

<b>Course Code</b> <b>Course Title</b> <b>No. of Credits</b> <b>Pre-requisites</b> <b>Compulsory/Optional</b>	ME 327 Vibration 3 ME 320 Compulsory for Design tack and Energy Systems track under Mechanical Engineering stream/Optional for others.
<b>Aim(s):</b> To introduce the fundamentals of vibrations theory and practice so that the students will be able to model and analyze vibratory systems to estimate, measure, prevent and rectify vibrations in machines and structures.	
<b>Intended Learning Outcomes:</b> On successful completion of the course, the students should be able to; <ul style="list-style-type: none"> <li>• analyze vibratory systems using frequency response methods,</li> <li>• analyze vibration of distributed parameter systems,</li> <li>• identify the modes of vibration of mechanical systems and estimate the modal parameters,</li> <li>• design methods to minimize vibrations.</li> </ul>	
<b>Time Allocation (Hours) :</b> Lectures 37 , Assignments 16 <b>(Notional Hours: 150)</b>	
<b>Course content / Course description :</b> <ul style="list-style-type: none"> <li>• <b>Frequency response analysis of vibratory systems:</b> Transform techniques: Transfer functions, State-space representation, Mechanical impedance approach: interconnection laws, Transmissibility functions, Force and motion transmissibility, Receptance analysis and applications.</li> <li>• <b>Distributed-Parameter Systems:</b> Flexural vibration of uniform beam, Vibration of cables, Torsional vibration of uniform shaft, Longitudinal vibration of uniform rod, Vibration of membranes and plates, whirling of shafts, Approximate methods: Influence coefficient method, Energy methods, Dunkerley and Raleigh approximations.</li> <li>• <b>Damping:</b> Internal damping ,Structural damping, Fluid damping, Interface damping, Modelling and measurement of damping.</li> <li>• <b>Vibration signal analysis and instrumentation:</b> Frequency spectrum, Signal types, Fourier analysis, Aliasing distortion, Random signal analysis, Signal-generating devices, Vibration exciters, Sensors and transducers, Signal conditioning/modifying devices, Signal analysis devices, Vibration recording and Display devices.</li> <li>• <b>Introduction to experimental modal analysis:</b> Modal representation of MDOF systems, Curve fitting of transfer functions, Experimental observation of natural frequencies, Modal damping ratios and mode shapes vectors.</li> <li>• <b>Vibration Design and Control:</b>Specification of vibration limits, Vibration isolation and design, Balancing of rotating machinery.</li> </ul>	

**Recommended Texts (if any) :**

- de Silva, C. W. (2000). *Vibration-Fundamentals and Practice*. CRC press, NY, USA.
- Anders Brand (2011). *Noise and Vibration Analysis: Signal Analysis and Experimental Procedures*, (1<sup>st</sup> Edition), New Jersey, USA.
- de Silva, C. W. (2005). *Vibration and Shock Handbook*. CRC press, NY, USA.

<b>Assessment</b>	<b>Percentage Mark</b>
<b>In-course</b>	
Tutorials/ <u>Assignments</u> / <u>Quizzes</u> /Practicals	30
Mid Semester Examination	-
<b>End-semester:</b> Written examination	70