|  |  |  |
| --- | --- | --- |
| Image result for nit meghalaya logo | **National Institute of Technology Meghalaya**An Institute of National Importance | **CURRICULUM** |
| Programme | **Master of Technology** | Year of Regulation | **2018-19** |
| Department | **Civil Engineering** | Semester | **II** |
| CourseCode | Course Name | Pre requisites | Credit Structure | Marks Distribution |
| L | T | P | C | INT | MID | END | Total |
| **CE508** | **Soil Dynamics and Earthquake Engineering** | **None** | **3** | **0** | **0** | **3** | **50** | **50** | **100** | **100** |
| CourseObjectives | 1. To make the students understand the fundamental concepts of theory of vibration, the dynamic soil properties and design of machine foundation.
2. To make the students aware with Seismology, Seismic Analysis and Design of Various Geotechnical Structures and to study the phenomenon of liquefaction and anti-liquefaction measures
 | Course Outcomes | CO1 | Students will be able to relate with the theory of vibration will be able to compare the propagation of body waves and surface waves through soil. |
| CO2 | Students will be able to categorize different methods for estimation of dynamic soil properties required for design purpose. |
| CO3 | Students will be able to apply theory of vibrations to design machine foundation based on dynamic soil properties and bearing capacity. |
| CO4 | Students will be able to understand various concepts related to Seismology and strong ground motion |
| CO5 | Students will be able to do Seismic Analysis and Design of Various Geotechnical Structures using Codal provisions/guidelines for seismic design of geotechnical structures. |
| SYLLABUS |
| **No.** | **Content** | **Hours** | **COs** |
| I | **Vibration Theory**Introduction to soil dynamics, 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 massoscillators, dynamic magnification factor, transmissibility ratio, vibration isolation, vibration measuring instruments, equation of motion for mdof system.  | **05** | **CO1** |
| II | **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, dampingratio, linear, equivalent-linear and non-linear models, ranges and applications of dynamic soil tests, cyclic plateload 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. | **06** | **CO2** |
| III | **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. | **06** | **CO3** |
| IV | **Seismology** Basic Seismology, Earthquake, List of major earthquakes, Causes of earthquakes, Sources of earthquake data, Elastic rebound Theory, Faults, Plate tectonics, Seismograph and Seismogram, Prediction of Earthquakes, Protection against earthquake damage, Origin of Universe, Layers of Earth, Theory of Continental Drift, Hazards due to Earthquakes. | **06** | **CO4** |
| V | **Strong Ground Motion** Size of Earthquake: Magnitude and Intensity of Earthquake, Modified Mercalli Intensity Scale, Measuring of Earthquake, Earthquake Magnitude- Local (Richter) magnitude, surface wave magnitude, Moment magnitude, Seismic energy, Correlations. Spectral Parameters: Peak Acceleration, Peak Velocity, Peak Displacement, Frequency Content and duration, Spatial Variability of Ground Motion, Attenuation Relationships, Fourier Amplitude Spectra, Arias Intensity. | **06** | **CO4** |
| VI | **Seismic Analysis and Design of Various Geotechnical Structures** Pseudo-static method, Pseudo-dynamic method, other dynamic methods, Seismic analysis of retaining wall, Seismic slope stability analysis, Behaviour of reinforced soil under seismic conditions, Seismic design of retaining structures, Seismic analysis of Tailings Dam, Seismic displacement-based analysis, seismic design of shallow foundations, seismic design of pile foundations, seismic uplift capacity of ground anchors, seismic design of Municipal Solid Waste (MSW) landfills. Codal provisions/guidelines for seismic design of geotechnical structures. | **07** | **CO5** |
| **Total Hours** | **36** |  |
| **Essential Readings** |
| 1. Das, B.M., Ramana, G. V. "Principles of Soil Dynamics", Elsevier.
 |
| 1. Prakash, S., "Soil Dynamics", McGraw Hill.
 |
| 1. Kramer S., "Geotechnical Earthquake Engineering", Pearson.
 |
| **Supplementary Readings** |
| 1. SARAN S., "Soil Dynamics & Machine Foundations", Galgotia Publications Pvt Ltd.
 |
| 1. Richart, F.E., Hall J.R and Woods R.D., "Vibrations of Soils and Foundations", Prentice Hall Inc.
 |
| 1. Prakash, S. and Puri, V.K., "Foundation for machines: Analysis and Design", John Wiley & Sons.
 |