Seismic Hazard and Earthquake Engineering

A proposal for a Nordic course

Background

Seismic hazard and earthquake engineering are two associated topics of broad interest for the seismology students in Nordic countries. These topics are usually taught in regular courses only in a few locations and there is a need for arranging a short-term concentrated Nordic course aimed at giving basic understanding of the principles of seismic hazard and earthquake engineering.

In a separate document (see Encl. 1) the background for the area where the course is proposed to be held is given in detail.

Purpose and target students

The main purpose is to give an overall understanding in seismic hazard through realistic examples and exercises. Problems associated with earthquake engineering applications will be included with special emphasis on geotechnical earthquake engineering.

The target students are those studying seismology in one of the Nordic countries at bachelor, master or PhD levels. Additionally engineers working with seismic hazard related problems may also attend the course. In such a case, basic knowledge about seismology is required.

Contents

List of topics to be covered are as follows:

- Basic concepts (hazard and risk)
- Input and methods
- Earthquake catalogues (instrumental seismicity)
- Earthquake catalogues (historical seismicity)
- Seismotectonic sources
- Active faults and maximum earthquakes
- Earthquake ground motion (attenuation)
- Probabilistic seismic hazard assessment
- Deterministic seismic hazard assessment

- Local site effects
- Earthquake engineering issues
- Vulnerability of buildings
- Earthquake resistant design

Textbook:

Reiter, Leon. (1990). Earthquake Hazard Analysis. Issues and Insights. *Columbia University Press*, New York. 254p. ISBN 0-231-06534-5.
All chapters.

Kramer, S.L. (1996). Geotechnical Earthquake Engineering. Prentice Hall, New Jersey, USA. 653p. ISBN 0-13-374943.
Chapter 6: Dynamic soil properties. pp. 184-254.
Chapter 7: Ground response analysis. pp. 254-308.
Chapter 8: Local site effects in design ground motion. pp.308-348.

Where?

The planned course will be arranged in Turkey, at the **Dokuz Eylül University** (DEU) Kaynaklar Campus in Buca, which is located in the Southeastern part of the city of Izmir. Izmir is the third largest city in Turkey with almost 4 million inhabitants. It provides unique examples in terms of seismic hazard and earthquake engineering. The Dokuz Eylul University is the largest in Western Anatolia with its 3091 academic personnel and 41 696 students. DEU has 55 academic sections including 10 faculties (with several departments under each), 20 research centers, 10 institutes and various academic units. A location map is attached at the end of this document (see http://www.deu.edu.tr/DEUWeb/English/ for further information).

When and how long?

The course can be arranged ideally in autumn 2007 with **3 weeks** duration. Proposed timing would be **24 September – 12 October 2007**. This would include 2 weeks of lectures (4 hours pr day and in total 40 hours) and a field trip of approximately 1 week duration. All lectures will be given at the Dokuz Eylül University (DEU) Campus at Kaynaklar, Buca, which is located in the Southeastern part of the city of Izmir, Turkey. The timing of the field excursions will be within the dates indicated above. However, they can be arranged flexibly (e.g. in two separate block of 2-3 days duration between the lecture weeks).

There are two alternatives for the field trip and these are outlined below:

Field-excursion Alternative 1: *Izmir and its surroundings*
This will include visit to active faults in the vicinity of Izmir in an area approximately 50 km radius. The selected localities include the Izmir, Manisa, Tuzla, Gülbahce, and the Seferihisar faults. In addition, several locations within the metropolitan area of Izmir will be visited for illustrative examples of geotechnical problems. This is logistically the easiest and may be finished in 3 days. This alternative does not require additional accommodation, since the field-excursions will be conducted as one-day trips with start and return from the DEU in Izmir.

Field-excursion Alternative 2: *Western Anatolia*
This alternative is an extended version of Alternative 1, where in addition to the localities mentioned in Alternative 1, it will include several locations within the larger Western Anatolia region. Several fault systems, the Gediz graben, the Alasehir graben and the Buyuk Menderes grabens and the associated structures will be visited. Geotechnical examples will remain the same as in Alternative 1. The total duration of this alternative is estimated to be one week and requires accommodation in various places along the route outside Izmir.

Cost estimate:

Following is an approximate cost estimate for a single student participation for 3 weeks (all prices in NOK):

Flight (t/r) to Izmir	(varies between 3500 – 4500)	4 000,-
Accommodation and subsistence	750,- (x 21 days)	15 750,-
Total		19 750,-

Lecturers:

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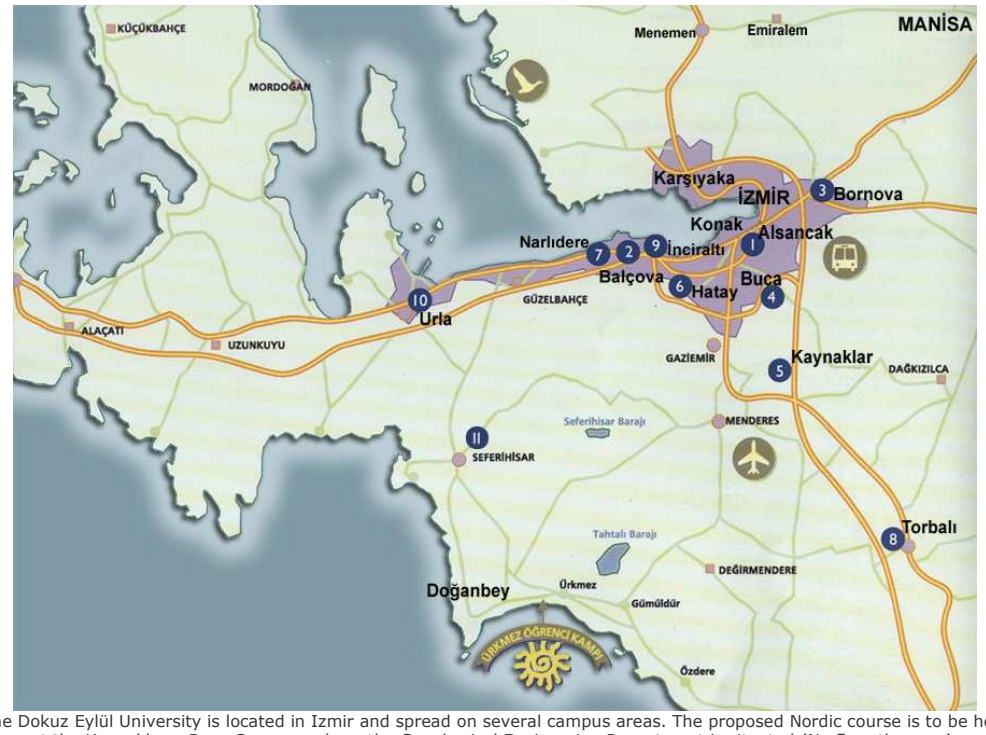

The Dokuz Eylül University is located in Izmir and spread on several campus areas. The proposed Nordic course is to be held at the Kaynaklar – Buca Campus, where the Geophysical Engineering Department is situated (No.5 on the map).