



## CIVE 555 – Dynamics of Structures and Earthquake Engineering

Term – Fall 2020 (202009)

We acknowledge with respect the Lekwungen peoples on whose traditional territory the university stands and the Songhees, Esquimalt and WSÁNEĆ peoples whose historical relationships with the land continue to this day.

**Instructor name:** Dr. Lina Zhou

Phone: Please use email

E-mail: linazhou@uvic.ca

Office: ECS302

**Office Hours**

Days: TBA

Time:

Location:

**List all prerequisites and co-requisites:** Calculus, Matrix Algebra and Structural Analysis

### Course Objectives

This course will cover the basic theory of structural dynamics and application in earthquake engineering: listing equations of motion for both single-degree of freedom and multi-degree of freedom systems; analysis of single-degree of freedom systems with and without viscous damping under free vibration, unit impulse and arbitrary excitations; numerical evaluation of dynamic response; analysis linear single-degree of freedom systems under earthquake load; analysis multi-degree of freedom systems under free vibration and earthquake excitations.

### Learning Outcomes

At the end of this course, students will be able to:

List equations of motion for single-degree of freedom systems.

Solve equations of motion for single-degree of freedom systems under free vibration.

Solve equations of motion for single-degree of freedom systems under arbitrary earthquake excitations by numerical methods.

Analysis of linear systems under earthquake excitations.

List equations of motion for multi-degree of freedom systems.

Analysis of multi-degree of freedom systems under free vibration and earthquake excitations.

### Syllabus

Module	Topics	Date/Week
1	<b>I. Single Degree of Freedom Systems</b>	09.15
	Chapter 1. Equations of Motion, Problem Statement, and Solution Methods	
2	Chapter 2. Free Vibration	09.22
3	Chapter 4. Response to Arbitrary, Step, and Pulse Excitations	09.29
4	Chapter 5. Numerical Evaluation of Dynamic Response	10.06
5	Chapter 6. Earthquake Response of Linear Systems	10.13
6		10.20

7	<b>II. Multi Degree of Freedom Systems</b> Chapter 9. Equations of Motion, Problem Statement, and Solution Methods	10.27
8	Chapter 10. Free Vibration	11.03
9	Reading break	11.10
10	Chapter 12. Dynamic Analysis and Response of Linear Systems	11.17
11	Chapter 13. Earthquake Analysis of Linear Systems	11.24
12		12.01

A-Section(s): A01/CRN 10608

Days: Tuesday

Time: 9:30 am – 11:20 am

Location: Zoom link will be provided through Brightspace.

### Required Text

Title: Dynamics of Structures:  
Theory and Applications to Earthquake Engineering  
5th Edition  
Author: Anil K. Chopra  
Publisher: Pearson Prentice Hall,  
Year: 2017

### Optional text

Title:  
  
Author:  
Publisher:  
Year:

### Assessments

Assignments 25%  
Mid-term 25%  
Final Project 50%

Due Dates: See assignment schedule  
Date: TBA

Seven assignments will be distributed over the course of the term. Two of them will be randomly selected for marking and they weight 5 points/assignment. The others weight 3 points/assignment. Assignments must be completed individually and submitted online before due. Assignments must be completed in Microsoft Word.

Assignment #	Modules	Start	Due (9:30 am)
1	Chapter 1. Equations of Motion, Problem Statement, and Solution Methods (reselect)	09.15	09.22
2	Chapter 2. Free Vibration	09.22	09.29
3	Chapter 4. Response to Arbitrary, Step, and Pulse Excitations	09.29	10.06
4	Chapter 5. Numerical Evaluation of Dynamic Response	10.06	10.13
5	Chapter 6. Earthquake Response of Linear Systems	10.20	10.27
6	Chapter 9. Equations of Motion, Problem Statement, and Solution Methods	10.27	11.03
7	Chapter 10. Free Vibration	11.03	11.10

## Projects:

Project reports must be completed with Microsoft Word and submitted online before due. The content is to include texts, images, plots and tables as needed to communicate the findings of the study. Scanned handwriting of texts is not accepted.

## NOTE:

Late assignments and project reports will receive a mark of zero.

