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Soil Dynamics Course in Curriculum

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Soil Dynamics Course in Curriculum

by

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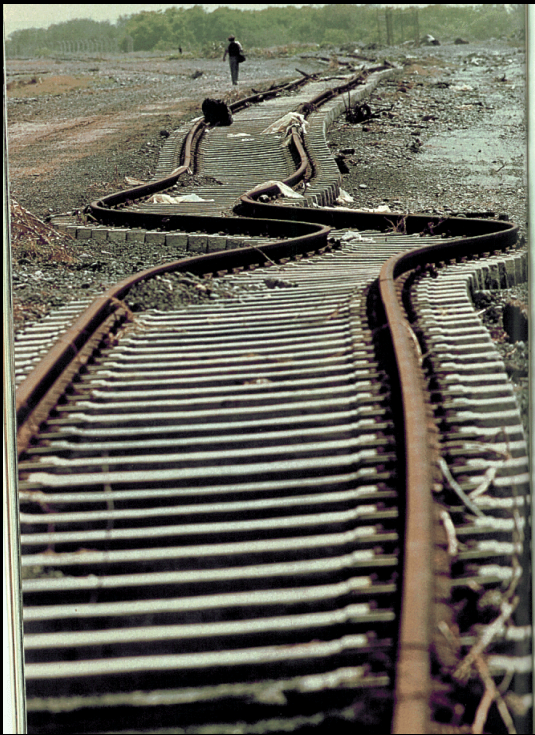
Also, Adjunct Professor, Academy of CSIR (AcSIR), New Delhi, India.

**Secretary of ISSMGE TC 212–Deep Foundations & TC 207–Soil-Structure
& Member of TC 203-Earthquake Geotech. Engg.**



Meeting of Soil Dynamics Forum, IIT Roorkee on 11th December, 2014

Need to Study 'Soil Dynamics'



Special Features of Soil Dynamics Course

- How different from others..

Distance Education Programs in Soil Dynamics

NPTEL – MHRD, Govt. of India Initiative

(Prof. Pradipta Banerji, Civil Engg. Group Coordinator)

Two Phases on NPTEL, Phase – I and Phase – II,

Phase – I, All Undergraduate Engineering Courses

Phase – II, Most Post-Graduate Engineering Courses

<http://www.nptel.iitm.ac.in/>



Distance Education Programs in Soil Dynamics

NPTEL – MHRD, Govt. of India Initiative

Soil Dynamics

– Video Course by Prof. Deepankar Choudhury, IITB (available free in Youtube)

-Web Course by Prof. P. Maheswari, S. Mittal & M.N. Viladkar, IITR

Geotechnical Earthquake Engineering

– Video Course by Prof. Deepankar Choudhury, IITB (available free in Youtube)

-Web Course by Prof. Madhavi Latha, IISc and Prof. N. R. Patra, IITK



Soil Dynamics Video Lecture Details

Instructor: Dr. Deepankar Choudhury, Department of Civil Engineering, IIT Bombay. For more details on NPTEL visit <http://nptel.iitm.ac.in>

Course Description :

Introduction : Scope and objective; Nature and types of dynamic loading; Importance of soil dynamics

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; Non-harmonic, arbitrary, impact and other types of forced vibrations; Duhamel's integral; Taxing of vehicles on uneven roads; Vibration isolation; Vibration measuring instruments; Equation of motion for MDOF system.

Wave Propagation : Longitudinal and torsional waves in infinitely long rod; Solution for one-dimensional and three-dimensional equations of motion; Waves in semi-infinite body; Waves in layered medium; Earthquake waves, P-wave, S-wave, Rayleigh wave and Love wave; Locating earthquake's epicenter.

Soil Dynamics Video Lecture Details (contd.)

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.

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.

Soil Improvement Techniques : Basic concept of soil improvement due to dynamic loading; Various methods; Mitigation of liquefaction

Dynamic Soil-Structure Interaction : 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.

Participation of India

First worldwide “Soil Dynamics” Course started at IIT Roorkee (then Univ. of Roorkee) by Prof. Shamsheer Prakash in 1962.

Large numbers (6) of national standards on Design, retrofitting of structures

Only major country with National Standards dealing with Earthquake Resistant Non-engineered construction

IAEE – International Association for Earthquake Engineering, present President from India, Prof. Sudhir K. Jain, Director, IITGN

Active Representation in ISSMGE (International Society for Soil Mechanics and Geotechnical Engineering, UK) Technical Committee TC 203 – Earthquake Geotech. Engg.

Soil Dynamics Course taught in INDIA

Course Code	Instructor	University
CE 647	Prof. Deepankar Choudhury	IIT Bombay
CE 641	Prof. Arindam Dey and Prof. A. Murli Krishna	IIT Guwahati
	Prof. Priyanka Ghosh	IIT Kanpur
	Prof. Jayant Kumar	IISc Bangalore
EQ 572	Prof. B. K. Maheshwari	IIT Roorkee
CE5320	Prof. A. Boominathan	IIT Madras
		IIT Kharagpur
CE 707	Prof. R. Ayothiraman	IIT Delhi

And many more.....

Earthquake Engineering Research in India

Three major Shake Tables of about 50 ton capacity with multi-directional shaking. E.g. SERC Chennai, CPRI Bangalore etc.

Seismological recording stations – several 100s

Research Institutes/Organizations – 7 IITs & some new IITs, IISc, SERC, NGRI, CPRI, NIDM, GSI, CWC, CWPRS, BMTPC etc.

Information Centre – National Information Centre for Earthquake Engineering (NICEE), IITK

Journal/Society – Indian Society of Earthquake Technology (ISET), IITR

Soil Dynamics Course taught in CHINA

Course Code	Instructor	University
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CIEE 707		University of Macau
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And many more.....

Soil Dynamics Course taught in USA

Course Code	Instructor	University
CE 5880		Ohio University
CE 631		University of Tennessee
CIVE 6347		University of Houston
CVEEN 6330		University of Utah
CE 565.742		John Hopkins University
CAE 566		Illinois Institute of Technology
CEE 4450		Cornell University

And many more.....

Soil Dynamics Course taught in EUROPE

Course Code	Instructor	University
	Prof. George Gazetas	NTUA, Greece
	Prof. Carlo G. Lai	Politecnico di Torino, Italy
GTE 09	Prof. Deepankar Choudhury	TU Darmstadt, Germany
AMCO2179	Prof. Alain Holeyman	UCL, Belgium
EQE 595	Prof. S. Umit Dikmen	Kandilli Rasarhanesi Ve Deprem Arastirma, Enstituesue, Turkey

And many more.....

Soil Dynamics Course

- Path Forward.....??
- Let's Discuss.....to have “Soil Dynamics” course in UG and PG curriculum worldwide to have expertise to built safe infrastructural facilities considering various dynamic loads.



Thank You

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Homepage: <http://www.civil.iitb.ac.in/~dc/>