



Course Outline: January 2011 Term

E17 Time Histories Interpretation and Processing for Dynamic Analysis

Offered via classroom and web cast

Purpose: Dynamic loading (EQ, Wind, Traffic or Blast) of infrastructure is increasingly being represented by recorded time histories. This course provides the fundamental knowledge required of anyone interpreting discrete test data, conducting time history analysis or interpreting its results. The concepts involved in the sampling of continuous phenomena to obtain discrete time series will be presented mainly in the context of strong motion data. Participants will be provided with the theory and worked examples that allow them to implement their own time history manipulation routines and to compute elastic response spectra using Mathcad. **Please note: this is not a course in time history analysis of structures; rather, it is a course in the manipulation and analysis of time histories themselves.**

Selected Topics: The course will cover the necessary concepts of sampling theory and data acquisition. There will be a brief overview of instrumentation. The basic concepts of scaling, integrating and differentiating time histories will be explored. Then several approaches to baseline correction of accelerograms will be presented and discussed. Common pitfalls of data interpolation will be demonstrated along with proper techniques. After a short review of single degree of freedom dynamics, transfer functions will be discussed. The course will also cover the efficient computation of response spectra based on the Nigam Jennings algorithm. The derivation and definition of other earthquake quantities such as Arias Intensity (AI), Incremental Velocity (IV) and Incremental Displacement (ID), as well as Cumulative Absolute Velocity and Displacement will be presented. Techniques for linear scaling and rotation of horizontal spectral pairs to best fit target spectra will be fully explored and demonstrated. Techniques for the generation of floor design spectra will be demonstrated.

The participants will use Mathcad to implement all the techniques and procedures shown in class. Thus, at the end of the course they will have a thorough understanding of the material and their own tools to manipulate and process time histories. Many of the basic techniques and concepts presented in the course also lend themselves to the analysis of other time series data such as wind and temperature, strain readings etc.

There will be 8 to 12 weekly assignments which are due in hardcopy on a weekly basis in class. For the duration of the Course, Mathcad will be made available through UBC.

Course Coordinator and Instructor: *Andreas Felber*, Ph.D., P.Eng., BC Hydro

Contact: *Andreas Felber*, E-mail: afelber@telus.net

Communications: Notices to students and questions outside of class will be handled only through e-mail.

Schedule: 12 Thursdays, 7:00 to 9:00 P.M., January 27 – Apr 21, 2011 (**Break:** Feb 24)

Internet

This course is being offered **via the internet** as well as in the classroom. As it is a live transmission, the dates and times of the classes are the same as in the classroom. Should you wish to take this course via the internet, please complete the application form provided for internet courses.

System requirements for CSE Program LIVE e-learning Training:

- ✓ Any DSL or Cable Connection better than 56K. (Boosted 56K also works. Please test to be sure)
- ✓ A microphone and speakers or headset plugged into your PC.
- ✓ PC with Windows 7 or XP running a processor greater than 750 MHz. with Ram of 256 Mb or greater.