



The University of Texas at Tyler – CCEM Dpt.
CENG 4350/5350 Structural Dynamics
Spring 2025
As of January-13, 2025

Instructor:

Dr. Kostas Kalfas
RBS 1035
TBA
kkalfas@uttyler.edu

Office Hours:

Tu/Th: 12:00 – 3:00 pm
or by appointment

Lectures:

Tuesday/Thursday: 3:30 – 4:50 pm, RBN 3039

Course Website:

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

Classroom Procedure:

- If you will miss a scheduled class, **you are still responsible for the material.** You are encouraged to seek additional instruction! Simply arrange a mutually agreeable time to meet with me. Take advantage of the assistance! It's FREE and really will help!
- Bring study notes, textbook, note-taking material, and calculator to every class. You may not borrow or exchange calculators during graded exercises. If your calculator fails during a graded exercise, do not expect that I will furnish a substitute. **Class preparation is your individual responsibility.**
- You are not required to use colored pencils or a straight edge, but colors and straight lines can help with emphasis and clarity in your notes.
- Food and gum are not authorized in the classroom.
- Drinking is permitted in the classroom during class. All beverages, including plain water, must be contained in a container with a fully sealable lid.

Catalog Description:

Introduction to the concepts of Newtonian and Lagrangian mechanics. Dynamic responses of structures and behavior of structural components to dynamic loading and earthquakes. Response of single-degree-of-freedom systems when subjected to free and forced vibrations, periodic and arbitrary excitations and numerical techniques to assess their response. Multi-degree-of-freedom systems response (equations of motion, modal analysis and time-histories) and its applications to analysis of framed structures; introduction to systems with distributed mass (continuous beams) and flexibility.

The topics that you will study in CENG 4350/5350 are as challenging as any you have had here at UT Tyler. To master them, you must study your lessons diligently as the material builds from Lesson 1. You must **prepare for each class** by reading the assignment and coming to class with a general understanding of the material outlined in the lesson objectives (listed for each lesson in the Study Guide). Be sure to come to class ready to learn every day.

You will be given the opportunity to practice what you are learning on homework (HW) throughout the semester. Your understanding of course content will be assessed on one “celebration of knowledge” event (mid-term EXAM) and a term end exam (FINAL EXAM).

Learning Objectives:

To provide students with an understanding of dynamic analysis of structural elements and systems. Apply the knowledge and methodology to determine the seismic response of building.

1. **Derive** the equation(s) of motion and **explain** the relevant variables that govern the response of single- and multi-degree-of-freedom systems.
2. **Identify** and **describe** the fundamental dynamic parameters of a system and their influence on the dynamic response.
3. **Select** the most appropriate method and **solve** equation(s) of motion for a single- or multi-degree-of-freedom system subject to free, harmonic, periodic, or random (earthquake) vibrations.
4. **Identify** and qualitatively **describe** the impact of assumptions and limitations of various solution methods for the dynamic response of structures.
5. **Describe** the construction of response and design spectra for earthquakes; and, qualitatively **describe** the impact of relevant parameters on their shapes.

Master of Science in Civil Engineering (MSCE) program:

The CENG 5350 Structural Dynamics course fit within the Master of Science in Civil Engineering (MSCE) program. This is one of the basic core computational/analysis courses for graduate students within the Structural Engineering track.

Prerequisite:

CENG 3325: Structural Analysis; MATH 3203: Matrix Methods in Science and Engineering; MATH 3305: Ordinary Differential Equations; Knowledge of MATLAB or equivalent

Required Textbook and Other Related Material:

Chopra, Anil K. *Dynamics of Structures: Theory and Applications to Earthquake Engineering*. 5th Edition, 2017. Prentice-Hall, Inc., Upper Saddle River, NJ. ISBN 9780134555126.

Note about the Syllabus:

This syllabus is a statement of intent about how the course will be taught this semester. It outlines what we will cover, what you will need to do in the course, and it explains what and when you must do it to successfully complete the course and get a great final grade. This syllabus is intended to protect you from arbitrary or untimely changes in course requirements and due dates. But I reserve the right to make changes as necessary to the syllabus with announcement of changes. As we learned during 2020, there are many circumstances outside of our direct course control that may require changes to this syllabus in content and schedule. These will always be announced in advance and the syllabus will be updated on Canvas so all can be aware of the required changes.

