



<b>Course Code</b> CVEE-455	<b>Course Title</b> Bridge Analysis and Design	<b>ECTS Credits</b> 6
<b>Department</b> Engineering	<b>Semester</b> Fall, Spring	<b>Prerequisites</b> CVEE-351
<b>Type of Course</b> Elective	<b>Field</b> Civil & Environmental Engineering	<b>Language of Instruction</b> English
<b>Level of Course</b> 1 <sup>st</sup> Cycle	<b>Year of Study</b> 4 <sup>th</sup>	<b>Lecturer(s)</b> Dr Loizos Papaloizou
<b>Mode of Delivery</b> Face-to-face	<b>Work Placement</b> N/A	<b>Co-requisites</b> None

### **Objectives of the Course:**

The main objectives of the course are:

- 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:

- 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.

**Course Contents:**

**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

**Seismic loads:** Eurocode 8 requirements, 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 EC2; additional requirements of EC8 for the seismic design.

**Learning Activities and Teaching Methods:**

Lectures, in-class examples and exercises, Homework assignments

**Assessment Methods:**

Homework assignments, mid-term exam(s), final exam.

**Required Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
C.R. Hendy and D.A. Smith	Designers' Guide to EN 1992 Eurocode 2: Design of concrete structures. Part 2: concrete bridges	Thomas Telford Ltd	2007	978-0727731593

**Recommended Textbooks/Reading:**

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