer-based structural analysis. These and other advanced analytical techniques are used to analyze and design trusses, beams, and frames. Course-work involves extensive use of the computer as an analytical tool.

- Learning Objectives:**
1. Develop an organized approach to solve structural analysis problems
 2. List and explain the assumptions and limitations of all analysis procedures covered in the course
 3. Determine moments and shears for statically indeterminate beams and frame structures using approximate analysis techniques
 4. Analyze trusses, beams and frames using the manual direct stiffness method
 5. Analyze beams and frames using the Moment Distribution Method
 6. Analyze beams and frames using Slope Deflection Method
 7. Calculate the displacement of a determinate beam, frame or truss using method of Virtual Work and Castigliano's 2nd Theorem
 8. Use Finite Element software (such as SAP2000) for structural analysis

Prerequisite:
CENG 3325: Structural Analysis

Required Text: Any structural analysis textbook with advanced topics

Recommended Text:

Hibbeler, R.C. Structural Analysis, 10th Edition, Pearson. ISBN-13: 978-0-13-461067-2

Tentative Course Schedule:

COURSE SCHEDULE - SUBJECT TO REVISION					
CENG 4314.060/5314.060 Fall 2022 (ONLINE)					
Lesson No.	Suggested Date	Topic	Text (Hibbeler 10th Ed.)	Assigned Work	Work Due
WEEK 1					
1	8/23	Virtual Work (Review): Beams, Frames and Trusses	9.1-9.4, 9.7-9.8	HW1	
2	8/25	Castigliano's Theorem: Axial and Flexure Members	9.5-9.6, 9.9		
WEEK 2					
3	8/30	Force Method: 1 Degree Indeterminate Beams	10.1-10.4	HW2	HW 1
4	9/1	Force Method: nth Degree Indeterminate Beams	10.1-10.4, 10.8		
	9/2	CENSUS DAY			
WEEK 3					
LABOR DAY					
5	9/6	Force Method: Frames	10.5	HW3	HW2
6	9/8	Force Method: Trusses (External and Internal Redundancy)	10.6		
WEEK 4					
7	9/13	Approximate Analysis Method - Indeterminate Beams	7.1, 7.3	HW4	HW3
8	9/15	Approximate Analysis Method - Portal and Cantilever Methods	7.4-7.6		
WEEK 5					
9	9/20	Approximate Analysis Method - Indeterminate Trusses	7.2	HW5	HW4
10	9/22	Direct Stiffness Method - Intro to Slope Deflection	11.1-11.2		
WEEK 6					
11	9/27	Slope Deflection Method - Beams	11.3	HW6	HW5
12	9/29	Slope Deflection Method - Sidesway Inhibited Frames	11.4		
WEEK 7					
	10/4	Exam 1			
13	10/6	Slope Deflection Method - Sidesway Uninhibited Frames	11.5	HW7	Exam 1
WEEK 8					
14	10/11	Matrix Analysis	Appendix A	HW8	
15	10/13	Stiffness Method - Beam Analysis	15.1-15.4		
WEEK 9					
16	10/18	Stiffness Method - 1D Axial Problems	14.1-14.2	HW9	HW8
17	10/20	Stiffness Method - Implementing for Truss Analysis	14.3-14.7		
WEEK 10					
18	10/25	Stiffness Method - Settlement, Misfit, Temperature	14.8	HW10	HW9
19	10/27	Stiffness Method - Frames (1)	16.1-16.3		
WEEK 11					
	11/1	Exam 2			
20	11/3	Stiffness Method - Frames (2)	16.4	HW11	Exam 2
WEEK 12					
21	11/8	Moment Distribution Method	12.1-12.3	HW12	
22	11/10	Moment Distribution Method Frames	12.4		
WEEK 13					
23	11/15	Moment Distribution Method - Frames with Sidesway	12.5		HW12
24	11/17	Influence Lines - Indeterminate Structures	10.10-10.11	HW13	
THANKSGIVING BREAK (11/21-11/26)					
WEEK 14					
25	11/29	TBD		HW14	HW13
26	12/1	TBD			
WEEK 15					
	12/5	Final Exam Week			

Exams:

There will be 2 midterm examination and one final examination. The midterm exams will be given during weeks 7 and 11 of the course. All exams are take home exams and you will be allowed to use any references to complete them. However, they are to be completed individually without assistance from any other person. The due date will be mentioned on the exam and within the assignment schedule.

Homework:

Homework will be assigned on a weekly basis. You may either submit the assignment to the CENG 4314/5314 folder in the CE office or upload the assignment as a single pdf file to Canvas. No late assignments will be accepted without prior approval from the instructor. The **final answer should be boxed in** at the end of the solution.

Project:

For those taking this course as CENG 5314 you will be required to complete a project to receive credit for the course. The project is posted to the canvas site.

Grades (CENG 4314):

Homework = 40%
 Professional Practice = 10%
 Midterm Exam 1 = 15%
 Midterm Exam 2 = 15%
 Final Exam = 20%

Grades (CENG 5314):

Homework = 30%
 Professional Practice = 10%
 Midterm Exam 1 = 15%
 Midterm Exam 2 = 15%
 Project = 10%
 Final Exam = 20%

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.

Final day to withdraw:

The final day to withdraw from the course without penalty is **November 4th**

Census dates:

The university requires that instructors to report the attendance to the register at various points in the semester. Therefore, on **September 2nd** I will be reporting attendance to the registrar's office.

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 SafeAssign™, available on Blackboard. 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.
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Department of Civil and Environmental Engineering

Assignment Schedule:

ASSIGNMENT SCHEDULE - SUBJECT TO REVISION			
CENG 4314.060/5314.060 Fall 2022 (ONLINE)			
Homework No.	Topic	Date Assigned	Assignment Due (by 4 pm)
1	Virtual Work and Castigliano's Theorem	August 23, 2022	August 30, 2022
2	Force Method - Beams	August 30, 2022	September 6, 2022
3	Force Method - Frames and Trusses	September 6, 2022	September 13, 2022
4	Approximate Analysis - Beams and Frames	September 13, 2022	September 20, 2022
5	Approximate Analysis Trusses	September 20, 2022	September 27, 2022
6	Slope Deflection Method - Beams and Sidesway Inhibited Frames	September 27, 2022	October 4, 2022
7	Slope Deflection Method - Sidesway Uninhibited Frames	October 6, 2022	NOT COLLECTED
8	Stiffness Method - Beams	October 11, 2022	October 18, 2022
9	Stiffness Method - 1D Axial and Planar Trusses	October 18, 2022	October 25, 2022
10	Stiffness Method - Trusses with Misfit, Temp Change and Settlement	October 25, 2022	November 1, 2022
11	Stiffness Method - Frames	November 3, 2022	NOT COLLECTED
12	Moment Distribution Method - Beams and Inhibited Frames	November 8, 2022	November 15, 2022
13	Moment Distribution Method - Uninhibited Frames, Influence Lines	November 17, 2022	November 29, 2022
14	TBD	November 29, 2022	NOT COLLECTED
Graduate Project		Date Assigned	Due Date (by 4 pm)
	Graduate Project	October 18, 2022	November 29, 2022
Exam	Content	Date Assigned	Due Date (by 4 pm)
Exam 1	Lessons 1-9, Homework 1-5	October 4, 2022	October 6, 2022
Exam 2	Lessons 10-18, Homework 6-10	November 1, 2022	November 3, 2022
Final Exam	Comprehensive but focuses on Lessons 19-26, HW 11-14	December 1, 2022	December 5, 2022