**Course Withdrawal Deadlines:** <https://www.uvic.ca/calendar/dates/index.php>

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Graduate Calendar.

**There will be no supplemental examination for this course.**

**Grading:** Please see the Grading information in the current calendar at:

<https://www.uvic.ca/calendar/future/grad/index.php#/policies>

## Course policies and guidelines

**Late Assignments:** *No late assignments will be accepted unless prior arrangements have been made with the instructor at least 48 hours before the assignment due date.*

**Coursework Mark Appeals:** *All marks must be appealed within 7 days of the mark being posted.*

**Attendance:** We expect students attend all lectures and labs. It is entirely the students' responsibility to recover any information or announcements presented in lectures from which they were absent.

**Electronic devices in labs and lectures:** No unauthorized *audio* or *video* recording of lectures is permitted.

**Electronic devices in midterms and exams:** Calculators are only permitted for examinations and tests if explicitly authorized and the type of calculator permitted may be restricted. No other electronic devices (e.g. cell phones, pagers, PDA, etc.) may be used during examinations or tests *unless explicitly authorized*.

**Plagiarism:** Submitted work may be checked using plagiarism detection software. Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the link given below for the UVic policy on academic integrity. Note that the university policy includes the statement that "*A largely or fully plagiarized assignment should result in a grade of F for the course.*"

**Academic Integrity:** You must make yourself aware of the University of Victoria guidelines and policy concerning fraud and academic integrity at this link, <https://www.uvic.ca/current-students/home/academics/academic-integrity/index.php>

**Policy on Academic Integrity:** <https://www.uvic.ca/calendar/future/grad/index.php#/policies>

**Standards of Professional Behaviour:** You are advised to read the Faculty of Engineering Document Standards for Professional Behaviour in current Graduate Calendar, which contains important information regarding conduct in courses, labs, and in the general use of facilities. Please find the document at this link: <https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf>

## Notes to Students:

Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Secretary to set up an appointment.

**University of Victoria Privacy Policy:** If any student has concerns about their private information being stored or accessed outside of Canada, they are required to inform the course instructor about their concerns before the end of second week of classes.

**Accommodation of Religious Observance:** See entry in current Graduate Calendar.

**Equality:** This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning located in the Campus Services Building, <https://www.uvic.ca/services/cal/>.

The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.

**Sexualized Violence Prevention and Response at UVic:** UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting [www.uvic.ca/svp](http://www.uvic.ca/svp). If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

**Where:** Sexualized violence resource office in EQHR; Sedgewick C119

**Phone:** 250.721.8021

**Email:** [svpcoordinator@uvic.ca](mailto:svpcoordinator@uvic.ca)

**Web:** [www.uvic.ca/svp](http://www.uvic.ca/svp)

**Policy on Inclusivity and Diversity:** See the entry in the current Graduate Calendar.

### Course Lecture Notes

Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

### Syllabus statement

A note to remind you to take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone.

**Counselling Services** - *Counselling Services can help you make the most of your university experience. They offer free professional, confidential, inclusive support to currently registered UVic students.*

<https://www.uvic.ca/services/counselling/>

**Health Services** - *University Health Services (UHS) provides a full service primary health clinic for students, and coordinates healthy student and campus initiatives.* <http://www.uvic.ca/services/health/>

**Centre for Accessible Learning** - *The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations <https://www.uvic.ca/services/cal/>. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.*

**Elders' Voices** - *The Office of Indigenous Academic and Community Engagement (IACE) has the privilege of assembling a group of Elders from local communities to guide students, staff, faculty and administration in Indigenous ways of knowing and being.*

<https://www.uvic.ca/services/indigenous/students/programming/elders/index.php>

The [Office of the Ombudsperson](#) is an independent and impartial resource to assist with the fair resolution of student issues. A confidential consultation can help you understand your rights and responsibilities. The Ombudsperson can also clarify information, help navigate procedures, assist with problem-solving, facilitate communication, provide feedback on an appeal, investigate and make recommendations.

Phone: 250-721-8357; Email: [ombuddy@uvic.ca](mailto:ombuddy@uvic.ca); Web: [uvicombudsperson.ca](http://uvicombudsperson.ca).