

MME 3325a – Mechanical Vibrations

COURSE OUTLINE – 2026-2027

**CALENDAR
DESCRIPTION:**

Free and forced vibration of single-degree-of-freedom systems; viscous and coulomb damping; vibration isolation and vibration measuring instruments; modelling of multi-degree-of-freedom systems via Newton's second law; modal analysis and modal summation method for response predictions of multi-degree-of-freedom systems; tuned mass vibration absorber; introduction to vibration of continuous systems; introduction to spectrum analysis for machinery diagnostics.

**COURSE
INFORMATION:**

Instructor: Haojie Mao, Ph.D.

TEB 365

Email: hmao8@uwo.ca

Lectures/tutorials/labs: See [Draft My Schedule](#)

PREREQUISITES:

NMM2270a and MME 2213b

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

ANTIREQUISITES: None

**ACCREDITATION
UNITS:**

Engineering Science = 85%, Engineering Design = 15%

TOPICS:

- Free/forced vibration of single-degree-of-freedom systems
- Viscous and Coulomb damping
- Harmonic excitation and transient vibration
- Vibration measurement device and design
- Motion equations and response prediction for multiple-degree-of-freedom systems and continuous systems
- Design for vibration suppression
- Spectrum analysis for vibration

**LEARNING
OUTCOMES:**

Upon successful completion of this course, students will be able to:

- Describe a dynamic system by establishing mathematical models, deriving and solving governing equations, and interpreting results. (KB2, KB3, **PA1**, ET2)
- Conduct vibration analysis for a variety of discrete and continuous systems induced by various inputs (harmonic excitation, impulse excitation, base excitation, unbalance rotation) both analytically and numerically. (**PA1**, ET2)
- Make design recommendation for vibration suppression of mechanical systems to improve performance via vibration isolators and vibration absorbers. (KB4, **PA1**, IESE1, DE3, DE4)
- Conduct vibration measurements and perform spectrum analysis. (**PA1**, ET2)

The terms in parentheses following each learning outcome refer to Graduate Attributes (GAs) established by the Canadian Engineering Accreditation Board (CEAB) of Engineers Canada. These attributes are used in the accreditation process to ensure that accredited engineering programs are providing the academic requirements for licensure as a professional engineer in Canada. Information on Graduate Attributes and Indicators can be found at [GA Indicators](#). The table below indicates which specific attributes are measured in this course and the level at which it is measured, wherein I=Introduced, D=Developed and A=Advanced/Applied

CEAB Graduate Attribute Learning Levels for this course:

Knowledge Base		Engineering Tools	D	Impact on Society	I
Problem Analysis	D	Individual & Teamwork		Ethics and Equity	
Investigation		Communication		Economics & Project Mgmt.	
Design		Professionalism		Life-Long Learning	

CONTACT HOURS:

3 lecture hours, 2 tutorial hours, 0.5 laboratory hour, half course

Laboratory: 3 lab sessions, 3 hours/session, with a total of 9 hours per semester

TEXTBOOK:

“Engineering Vibrations” by D. J. Inman, 5th Edition, PEARSON. ISBN 978- 0-13-680985-2. Available from publisher <https://www.pearson.com/en-us/subject-catalog/p/engineering-vibration/P200000003490/9780136809852>

4th Edition is also acceptable. Available from Amazon.ca

<https://www.amazon.ca/Engineering-Vibrations-4th-Daniel-Inman/dp/B014U7CJP2>

REFERENCES:

“Fundamentals of Mechanical Vibration” by S. Graham Kelly, McGraw-Hill.

https://www.amazon.ca/Fundamentals-of-Mechanical-Vibrations/dp/0071125205/ref=tmm_pap_swatch_0?_encoding=UTF8&sr=1-1

“Mechanical Vibrations” by S. S. Rao, Addison Wesley, SI Edition, Prentice Hall.

https://www.amazon.ca/Mechanical-Vibrations-Units-Singiresu-Rao/dp/1292178604/ref=tmm_pap_swatch_0?_encoding=UTF8&sr=1-1

“Shock and Vibration Handbook” by C. M. Harris, McGraw-Hill, 5th Edition.

https://www.amazon.ca/Harris-Shock-Vibration-Handbook-Cyril/dp/0071370811/ref=sr_1_2?sr=8-2

UNITS:

SI will be used; however, English units may be introduced through examples as

required.

