ME 143
Mechanical Vibrations

Sem/AY:	2nd Sem 1617	**Instructor:**	Job Immanuel Encarnacion
Time:	TTh 830-1100 AM	**Office:**	ME Faculty Room
Room:	E-Lab	**Phone:**	09479902457
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Consultation Hours: Wednesday and Friday, 1300-1500, Monday and Friday by appointment

Course Description: This course explores the realm of vibrations as brought upon by concepts in engineering dynamics. Vibration is a hauntingly beautiful thing because we are all subject to it in our everyday life. Hence, we study it to better understand our surroundings and life in general. This course aims to:

- Introduce students to the manifestation and application of vibration in everyday life.
- Provide the mathematical fundamentals of vibrations systems in order to determine complete solutions and subsequent vibrational characteristics.
- Further the student's perspective in the design of structures and machinery in the context of everyday and catastrophic vibration.
- Develop the student's analytical and practical skills through assignments, quizzes, papers, and projects.
- Introduce students to vibration testing; its applications, and importance.

Student Outcomes: After this course, the students should be able to:

- Define and explain the fundamental concepts of vibration analysis.
- Identify and describe vibrational systems, sources of vibrations, and solutions used to counter unwanted vibrations.
- Analyze dynamic systems through physical and mathematical modeling.
- Establish the importance of vibration analysis in engineering.
- Incorporate the concepts learned in vibration analysis in engineering design.
- Love the field of mechanical engineering (and vibrations).

References

- **EV**: *Engineering Vibrations, 4th Edition*, Daniel Inman (2014) [Available in Library (Old Version)]
- **NVA**: *Noise and Vibration Analysis: Signal Analysis and Experimental Procedures*, Anders Brandt (2011) [Available in the Library]
- **MV**: *Mechanical Vibrations: Theory and Application*, S. Graham Kelly (2012) [Available in the Library]
- **VCM**: *Vibration-based Condition Monitoring*, Robert Randall (2011) [Available in the Library]
- **AA**: *Mechanical Vibrations, 5th Edition*, Singiresu Rao (2011) [Additional Text]

Grade Equivalents

Final Grade	Equivalent Grade	Final Grade	Equivalent Grade
92 - 100	1.00	68 - below 72	2.50
88 - below 92	1.25	64 - below 68	2.75
84 - below 88	1.50	60 - below 64	3.00
80 - below 84	1.75	55 - below 60	4.00
76 - below 80	2.00	0 - below 55	5.00
72 - below 76	2.25		

Course Outline

Week	Topic/Activity	Reference
0	Course Introduction	
	Overview of the study of vibrations	**NVA 1.1-1.4**, AA 1.1-1.3
Introduction to Mechanical Vibrations		
1	Mathematical Modeling of Signals	**NVA 2.1-2.4, 2.7**, MV 1.2-1.7
	Mathematical Models of Vibrational Elements	**MV 2.1-2.3, 2.5-2.8**, EV 1.1, AA 1.4
Analysis and Modeling of Vibrational Systems		
2	Introduction to Mathematical Modeling of Vibrations	**EV 1.1-1.4**, MV 2.9-2.10, 2.13
	SDOF Systems: Free and Damped Vibrations	**MV 3.1-3.6**
3	SDOF Systems: Forced Vibrations	**EV 2.1-2.3**, MV 4.1-4.3
4	MDOF Systems: Free and Damped Vibrations	**MV 6.1-6.2, 6.4-6.5, 8.1-8.3, 8.4**, EV 4.1
5	Natural Frequencies and Resonance	**EV 4.2-4.3**
	MDOF Systems: Forced Vibrations	**MV 9.1-9.5**, EV 4.4-4.6
	Midterm Exams	
6	System Identification for Project	
7	Consultation for Project	
8	Consultation for Project	
9	Vibrations in Rotating Machinery Eccentric Loadings	**EV 2.4-2.5**, MV 4.4-4.5
Introduction to Vibrational Control		
10	An appreciative course in vibrational control	*Your experience and imagination*
11	Project Proposal	
12	*Holy Week*	
Analysis and Modeling of Vibrational Control		
13	Vibration Measurement	**VCM 1.4-1.6, EV 7.1-7.3**
14	Mathematical models of Vibrational Control	**EV 5.1-5.4, 5.6-5.7**, MV 4.6-4.9
	Finals	
***Advanced* Topics in Vibrations**		
	This is an option	To be determined by the middle of the semester
	Project Presentation	

Course Evaulation

- **Long Exams** **40%**

  Exams are 20% each. Exams are not departmental for the current semester. Open books, open notes but the usage of electronic devices are prohibited.

- **Assignments** **30%**

  There will be an assignment given each week plus one special assignment on any of the topics. Submission of assignments will be online unless otherwise stated. The deadline for each assignment is on Monday the following week, 11:59PM GMT+8.

- **Project** **30%**

  The project is designed for students to enjoy the applications of the concepts learned in class. The students are encouraged to explore topics that are close to their hearts.