

CIVE 799 Geotechnical Earthquake Engineering Course outline – Winter Term 2021

Instructor: **Lijun Deng, PhD, PEng, Associate Professor**
Email: ldeng@ualberta.ca
0930 – 1050 Monday and Friday, Mountain Time Zone
Lectures delivered in Zoom, recorded videos will be posted

Office hour: 1630 – 1730 Thursday

Recommended Text: There is no single recommended text.

Critical References: Geotechnical Earthquake Engineering, Kramer, S.L. Pearson, 1996
Soil Liquefaction during Earthquakes, Idriss, I.M. and Boulanger, R.W., 2008
Innovative Earthquake Soil Dynamics, Kokusho, T. 2017, CRC Press
Geotechnical Earthquake Engineering Handbook, Day, R. 2012, McGraw Hill
Geotechnical Earthquake Engineering, Towhata, I., 2008, Springer

Other handouts

Mark Distribution: 35% Assignment (6 assignments)
25% Midterm Examination (80 min, in-class, Open book)
40% Final Examination (120 min, in the final exam week, Open book)

Course Outline (subject to adjustment)

1. Introduction (2 lectures)

Plate tectonics, faults, effects on civil infrastructure, earthquake reconnaissance

2. Ground motions during earthquakes (2 lectures)

Ground motions parameters
Seismic response of SDOF structure
Response spectra of ground motions
Fourier spectra of ground motions

3. Ground response analysis (6 lectures)

Wave propagation
Dynamic soil properties
Ground response analysis
Laboratory and field tests of dynamic soil properties

4. Liquefaction during earthquakes (6 lectures)

Field observation of liquefaction
Soil cyclic behaviour
Initiation of liquefaction
Idriss and Boulanger's method of liquefaction assessment
Consequences of liquefaction
Mitigation of liquefaction

5. Seismic design of foundations (4 lectures)

- Dynamic soil-foundation interaction
- Bearing capacity for liquefied soil
- Rocking foundation for improved seismic performance

6. Seismic slope stability (3 lectures)

- Earthquake induced landslides
- Seismic slope stability analysis
- Slope deformation: Newmark's and Makdisi's methods

7. Seismic design of retaining structures (2 lectures)

- Seismic earth pressure
- Sitar's method of seismic earth pressure
- Seismic displacement of retaining walls
- Other design considerations

Policy about course outlines can be found in Section 23.4(2) of the University Calendar

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