TUTORIALS:

Students are expected to attempt to answer relevant questions from the text and discuss in the tutorial periods. The teaching assistant will present numerical solutions for some examples.

EXAMINATIONS

Two 1-hour closed book quizzes

One 2-hour closed book midterm exam

3-hour closed book final exam

EVALUATION:

The final grade is computed as follows:

Evaluation Format	Weight	Due	CEAB GAs Assessed
Assignments	9%	A#1 Week 4, A#2 Week6, A#3 Week 10, A#4 Week 12, A#5 Week 13	ET2
Quizzes	12%	Quiz 1 Oct. 9, 2026 (Week 5), Quiz 2 Nov. 27, 2026 (Week 11)	
Midterm exam	20%	Oct. 30, 2026 (Week 7)	
Hands-on Laboratory – three group laboratory sessions	9%	Report due one week after conducting lab	
Final Examination	50%	Dec. 11-22, 2026, TBD	IES1, PA1

COURSE POLICIES:**Assignments**

- Late submission of assignment will translate into a zero mark for that assignment.
- Assignments are due on Friday at noon as specified by each posted assignment, but you can submit as late as the following Monday at noon without penalty.
- Since flexibility in the submission deadline has been provided, any request for academic consideration for assignments will be denied.

Laboratory sessions

- Students who arrive 15 min after the scheduled lab time will receive a grade with 50% deduction of the mark received for that lab session;
- Missing a lab without academic consideration will result in a zero mark for that lab;
- Late submission of lab report will receive a grade with 50% deduction of the mark received for that lab session;
- Students who miss a lab with academic consideration are required to reschedule the lab by contacting the course instructor no later than 2 days after that lab. Failure to do so will result in a zero mark for that lab.

Quizzes and Midterm exam

- No make-up options for quizzes and midterm exam will be offered regardless of the circumstances for which the quiz or midterm exam was missed;
- Missing a quiz without academic consideration will result in a zero mark for that quiz or midterm exam;
- Missing a quiz with academic consideration will automatically shift the weight of the missed quiz into the midterm exam;
- Missing the midterm exam will result in a zero mark for the midterm exam;
- Missing the midterm exam with academic consideration (**designated assessment**, therefore students are required to provide formal supporting documentation) will automatically shift the weight of the midterm exam into the final exam;
- Quizzes and examinations will be CLOSED BOOK* with only non-programmable calculators permitted.

Final exam

- If a minimum of 50% is not obtained on the final examination, the student cannot receive a final mark greater than 48% for the course;
- Examination will be CLOSED BOOK* with only non-programmable calculators permitted.

***CLOSED BOOK exam procedures**

For all closed-book examinations, only the following items are permitted on the desk or work surface: approved calculators, instructor-provided formula sheets, provided or authorized scratch paper, and pens/pencils. All other materials and electronic devices, including phones, smart watches, tablets, earbuds/headphones, and other communication or recording devices, must be stored away and may not be accessed during the examination.

To support a fair and consistent examination environment, proctors may ask any student, including students selected at random, to briefly show or turn over permitted materials such as scratch paper or formula sheets for inspection. Students are expected to comply with reasonable instructions from examination proctors.

Unauthorized possession or use of materials or electronic devices, photographing or recording examination materials, or failure to comply with examination procedures may result in the examination being terminated and the matter being referred for review in accordance with Western University's applicable academic integrity and scholastic offence policies.

General Faculty / University Policies

The Faculty of Engineering and Western University have overarching policies that prescribe how undergraduate courses should run. The course-specific policies described above should be considered in addition to those overarching policies, or as course-specific interpretations of them. In the event of contradictions or confusion between course-specific policies above and general Faculty / University policies, please contact your course instructor for clarification.

Western Engineering's undergraduate policies can be found by navigating to:

<https://www.eng.uwo.ca/undergraduate/academic-support-and-accommodations/policies.html>

and then clicking the “Engineering Undergraduate Policies framework” link.

The policy covers:

- Absence/Late Accommodation Policy
- Religious Accommodation
- Academic Integrity
- Academic Offences
- Faculty of Engineering AI Policy
- Accessibility
- Inclusivity, Diversity, and Respect
- Health and Well-being
- Gender-Based and Sexual Violence