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| 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 | | | | | | | | | | **2020-21** | | | | | |
| Department | | | | **Civil Engineering** | | | | | | | | | | | | | Semester | | | | | | | | | | **VII** | | | | | |
| Course  Code | | Course Name | | | | | | | | **Pre requisite** | | | | Credit Structure | | | | | | | | Marks Distribution | | | | | | | | | | |
| L | | T | | | P | C | | INT | | | MID | | | END | | | Total | |
| **CE 419** | | **Dynamics of soil and foundation** | | | | | | | | **Nil** | | | | **3** | | **0** | | | **0** | **3** | | **50** | | | **50** | | | **100** | | | **200** | |
| Course  Objectives | | To understand the fundamental concepts of Theory of vibration and the various terminology encompassed to study the behavior of soils due to the effects of dynamic loads | | | | | | | | | | Course Outcomes | | | | CO1 | | | Able to understand the theory of vibration, resonance phenomenon and dynamic amplification. | | | | | | | | | | | | | |
| To study about the dynamic soil properties & their determination by field and laboratory tests & create an understanding about the general principles of analysis and design of machine foundation | | | | | | | | | | CO2 | | | Able to understand propagation of body waves and surface waves through soil. | | | | | | | | | | | | | |
| To familiarize with the methods of analysis of dynamic earth pressure and to study the phenomenon of liquefaction and anti liquefaction measures | | | | | | | | | | CO3 | | | Able to understand different methods for estimation of dynamic soil properties required for design purpose. | | | | | | | | | | | | | |
| CO4 | | | Able to apply theory of vibrations to design machine foundation based on dynamic soil properties and bearing capacity. | | | | | | | | | | | | | |
| CO5 | | | Able to determine the dynamic earth pressure, assess liquefaction potential of any site and adopt appropriate mitigation techniques. | | | | | | | | | | | | | |
| 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 | | **1** | | **0** | **0** | **0** | **0** | **0** | | **1** | | **1** | | **0** | | | **0** | | | **0** | | **0** | | | **1** | | | **2** | | | **0** |
| 2 | CO2 | | **0** | | **1** | **0** | **0** | **0** | **0** | | **1** | | **1** | | **0** | | | **0** | | | **0** | | **0** | | | **1** | | | **3** | | | **0** |
| 3 | CO3 | | **0** | | **0** | **0** | **0** | **0** | **0** | | **1** | | **1** | | **0** | | | **0** | | | **0** | | **0** | | | **1** | | | **2** | | | **0** |
| 4 | CO4 | | **0** | | **1** | **0** | **0** | **0** | **0** | | **1** | | **1** | | **0** | | | **0** | | | **0** | | **0** | | | **1** | | | **2** | | | **0** |
| 5 | CO5 | | **0** | | **0** | **0** | **0** | **0** | **0** | | **1** | | **1** | | **0** | | | **0** | | | **0** | | **0** | | | **1** | | | **2** | | | **0** |
| **SYLLABUS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **No.** | **Content** | | | | | | | | | | | | | | | | | | | | | | | **Hours** | | | | | | **COs** | | |
| I | **Introduction** Scope and objective, nature and types of dynamic loading, importance of soil dynamics. | | | | | | | | | | | | | | | | | | | | | | | **02** | | | | | | **CO1** | | |
| II | **Vibration Theory**  Vibration of elementary systems, degrees of freedom (sdof and mdof systems), equation of motion for sdof system, types of vibrations, earthquake excitation, undamped and damped free vibrations, torsional vibration, critical damping, decay of motion, undamped and damped forced vibration, constant force and rotating mass oscillators, dynamic magnification factor, transmissibility ratio, vibration isolation, vibration measuring instruments, equation of motion for mdof system. | | | | | | | | | | | | | | | | | | | | | | | **08** | | | | | | **CO1** | | |
| **CO2** | | |
| III | **Dynamic Soil Properties**  Stresses in soil element, determination of dynamic soil properties, field tests, laboratory tests, model tests, stress-strain behavior of cyclically loaded soils, estimation of shear modulus, modulus reduction curve, damping ratio, linear, equivalent-linear and non-linear models, ranges and applications of dynamic soil tests, cyclic plate load test, liquefaction, screening and estimation of liquefaction, simplified procedure for liquefaction estimation, factor of safety, cyclic stress ratio, cyclic resistance ratio, crr correlations with spt, cpt, sasw test values. | | | | | | | | | | | | | | | | | | | | | | | **10** | | | | | | **CO3** | | |
| IV | **Machine Foundations** Types of machines, basic design criteria, methods of analysis, mass-spring-dashpot model, elastic-half-space theory, tschebotarioff’s reduced natural frequency method, types of foundations, modes of vibrations, vertical,sliding, torsional (yawing) and rocking (and pitching) modes of oscillations, design guidelines as per codes, typical design problems, design of foundations for reciprocating machines, impact machines, and rotary machines, pile foundation under machine induced vibrations. | | | | | | | | | | | | | | | | | | | | | | | **10** | | | | | | **CO4** | | |
| V | **Soil Improvement Techniques** Basic concept of soil improvement due to dynamic loading, various methods, mitigation of liquefaction. Dynamic earth pressures, force and displacement based analysis, pseudo-static and pseudo-dynamic analysis, guidelines of various design codes, dynamic analyses of various geotechnical structures like retaining wall, soil slope, railway subgrade and ballast using msd model. | | | | | | | | | | | | | | | | | | | | | | | **06** | | | | | | **CO5** | | |
| Total Hours | | | | | | | | | | | | | | | | | | | | | | | | **36** | | | | | |  | | |
| **Essential Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Das, B.M., "Fundamentals of Soil Dynamics", Elsevier. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Prakash, S., "Soil Dynamics", McGraw Hill. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Kramer S., "Geotechnical Earthquake Engineering", Pearson. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. SARAN S., "Soil Dynamics & Machine Foundations", Galgotia Publications Pvt Ltd. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Richart, F.E., Hall J.R and Woods R.D., "Vibrations of Soils and Foundations", Prentice Hall Inc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Prakash, S. and Puri, V.K., "Foundation for machines: Analysis and Design", John Wiley & Sons. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |