

ME1020 – MECHANICAL VIBRATIONS**2023-2024 Spring**

(Modifications to this syllabus may be required during the semester. Any changes to the syllabus will be posted on the course website and announced in class)

Catalog Description and Objective

Vibrations in engineering systems are associated with noise and rapid wear of machine parts. The course introduces the foundations of vibration theory and its applications to the analysis and design of mechanical systems. Computer tools will be utilized by students to develop programs for the vibration analysis. (3 credit hours).

Prerequisites:

- MATH 290 Differential Equation or equivalent
- ME 1014 Dynamic systems or equivalents

Schedule

Lecture, Room 4-201, Monday 08:15 – 11:00

Instructor

S.C. Fok (Email: saicheong.fok@scupi.cn)

Office: Room 222 (Zone 4); or Room 505 (SCUPI new building).

Office Hours

Monday 12:00 – 13:00 Tuesday 12:00 – 17:00

For consultation outside office hours, please send an email to make an appointment.

Textbook

Engineering Vibration 4th Edition, D.J. Inman, Pearson Higher Ed., ISBN–9780273768449

Additional references and supplementary materials will be posted on Blackboard.

Course Objectives

The course objectives are:

- Introduce students to the modeling and analysis of vibrations in mechanical systems.
- Acquaint students with the common methods of suppressing vibrations in mechanical systems..
- Develop the students' skills in the utilization of computer tools to investigate the vibrations in mechanical systems.

Learning Outcomes

After the successful completion of this course students should be able to:

- Model mechanical systems for vibration analysis.
- Evaluate the free and forced responses of single and multiple degree of freedom systems.
- Develop solutions to suppress the vibrations.
- Utilize computer tools to analyze mechanical vibrations.

Grading Policy

Grade will be based on overall performance in all assessment items as follows (note: the assessment items and percentages may be subjected to change):

| ACTIVITIES | PERCENTAGES |
|-------------------------------------|-------------|
| Quizzes, labs, project, assignments | 30% |
| Midterms | 40% |
| Final | 30% |

Submission requirements (including due dates) for all assessments will be announced to students in class or on Blackboard. Letter grades are based on SCUPI standard policy.

Tentative Course Schedule (changes will be announced):

| Week | Text | Topic |
|------|--------------|---|
| 1 | Chap. 1 | Introduction and revision of fundamentals |
| 2 | Chap. 1 | Revision of modelling |
| 3 | Chap. 1 | 1 DOF system free vibration |
| 4 | Chap. 2 | 1 DOF harmonic excitation |
| 5 | Chap. 3, & 4 | General force response |
| 6 | | Midterm |
| 7 | Chap. 2 | Base excitation |
| 8 | Chap. 2 | Rotating imbalance |
| 9 | Chap. 5 | Balancing rotating machines |
| 10 | Chap. 5 | Vibration isolation |
| 11 | | Midterm |
| 12 | Chap. 4 | 2 DOF undamped free vibration |
| 13 | Chap. 5 | 2 DOF undamped vibration absorber |
| 14 | Chaps. 3, 7 | Modal analysis |
| 15 | Chaps. 3, 7 | Applications |
| 16 | | Public Holiday |
| 17 | | Revision |

The course will cover the analysis and suppression of mechanical vibration through guided learning, discussion, formative exercises, quizzes, class assignments, computer laboratory exercises and project(s). Laboratory exercises will cover the use of computer tools for the modelling and numerical investigations of vibrating systems. Projects will enable students to apply the knowledge and computer skills in the analysis and suppression of vibrations in engineering systems. Quizzes, class assignments, and formative exercises will focus on fundamentals so that students can better understand basic concepts.

Class Policies

- Sichuan University attendance policy will be enforced. Attendance will be taken at the start and at the end of the class. Students who come to class more than 15 minutes late (without valid reasons) will be considered as absence. Students who leave class early (without valid reasons) will be considered as absence. Students who sign the attendance for another student will be considered as absence and will be reported to the University as a misconduct. Students performing activities not associated with the course while in class (e.g. sleeping, watching video, playing games, doing other course assignments or personal work) will be considered as absence.
- Students with 3 unexcused absences (including lateness or leaving class early) will receive zero for all assessment items except examinations. These assessment items include assignments, quizzes, laboratory exercises, projects, etc.
- All assessment items have clearly stated submission requirements. No marks will be given if the submission requirements are not met. Late submissions will not be accepted. No makeup assignments, quizzes, laboratory exercises, and projects will be allowed.
- If a student cannot attend the midterm examinations, the student must contact the instructor immediately with a valid reason. If the reason stated is consistent with University Policy, arrangements can be made for alternate assessments. Otherwise, the student will get zero for the midterm examinations.
- If a student has a valid reason and cannot attend the final exam, the student must apply to the administration for a defer examination.
- Challenge to the grading must be made within 7 days after the returned of the assessment item or after the release of the solutions. No challenges to the grading will be entertained after the 7-day period.

Academic misconduct and non-academic misconduct will not be tolerated. All misconduct will be reported and dealt with by SCUPI.

ACADEMIC MISCONDUCT

All students in attendance at the Sichuan University are expected to be honorable and to observe standards of conduct appropriate to a community of scholars. The University expects from its students a higher standard of conduct than the minimum required to avoid discipline. Academic misconduct includes all acts of dishonesty in any academically related matter and any knowing or intentional help or attempt to help, or conspiracy to help, another student. The Academic Misconduct Disciplinary Policy will be followed in the event of academic misconduct.

NON-ACADEMIC MISCONDUCT

All cell phones, computers and mobile phones are to be turned off and put out of sight during lectures (mobile phones and computers can be turned on during online quizzes). All newspapers and other materials not related to the class are to be put away once class begins. Operating these devices and reading unrelated materials while in class is disrespectful of your instructor and fellow classmates. If you fail to abide by this rule, the instructor has the right to confiscate the device or materials and mark you as absence. If you have an emergency and need to have your phone turned on during class, ask your instructor for permission.