



Course Syllabus

Course Code CEE-455	Course Title Bridge Analysis and Design	ECTS Credits 5
Prerequisites CEE-353	Department Engineering	Semester Fall, Spring
Type of Course Elective	Field Civil & Environmental Engineering	Language of Instruction English
Level of Course 1 st Cycle	Lecturer(s) Dr Loizos Papaloizou	Year of Study 4 th
Mode of Delivery Face-to-face	Work Placement N/A	Corequisites None

Course Objectives:

The main objectives of the course are to:

- To develop an understanding for the basic concepts in proportioning and designing bridges.
- To introduce the basic knowledge on the structural analysis and the conceptual design of individual elements of a bridge.
- To understand the load flow mechanism and identify loads on bridges.
- To help the students develop an understanding about how earthquakes affect the design of bridges.
- To carry out an analysis of a bridge starting from conceptual design, with advanced computer analysis software.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Identify the most common types of bridges and understand the load flow mechanisms.
- Apprehend the most important bridge construction methods.
- Calculate the static and moving loads for a given simple highway bridge, according to the latest design codes.
- Understand the effects of seismic loads on bridges and recognize the major factors that are related to the severity of these effects.

- Be familiar with specialized finite element analysis software for bridges.
- Be able to use the latest design codes and design procedure for various bridge elements.
- Perform modelling of trusses, beams, frames, plates and shells with a finite element software.
- Apply bridge loads with a finite element software.
- Solve influence line problems.

Course Content:

- Introduction: Terminology; functional, economic and aesthetic considerations;
- Types of concrete bridges; construction methods; geotechnical considerations.
- Loads: calculation of highway design loading according to the European standards (EC1), maximum static loads.
- Moving loads.
- Thermal loads: code requirements, expansion gaps, bearings.
- Wind Loads.
- Seismic loads.
- Usual damages of bridges during past earthquakes, Seismic isolation.
- Modelling: discretization methods, frame models, detailed finite element models, sub-soil and foundation modelling issues, modelling of pre-stressed bridges.
- Analysis; Influence lines; load combinations for the worst-case scenario.
- Design: required material properties; design process for static and moving loads according to codes.
- Use of specialized software for bridge analysis.

Learning Activities and Teaching Methods:

Lectures, Projects, Experiments, in-class assignments, discussion.

Assessment Methods:

Homework, Project, mid-term exam, final exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Designers' Guide to EN 1992 Eurocode 2: Design of concrete structures. Part 2: concrete bridges	C.R. Hendy D.A. Smith	Thomas Telford Ltd	2007	9780727731593

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Seismic Design and Retrofit of Bridges	M. J. N. Priestley, F. Seible, G. M. Calvi	John Wiley & Sons	1996	9780471579984