SHIV NADAR UNIVERSITY

Graduate Course Description

I. Course Title: Structural Dynamics

II. Course Code: CED602

III. Course Credits (L:T:P): 4 (3:1:0)

IV. Total Contact Hours/Batch/Week (L:T:P): 3:1:0

V. Course Type: Major Elective/UWE

VI. Prerequisite: Engineering Mechanics & Engineering Mathematics

VII. School/Department: Civil Engineering

VIII. Disciplines to which the course may be of interest: School of Engineering

IX. **Course Objectives**:

- To discuss the theory of structural response to dynamic loads and to understand and appreciate the importance of vibrations
- To appreciate the need and importance of dynamic analysis in structural and mechanical designs
- To determine the response of SDOF and MDOF systems (with and without damping) due to free vibrations, harmonic vibrations, and arbitrary excitations
- Students will learn to compute the dynamic response of structural systems under dynamic loads such as blast and earthquake excitations

X. **Course Outcomes**:

At the end of the course, students will be able to

- Analyze and study dynamics response of single degree freedom system using fundamental theory and equation of motion.
- Analyze and study dynamics response of Multi degree freedom system using fundamental theory and equation of motion.
- Use the available software for dynamic analysis.

XI. **Course Content**:

- Fundamentals of vibration
- Dynamic equilibrium of structures
- Formulation of dynamic models for discrete and continuous structures
- Response of single degree of freedom systems to periodic and non-periodic excitations

- Response spectra
- Response of two degree of freedom systems
- Response of multi-degree of freedom systems
- Response of continuous systems
- Random Vibrations

XII. **Reference Books**:

1. A. K. Jain, Dynamics of Structures with MATLAB Applications, Pearson, 2016
2. J. L. Humar, Dynamics of Structures, CRC Press, 2012
3. S. S. Rao, Mechanical Vibrations, Prentice Hall, 2010
4. S. G. Kelly and S. K. Kudari, Mechanical Vibrations, TMH, 2010
5. P. Paultre, Dynamics of Structures, Wiley, 2011
6. W. J .Palm, Mechanical Vibration, Wiley India, 2013
7. W. T. Thomson and M. D. Dahleh, Theory of Vibration with Applications, Prentice Hall, 1997
8. R. W. Clough and J. Penzien, Dynamics of Structures, CBS, 2015
9. M. Paz and W. Leigh, Structural Dynamics: Theory and Computation, Springer, 2013
10. A. K. Chopra, Dynamics of Structures: Theory and Applications to Earthquake Engineering, Pearson, 2007

XIII. **Assessment Scheme**:

Students will be assessed on how well they understand and use the fundamentals of structural dynamics through the problems they solve during the lecture classes and examinations. These problems will assess concept understanding, critical thinking, and problem-solving skills.

Homework Assignment – 20%

Project (literature review, project work, report submission and project presentations) – 30%

Mid-term examination – 20%

Final Examination – 30%

Students must score above 40% to pass the course.