



**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani**  
**Pilani Campus**  
**AUGS/ AGSR Division**

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**SECOND SEMESTER 2020-21**  
**COURSE HANDOUT**

**Date: 15-1-2021**

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

**Course No** : CE F419  
**Course Title** : Geotechnical Earthquake Engineering & Machine Foundation  
**Instructor-in-Charge** : Prof. Kamallesh Kumar

**1. Course Description:** Basics of Geotechnical Earthquake Engineering and foundations supporting vibratory machines will be covered.

**2. Scope and Objective of the Course:** Earthquake resistant geotechnical construction has become an important design aspect recently. Course includes discussion on introduction to geotechnical earthquake engineering, earthquakes, dynamic soil properties, site seismicity, seismic soil response and design earthquake. Concept of liquefaction will be covered in detail. Earthquake resistant design of shallow foundation, earthquake resistant design of deep foundation, slope stability analysis for earthquakes and retaining wall analysis for earthquake will also be covered. Later part of course will be on machine foundations. Methods of analysis of block foundations, soil spring constants, determination of soil spring constants, damping, vertical vibration, rocking vibration, pure sliding and yawing of block foundations will be covered in this context.

**3. Text Books:**

- T1. Kamallesh Kumar “Basic Geotechnical Earthquake Engineering”, New Age International Publishers, Second Edition, 2017.  
T2. Ranjan G. and Rao R. “Basic and Applied Soil Mechanics”, New Age International Publishers, Second Edition, 2000.

**4. Reference Books:**

- R1. Day R. W. “Geotechnical Earthquake Engineering Handbook”, McGraw-Hill Handbooks, 2002.  
R2. Arora K. R. “Soil Mechanics and Foundation Engineering”, Standard Publishers Distributors, Fourth Edition, 1997.



### 5. Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
1	Introduction to geotechnical earthquake engineering	T1 Chapter 1	Introduction, Earthquake records, Earthquake records of India
2	Earthquakes	T1 Chapter 2	Plate tectonics, Seismic waves, Faults, Earthquake magnitude & intensity, Seismograph
3	Dynamic soil properties	T1 Chapter 4	Introduction, Types of soils, Measuring dynamic soil properties
4	Site seismicity, Seismic soil response & design earthquake	T1 Chapter 5	Site seismicity, Seismic soil response, Design Earthquake
5	Liquefaction	T1 Chapter 6	Introduction, Factors governing liquefaction in field, Liquefaction analysis, Antiliquefaction measures
6	Earthquake resistant design for shallow foundation	T1 Chapter 7	Introduction, Bearing capacity analysis for liquefied soil, Bearing capacity analysis for cohesive soil weakened by earthquake
7	Earthquake resistant design of deep foundation	T1 Chapter 8	Introduction, Design Criteria
8	Slope stability analysis for earthquakes	T1 Chapter 9	Introduction, Inertia & weakening slope stability
9	Retaining wall analysis for earthquakes	T1 Chapter 10	Introduction, Pseudostatic method, Analysis for liquified and weakened soil, Restrained & temporary retaining walls
10	Machine Foundations	T2 Chapter 18	Introduction, Methods of analysis, Determination of soil spring constants, Damping, Virtual vibration, Rocking vibration, Pure sliding & yawing of foundation



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**6. Evaluation Scheme:**

Component	Duration	Weightage (%)	Date & Time	Nature of component (Close Book/ Open Book)
Mid-Semester Test	90 Min.	30		
Comprehensive Examination	120 Min.	40		
Other Evaluation Component	-	30		

**7. Chamber Consultation Hour:** To be announced in the first class.

**8. Notices:** Mostly on Nalanda.

**9. Make-up Policy:** Make-up would be granted only for genuine cases with **prior permission**.

**10. Note (if any):** Course related instructions will be given throughout the semester.

**Instructor-in-charge**  
**Course No. CE F419**