



ACADEMIC YEAR: 2019-20

COURSE: Bridge Construction

TYPE OF EDUCATIONAL ACTIVITY: Characterizing

TEACHER: Giuseppe SANTARSIERO

e-mail: giuseppe.santarsiero@unibas.it

web: web.unibas.it/santarsiero

phone:

Mobile (optional):

Language: Italian

ECTS: 6

n. of hours: 54

Campus: Potenza
School of Engineering
Program: Civil Engineering

Semester: II

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course of Bridge Construction is placed at the end of the Civil Engineering MSc and is aimed to provide the basic elements to design bridge of medium complexity and deal with long span bridges. Moreover, the course wants to provide the fundamentals to deal with existing bridges, for their assessment and retrofitting.

- **knowledge:** principles and theories for the structural analysis and design of bridges. Technological and construction aspects. Basic knowledge for monitoring, management and requalification of existing bridges.
 - **Skills:** ability to design a medium complexity bridge, recognizing the basic structural components and their interactions. Ability to use the safety verification methods according to the code prescriptions.
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PRE-REQUIREMENTS

- Knowledge of Structural Mechanics' basic concepts;
 - Knowledge of Structural Engineering concepts with emphasis on safety verification of steel and reinforced concrete structures;
 - Knowledge of structural analysis methods through finite element software packages.
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SYLLABUS

Part 1 – ANALYSIS AND DESIGN OF NEW BRIDGES: Evolutionary history of bridges, classification of bridges based on: material, static scheme, obstacle, road category. Considerations on the span length; design actions on bridges according to the current codes and brief comparison with the past ones; Influence lines and surfaces; Effects of shrinkage and creep; Bridges with box girder cross section; Bridges with beams-slab cross section; Analysis of prestressed structures; Analysis of mixed steel-concrete structures; Analysis of secondary structures: plates; Arch structure analysis; Piers, types of foundations, slab. Restraints and supports; Outline of cable-stayed bridges and suspension bridges; Construction methods of bridges; Overview of seismic analysis of bridges; Finite element modelling;

PART 2 – EXISTING BRIDGES: Evaluation of the health and safety of existing bridges with emphasis on material durability and seismic loads. Fundamentals of corrosion in concrete and prestressed concrete structures. Structural health monitoring (SHM) of bridges. Techniques for the static, seismic and functional requalification of bridges. Overview on Bridge Management Systems. Outline of strengthening techniques based on external post-tensioning and using fiber-reinforced polymers (FRP). Presentation of case studies related to existing bridges.

PART 3 – DESIGN EXERCISE: Design of the deck of a single span bridge.



TEACHING METHODS

The course is organized as follows:

- Theoretical lessons (40 ore);
- Classroom tutorials (14 ore);
- Homework exercise.

EVALUATION METHODS

The exam is divided in two parts on the same day:

- Oral examination related to parts 1 and 2 of the course. Theoretical and practical aspects of bridge design and management/strengthening of existing bridges;
- Discussion of the homework exercise and verification of the projects documents

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- M.P. Petrangeli, Progettazione e costruzione di ponti, IV ed., Ed. Masson, Milano, (1997);
- Fritz Leonhardt, (C. A. & C. A. P. Calcolo di progetto e tecniche costruttive), Eduard Monnig - I ponti. 6-Edizioni di scienza e tecnica (1979);
- M.J.N. Priestley, F. Seible, G.M. Calvi. Seismic Design and Retrofit of Bridges. Ed. Wiley and Sons. (1996);
- P.E. Pinto, P. Franchin, A. Lupoi. Valutazione e consolidamento sismico di ponti esistenti, IUSS Press, (2009);
- Lecture notes provided by the teacher.

INTERACTION WITH STUDENTS

Office hours: Thursday from 10.30 am to 12.30 am. 2nd floor, Laboratory of Structures, School of Engineering.
Professor can be contacted by e-mail.

EXAMINATION SESSIONS (FORECAST)¹

14/02/2020, 13/03/2020, 09/04/2020, 11/05/2020, 08/06/2020, 03/07/2020, 18/09/2020, 23/10/2020, 20/11/2020, 16/12/2020.

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION

¹ Subject to possible changes: check the web site of the Teacher or the Department/School for updates.