|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Image result for nit meghalaya logo | | | | **National Institute of Technology Meghalaya**  An Institute of National Importance | | | | | | | | | | | | | | | | | | | | | | | **CURRICULUM** | | | | | | |
| Programme | | | | **Bachelor of Technology in Civil Engineering** | | | | | | | | | | | | | Year of Regulation | | | | | | | | | | **2019-20** | | | | | | |
| Department | | | | **Civil Engineering** | | | | | | | | | | | | | Semester | | | | | | | | | | **VIII** | | | | | | |
| Course  Code | | Course Name | | | | | | | | **Pre requisite** | | | | Credit Structure | | | | | | | | Marks Distribution | | | | | | | | | | | |
| L | | T | | | P | C | | INT | | | MID | | | END | | | | Total | |
| **CE418** | | **Dynamics of Structure** | | | | | | | | **Nil** | | | | **3** | | **0** | | | **0** | **3** | | **50** | | | **50** | | | **100** | | | | **200** | |
| Course  Objectives | | Study the various types as well as characteristics of loading and formulate the equations of motion. | | | | | | | | | | Course Outcomes | | | | CO1 | | | Know the fundamental theory of dynamic equation of motions and analysis methods for dynamic systems | | | | | | | | | | | | | | |
| Learn the response of un-damped and damped SDOF and MDOF systems under various loadings. | | | | | | | | | | CO2 | | | Understood various type degree of freedom systems in structures. | | | | | | | | | | | | | | |
| Employ the approximate and iterative methods to model continuous vibratory systems. | | | | | | | | | | CO3 | | | Understand the modeling approach of dynamic response in civil engineering applications. | | | | | | | | | | | | | | |
| Use the seismic codes in analysis and design of civil engineering structures. | | | | | | | | | | CO4 | | | Interpret the dynamic analysis results for design of civil engineering structures | | | | | | | | | | | | | | |
| Evaluate dynamic response using numerical methods | | | | | | | | | | CO5 | | | Apply the structural dynamics theory to earthquake analysis, response, and design of structures. | | | | | | | | | | | | | | |
| Learn the response of continuous system under dynamics loading and formulate the equations of motion. | | | | | | | | | |  | | |  | | | | | | | | | | | | | | |
| No. | COs | | Mapping with Program Outcomes (POs) | | | | | | | | | | | | | | | | | | | | | | | Mapping with PSOs | | | | | | | |
| PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | | PO8 | | PO9 | | | PO10 | | | PO11 | | PO12 | | | PSO1 | | | PSO2 | | | | PSO3 |
| 1 | CO1 | | 3 | | 3 | 2 | 1 | 1 | 1 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 3 |
| 2 | CO2 | | 3 | | 3 | 2 | 1 | 1 | 1 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 3 |
| 3 | CO3 | | 3 | | 3 | 2 | 1 | 1 | 1 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 3 |
| 4 | CO4 | | 3 | | 3 | 2 | 1 | 1 | 1 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 3 |
| 5 | CO5 | | 3 | | 3 | 2 | 1 | 1 | 1 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 3 | | | | 3 |
| 6 | CO6 | | 0 | | 0 | 0 | 0 | 0 | 0 | | 0 | | 0 | | 0 | | | 0 | | | 0 | | 0 | | | 0 | | | 0 | | | | 0 |
| SYLLABUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. | Content | | | | | | | | | | | | | | | | | | | | | | | Hours | | | | | | | COs | | |
| I | **Introduction**  Importance of structural dynamics for civil engineers, types of dynamic loads, effect of dynamic load on structure, background of the available methods. | | | | | | | | | | | | | | | | | | | | | | | 04 | | | | | | | CO1 | | |
| II | **Single Degree-of-Freedom System**  Degrees of freedom, equation of motion; free vibration of single degree of freedom systems; forced vibration: harmonic and periodic loadings; frequency response functions, force transmission and vibration isolation; response to arbitrary excitation. | | | | | | | | | | | | | | | | | | | | | | | 08 | | | | | | | CO1  CO2 | | |
| III | **Earthquake Response of SDOF Systems**  Earthquake excitation, response time history, construction of response spectra; response spectrum characteristics, tripartite plot, and design spectrum. | | | | | | | | | | | | | | | | | | | | | | | 06 | | | | | | | CO2 | | |
| IV | **Two Degree Freedom System**  Dynamic equations of equilibrium, free vibration of undamped system, natural modes, coordinate transformation, orthogonality conditions, response to initial condition, harmonic loading. | | | | | | | | | | | | | | | | | | | | | | | 06 | | | | | | | CO1  CO2  CO3 | | |
| V | **MDOF Systems**  Equation of motions, matrix formulation, natural modes of undamped system, numerical solution for the eigenvalue problems; solution of free vibration response for undamped systems; concept of proportional damping, free vibration analysis of systems with damping. | | | | | | | | | | | | | | | | | | | | | | | 06 | | | | | | | CO1  CO2  CO4 | | |
| VI | **Introduction to Dynamics of Continuous Systems**  Equations of motions for axial vibration of a beam; equations of motion for flexural vibration of a beam; free vibration analysis- boundary value problems, natural frequencies, mode shapes, orthogonality conditions, forced vibration analysis using modal superposition method. | | | | | | | | | | | | | | | | | | | | | | | 06 | | | | | | | CO1  CO3  CO4 | | |
| Total Hours | | | | | | | | | | | | | | | | | | | | | | | | 36 | | | | | |  | | | |
| **Essential Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. A. K. Chopra, “Dynamics of Structures: Theory and Applications to Earthquake Engineering”, PHI Ltd. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. P. Mario, “Structural Dynamics”, CBS Publishers. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. R. W. Clough and J. Penzien, “Dynamics of Structures”, McGraw-Hill International Edition. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. K. Rao, “Vibration Analysis and Foundation Dynamics”, Wheeler. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. J. Biggs and J. M. Biggs, “Introduction to Structural Dynamics”, McGraw-Hill. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. L. Meirovitch, “Elements of Vibration Analysis”, McGraw-Hill. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |