

CEE6442-A: Dynamic Analysis in Geotechnical Engineering**MW 4:30pm – 5:45pm****Howey (Physics) S107****Instructor:**

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Office Hours:

Monday 11:00am - 1:00pm.

You are also welcome to stop by my office and talk with me about any aspect of the course outside the office hour, but setting up a meeting time via email with [CEE6442] in the subject line will give the highest probability of success.

Course Objectives:

- (1) Understand and be able to define basic terms.
- (2) Have conceptual understanding of the phenomena and mechanisms in soil dynamics, mainly because ‘everything in dynamics is relative’.
- (3) Be able to derive critical theories/governing equations (e.g., body wave, wave reflection/refraction, resonant column, etc.) using engineering ‘common sense’ (e.g., compatibility, force equilibrium, and mass conservation).
- (4) Be able to provide critical reviews on technical papers studying soil dynamics, lab & field testing, earthquake engineering, and soil behavior under THCM cycles.

Textbook:

- [T1] Kramer, S.L. (1996). *Geotechnical Earthquake Engineering*. Prentice Hall, Inc., Upper Saddle River, New Jersey, 653 pp. (\$27.90 Paperback)
- [T2] Santamarina and Fratta (2006). *Discrete signals and inverse problems: An introduction for engineers and scientists*. Online link: <http://onlinelibrary.wiley.com/book/10.1002/0470021896>

Note: Copies of required/recommended references for this course will be distributed during the term. Additional reference books include:

- Das, B., & Ramana, G. V. (2010). *Principles of soil dynamics*. Cengage Learning.
- Verruijt, A. (2010). *An introduction to soil dynamics (Vol. 24)*. Springer Science & Business Media.

Grading:

Exam I	Wednesday, February 5, 2020	15%
Exam II	Wednesday, March 11, 2020	15%
Final Exam	Friday, April 24 2:40 PM - 5:30 PM	20%
Homework	(see class schedule for details)	50%

Academic Honor Code:

This course will be conducted under the guidelines of the Georgia Tech Academic Honor Code. Please refer to <http://www.honor.gatech.edu> for further questions involving the Academic Honor Code. In particular, cheating of any kind is unethical and unacceptable; quote and attribute any words/ideas that are not your own; wireless communication systems of all kinds must be turned off while in the classroom.

Attendance

Attendance at all lectures is mandatory. In accordance with the Institute requirement, verification of participation of the class will be reported to the Registrar's Office and the Office of Scholarships and Financial Aid.

Homework

- In total 7 homework (HW) throughout the semester. HW is due at 6:00pm on the due date.
- HW can be turned in during class or at my office (Mason 2251). Grades for HW turned in after that time will be reduced by 10 per day late, including weekends and holidays.
- HW must be submitted in **hard copy**. **Do not submit HW by email. Do not submit pictures of HW assignments.**
- You are allowed (and encouraged) to work in study groups on HW, but each completed assignment should be your own work.
- It is **NEVER** acceptable for different students to turn in copies of the same printout. Please list any people with whom you studied on your assignment.

The following formats are **REQUIRED** for all homework assignments.

1. Turned-in HW must be neat, legible, and organized.
2. Be certain to place your name, the HW number, and the date.
3. All graphs must be computer generated. Hand drawn graphs will not be graded.
4. Experimental data should be plotted as discrete points, while theoretical relationships should be shown as continuous lines.
5. Show all units. Be certain to track units throughout the assignment and include them in the final answer.
6. Clearly state any assumptions (such as an assumed unit weight or density) you have made in solving the problems.

Laboratory session

There will be one lab assignment, related to laboratory p-/s-wave measurement and signal analysis. While you will conduct the experiments in a group, you need to submit your own copy of the lab report.

Office of Disability Services

The Georgia Institute of Technology has policies regarding disability accommodation, which are administered through The Office of Disability Services: <http://disabilityservices.gatech.edu>. For students with disabilities, please contact this Office to request classroom accommodations.

Class Schedule

Week	Day	Class	Date	Topic	Reading	Assigned	Due
1	M	1	6-Jan	Introduction			
	W	2	8-Jan	Wave propagation	T1: 5.1-5.2	HW#1	
2	M	3	13-Jan	Waves in semi-infinite	T1: 5.3		
	W	4	15-Jan	Waves in layered body	T1: 5.4		
3	M	--	20-Jan	MLK Day			
	W	5	22-Jan	Waves at interface	T1: 5.4	HW#2	HW#1
4	M	6	27-Jan	Waves in soils	T1: 5.5		
	W	7	29-Jan	Dynamic soil properties	T1: 6.4	HW#3	HW#2
5	M	8	3-Feb	Shear modulus and damping	T1: 6.4		
	W	9	5-Feb	Exam I			
6	M	10	10-Feb	Lab testing I - Bender element	T1: 6.3.2; Extra mat	HW#4	HW#3
	W	11	12-Feb	Lab testing II - Res. col.	T1: 6.3.2		
7	M	12	17-Feb	Lab testing III - Cyclic	T1: 6.3.2		
	W	13	19-Feb	Lab demo (Mason 2131)			
8	M	14	24-Feb	Lab session			
	W	15	26-Feb	Lab session			
9	M	16	2-Mar	Field testing I - Invasive	T1: 6.3.1	HW#5	
	W	17	4-Mar	Field testing II - Non-invasive	T1: 5.3.1		
10	M	18	9-Mar	Signals and systems	T2: 3.1-3.7	HW#6	
	W	19	11-Mar	Exam II			
11	M	--	16-Mar	Spring Break			
	W	--	18-Mar	Spring Break			
12	M	20	23-Mar	Cross-correlation	T2: 4.1-4.2		HW#5
	W	21	25-Mar	Convolution	T2: 4.3-4.6		
13	M	22	30-Mar	Frequency domain analysis I	T2: 5.1-5.10	HW#7	HW#6
	W	23	1-Apr	Frequency domain analysis II	T2: 5.1-5.10		HW#4
14	M	24	6-Apr	Lab session			
	W	25	8-Apr	Discrete inverse problem	T2: 8.1-8.9		
15	M	26	13-Apr	Matrix inversion	T2: 9.1-9.11		
	W	27	15-Apr	Matrix inversion	T2: 9.1-9.11		
16	M	28	20-Apr	Induced seismicity	Extra mat.		HW#7
	W	--	22-Apr	Reading Period			
	F	29	24-Apr	Final Exam: 2:40 PM – 5:30 PM			