

0.Course Information

MECH 463: Mechanical Vibrations

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Suggested Readings:

1. Course Information Document (Blue Sheet)
2. This course is on CONNECT.

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Course Objectives

- i. **Develop** lumped parameter models of mechanical systems.
- ii. **Formulate** equations of motion using free-body-diagrams and energy methods
- iii. **Solve** for vibration response.
- iv. **Design** counter-vibration measures: absorbers, isolators, and system modification.
- v. **Understand** working principles of vibration measurement devices.
- vi. **Apply** computational tools (MATLAB and MSC-ADAMS) in vibration analysis and design.

Prerequisites: MECH 221, MECH 260; a sound working knowledge in kinematics, solid mechanics, differential equations, complex numbers, and matrix algebra is essential for this course.

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Course Content

Read the sections indicated below from the course text book—
MECHANICAL VIBRATIONS BY S.S. RAO (5TH OR 4TH EDITION)—
before each lecture.

No	Topic	Read	Do	Objectives
1	Introduction to Vibrations	1.1–1.6	A1	i
2	Single-Degree-of-Freedom Systems			
2.1	Formulation of Equations of Motion	2.1; 2.2.1; 2.2.3;	A2	ii
2.2	Equivalent Systems	1.7; 1.8	A2	ii
2.3	Undamped SDOF response	1.10; 2.2; 3.3	A3	iii
2.4	Viscously Damped SDOF response	2.6;3.4	A3	iii
2.5	Vibration Isolation	9.10	A4	iv
2.6	Forced Vibration: General Excitation	4.2–4.5	A5	iii
3	Vibration Measuring Instruments	10.4; 10.5		v
4	Spectral Analysis	Class Notes	A6	v
4.1	Introduction to Fourier Series & Fourier Transform			
4.2	MATLAB Implementation			
4.3	Frequency Response Functions and Coupled Systems			ii
5	Multi-Degree-of-Freedom Systems			
5.1	Formulation of Matrix Equations of Motion; Coupling and Principal Co-Ordinates	5.1–5.6 6.1–6.8		i–ii
5.2	Eigenvalue Problems & Orthogonality Conditions	6.9–6.10		iii
5.3	Free and Forced Vibration Response	6.13–6.15		iii
5.4	Vibration Absorbers	9.11	A7	iv
6*	Continuous Systems			ii–iii
6.1	String Vibrations; Normal Modes and Orthogonality	8.1–8.2	A8	

Course objective vi. will be met in ADAMS sessions to be scheduled
in PACE lab. e-signup on CONNECT.

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Grading Scheme & Course Delivery

Component	Weightage
Homework	5%
Tutorials	5%
ADAMS	5%
3 'Midterm' exams	15%
Laboratory Report	10%
Final	60%

You must secure at least 50% overall and at least 50% in the final to pass. If you score below 50% in the final exam, your final exam mark will be your course mark.

Lectures will use slides based on course notes package. Reading slides on their own is not a substitute for reading the course notes package and the text book sections referred to therein.

The inked slides will not be posted on CONNECT.

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TA Information

Name	Office hours	Contact
Masih Hanif (Lab)	TBA	masih.hanif@gmail.com, ph: 604-822-3147
Banda Logawa (Tutorials)	CIRS 2160, 1-4pm (M) & 3:30-5pm (Tue).	logawa_b@yahoo.com, ph: 778-989-4777.
Louis Moskven (Tutorials)	CEME 1054, TBA	lmoskven@gmail.com, ph: 604-822-2817
Manav (Lab)	CEME 1054, TBA	manav.iitk@hotmail.com, ph: 604-822-2817
Ahmad Panah (ADAMS)	8am-6pm (M-F)	ahmadpa20@gmail.com, ph: 604-222-5613,
Reza Zanganeh (Tutorials)	ICICS X227, 4pm-7pm (M-F).	r.zangeneh87@gmail.com, ph: 778-708-1717.

Each tutorial group will be assigned a TA. Know your group's TA and they will be your first contact for all your course related matters.

The lab TAs are Masih & Manav who will conduct and grade lab reports.

Course Information

1. **Course Load:** THIS IS A 4 CREDIT COURSE AND THE COURSE LOAD IS HEAVIER compared to a normal 3 credit course. It integrates concepts from Dynamics & Solid Mechanics. Students find this material challenging and rewarding. **A 3-5 hours of study per week spent on this course outside the lectures, labs, and tutorials will keep you up to speed.** Please do not leave things to the last moment.
2. **Tutorial attendance is compulsory.** Tutorial problems are posted every Friday on CONNECT. We will solve these problems together, **in groups**, on the following Wednesday and Friday in the tutorials. **Please sign up via CONNECT in groups of 3.** Your group will solve the tutorial problems and submit the solution to the TA allocated for marking and feedback.
3. **Assignments:** Regular assignments will be posted on CONNECT. Solve assignment problems on your own to determine your understanding of the lecture material. Solutions will be posted on CONNECT, approximately a week after the assignments are issued.

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4. **Homework:** One home-work problem per week will be posted on every Wednesday; your hand-written answers should be submitted before 3pm on the following Wednesday in CEME 1054. **Late submissions are not allowed under any circumstances.** Solving homework and assignment problems will help you prepare for the midterm and final examinations. **Marked homework can be picked up from CEME 1054, approximately a week after you submit them.**
5. **Labs:** Please come prepared: read the handout carefully and complete the pre-lab exercise. *You will be given a short quiz in the lab, the mark of which will count toward the pre-lab.* The report should be submitted within two weeks (including holidays, weekends) in the tutorial. **Late submissions will incur mark deduction (~ 2%).** Grading scheme for the lab reports is posted on CONNECT along with the lab handout. *Follow the report guidelines in the handout and ensure that your report addresses all points in the grading scheme.*
6. **ADAMS:** Tutorials on using ADAMS will be conducted in the PACE LAB in ICICS Building. Please sign up for these sessions on CONNECT.

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7. **‘Midterm’ exams:** Three exams will be held in the lecture times on the dates announced (see page 1). **These dates are final and non-negotiable.** The exams are closed-book ; **your hand-written formula sheet (letter paper, both sides)** is allowed. The exam is of 45 minutes duration and will comprise one question (20 marks) with parts.
8. **Office hours: Open doors policy.** Please email to arrange individual appointments. I am here to help you learn. Let me know if you face any difficulties. Make most of the learning opportunities given to you and enjoy what you study.

Things that you can do to succeed in this course ...

Tips to Excel in MECH463

1. **Be proactive** by thinking through all aspects of a concept or question.
2. **Read** the suggested topics from the text book before each lecture.
3. **Read the course notes package. The slides are based on course notes package.**
4. **Attend** all Tutorials and Lectures.
5. **Discuss** your questions with friends, TAs and me.
6. **Remember** that learning is an active process and making mistakes is a part of it. Make most of the learning opportunities and facilities provided to you.

Questions?

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