Kingdom of Saudi Arabia Ministry of Higher Education **Qassim University** College of Engineering		**المملكة العربية السعودية** وزارة التعليم العالي **جامعة القصيم** **كليه الهندسه**

Advanced Mechanical Vibrations

College: Engineering

Department: Mechanical

First: Course Definition

1- Course Code: ME 662

2- Units: 3 credit hrs

3 – Semester

4 -Prerequisite Basic course in vibration

5- Co-requisite

6- Location (if not on main Campus):

Second: Course Objectives

1. To teach the mathematical techniques necessary for describing and analyzing mechanical vibration at an advanced level.
2. To impart the ability to model, analyze and solve vibration problems.
3. To impart the knowledge of vibration control techniques and the ability to apply these techniques.
4. To teach common vibration measurement techniques and impart the ability to choose the correct technique in a given situation.

Third: Course Specifications

1- Topics to be covered

Subject	No of Weeks	Units
Formulation of vibration problems	1	3
Free vibrations of Single-Degree-of-Freedom (SDOF) systems	2	6

Harmonic forced vibrations of SDOF systems	2	6
General periodic and non-periodic response	3	9
Multi-degree-of-freedom systems	2	6
Vibration control techniques	1	3
Continuous systems	2	6
Vibration measurement	2	6

2- Course components (Total hrs in the Semester)

Lecture	Exercise or lab	Other
45	---	---

3- Intended Learning Outcomes of the Course (ILO's)

a. *Knowledge*

i) Description of the knowledge to be acquired:

- Characteristics of vibrating systems, including models of damping
- Complex vector representation of vibration
- Use of convolution integral and Fourier Transform in representing vibration
- Multi-DOF and continuous models of vibrating systems
- Exact and approximate solution techniques for vibration problems

ii) Teaching strategies to be used to develop that knowledge

- Class lectures
- Group Discussion
- Homework

iii) Methods of assessment of knowledge acquired

- Quizzes
- Exams

b- Cognitive (Intellectual) Skills

i) Cognitive skills to be developed

- Ability to visualize the behavior of vibrating systems.
- Ability to prepare mathematical models of real vibrating systems.
- Ability to solve equations of vibration, using exact solutions, approximate techniques, and computer methods.
- Ability to interpret the solutions of vibration equations.
- Ability to choose effective methods of vibration measurement and control.

ii) Teaching strategies to be used to develop these cognitive skills

- Class lectures and presentations
- Homework problems

iii) Methods of assessment of students' cognitive skills

- Quizzes and homework
- Term projects
- Exams

c. Interpersonal Skills and Responsibility

i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- Ability to work in a team
- Ability to meet assigned deadlines

ii) Teaching strategies to be used to develop these skills

- Group discussions and projects
- Class attendance requirements, homework deadlines, and general class discipline

iii) Methods of assessment of students' interpersonal skills and capacity to carry responsibility

- Observation of student contribution in group discussions and group projects.
- Record of attendance, homework timeliness and class behavior.

d. Communication, Information Technology and Numerical Skills

i) Description of the skills to be developed in this domain

- Ability to communicate the material learned
- Ability to use computer programs for calculations and visualization of vibrations.
- Ability to search for information using the internet

ii) Teaching strategies to be used to develop these skills

- Student presentations
- Home assignments involving use of computers and internet resources

iii) Methods of assessment of students numerical and communication skills

- Exams
- Performance in homework and presentations

e. Psychomotor (if applicable) & Other Non-cognitive Skills

Not applicable

i) Description of the psychomotor or other skills to be developed and the level of performance required

ii) Teaching strategies to be used to develop these skills

iii) Methods of assessment of student's psychomotor skills

4- Student Assessment Schedule

Serial	*Assessment tool (test, group project, examination etc.)*	*Week due*	*Weight*
1	Homework & Quizzes	Every week	15%
2	Term project	15th	10%
3	Midterm exam	7th	25%
4	Final exam	16th	50%

5- Student Support

- Regular office hours
- Electronic copies of books and online resources

- Relevant software

6- Learning Resources

i) Essential Books (References)

- L Meirovitch, “Elements of Vibration Analysis”, McGraw-Hill

ii) Course Notes

iii) Recommended Books

iv) Electronic Books & Web Sites :

v) Periodicals

7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Informal discussion with students
- Student survey at the end of course

ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Student performance on homework and quizzes

iii) Processes for Improvement of Teaching

- Self-assessment by the instructor
- Feedback from Department Chairman and Vice Dean Academics, as required

iv) Processes for verifying standards of student achievement (e.g. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- Courses are reviewed by relevant subject committees and the department and college councils.