Course Topics (Subject to Change):

SUBJECTS	No. of Hours
Introduction, Dynamics Concepts, Rigid Body Motion	3
SDOF: Free Vibration	3
SDOF: Periodic Excitation	4
SDOF: Arbitrary Excitations	4
SDOF Numerical Techniques	6
MDOF: Equations of Motion	4
MDOF: Modal Analysis and Time Histories	6
Distributed Systems	6
Earthquake Analysis	5
Mid-term Exams	1



Exams:

There will be 1 midterm examination and one final examination. The exams are **TENTATIVELY** scheduled for:

Exam 1: TBA

Final Exam: TBA

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. **ALL EXAMS WILL BE HELD IN PERSON DURING CLASS TIME; UNLESS OTHERWISE STATED BY THE INSTRUCTOR. THERE ARE NO EXCEPTIONS. SO YOU WILL NEED TO PLAN ON SHOWING UP TO CLASS DURING THOSE DATES.**

Homework:

Homework will be assigned on a regular basis (see schedule) and submitted as PDF's through Canvas. You can scan documents and make PDFs. Homework is due on the date outlined in the schedule. **You will need to upload your homework as a single pdf file to canvas no later than 11:59 pm on the date it is due.** No late homework will be accepted except for unusual circumstances. This course has a strict late policy — late homework will receive a ZERO (0). If any special circumstances arise that require an extension (illness, emergencies, trips, other responsibilities, personal issues, etc.), please ensure you coordinate with me at least 24 hours prior to the due date, and I will work with you on adjusting the due date as appropriate. Except for extremely rare circumstances, all uncoordinated late work will receive no course credit or a substantial cut. Talk to me prior to not turning in an assignment, I'll work with you, and rather you do an assignment late than not at all! Failure to follow the correct homework format will result in points deduction. Homework that is not submitted as complete and following the homework guidelines will receive a ZERO (0). **Homework must be submitted on an engineering paper.** Solutions should be presented in a clear, neat and methodical manner. Follow the "homework submission guidelines" when completing your assignment. Solutions which are not clearly presented will NOT receive full credit.

Homework Submission Guidelines:

1. Homework should be submitted using letter size (8 ½ x 11") paper. Engineering paper is required. Use the format shown in Enclosure 1 of this Syllabus as the standard for homework and sample calculation pages.
2. Cover Sheet. All submissions must have a signed cover page. For HW use the provided cover sheet. Before signing the cover sheet take time to reflect and ensure that all work is either yours or that credit is given where due. Homework **will not be accepted** without the signed cover page, no exceptions. For group work, all members of the group must sign the cover sheet. If a member of the group is not physically at UT Tyler, then they must sign the cover page as soon as possible upon returning. Engineers are ethical and give credit where credit is due, it's a good practice to start or continue now.
3. 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
4. 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.
5. Multiple sheets should be stapled at the top left corner of the page.

6. The submitted papers should be free of frail edges, stains, smudges and wrinkles.
7. 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.
8. All numbers and writing should be clear and readable.
9. 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! In that case, you may neatly tape or glue short computer printouts onto Engineer paper at the appropriate place in the logical flow of the problem
10. The **final answer should be boxed** and at the bottom of the problem.

Grades (for 4350):

Homework = 30%
 Midterm Exam = 30%
 Final Exam = 40%

Grade Scale:

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

Grades (for 5350):

Homework = 15%
 Midterm Exam = 30%
 Final Exam = 40%
 Term Paper = 15%

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 31st, 2025**.

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 report the attendance for the class.

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.

Information for Classrooms and Laboratories: It is important to take the necessary precautions to ensure a healthy and successful year. UT Tyler continues to urge you to protect yourselves against the flu, COVID and any new threats that may be developing. Be diligent about preventive measures such as washing hands, covering sneezes/coughs, social distancing and vaccinations, which have proven to be successful in slowing the spread of viruses. Encourage those who don't feel well to stay home, and if they show symptoms, ask them to get tested for the flu or COVID. Self-isolation is important to reduce exposure ([CDC quarantine/isolation guidelines](#)). Please work with your faculty members to maintain coursework and please consult [existing campus resources](#) for support.

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.

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 Canvas. UT Tyler Resources for Students
- [UT Tyler Writing Center](http://www.uttyler.edu/writingcenter) (903.565.5995), writingcenter@uttyler.edu
 - [UT Tyler Tutoring Center](http://www.uttyler.edu/tutoring) (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](http://www.uttyler.edu/counseling) (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: Kostas Kalfas, Ph.D.
Assistant Professor
Department of Civil Engineering

