Degree course	PostGrad Course: Architecture-Restoration LM4
Course code	
Lecturer	Aurora Angela Pisano, Raffaele Pucinotti
Course name	Laboratory of Solids/Structural Mechanics and Structural Engineering, Part 1: Engineering Mechanics of Solids and Structures Part 2: Structural Engineering
Disciplinary area	Civil Engineering and Architecture
Disciplinary field of science	ICAR/08 Solids and Structural Mechanics ICAR/09 Structural Engineering
University credits - ECTS	8
Teaching hours	80
Course year	First
Semester	First and Second

Synthetic description

The laboratory introduces the basic concepts of analysis, design and safety of structure in accordance with the latest Italian and International standards. The first part of the course is dedicated to masonry structures, load analysis, description and interpretation of the most recurring structural elements. Particular attention is given to the arches. The second part of the course starts with the static of reinforced concrete and steel and then goes to the design of simple structures as well as the verification of structural elements by means of the semi-probabilistic method at ultimate-limit-states.
The Laboratory also addresses issues related to on-site and laboratory investigations with particular reference to non-destructive testing (PnD). Finally, the criteria for the anti-seismic design of buildings and some simplified methods of analysis are introduced.

Course entry requirements

Calculus, Statics, Solids and Structural Mechanics

Course programme

PART 1: ENGINEERING MECHANICS OF SOLIDS AND STRUCTURES

Masonry structures: general concepts, recalls on the mechanical behavior of no-tensile-strength materials. The roof structures, the elevation structures. Design criteria. Load analysis; seismic actions, arches, chains, steel reinforced masonry. Flat arches and their static behavior. Ropes and arches: two optimal static shapes. Elements of static graphics.
Structural elements calculation techniques; simplified seismic analysis: equivalent static analysis. Masonry structures: analysis, diagnosis, structural intervention techniques for consolidation. Design and verification of arches. Mery's method. Introduction to the anti-seismic design of masonry constructions. Standard references and applications.

PART 2: STRUCTURAL ENGINEERING

Existing structures: main deterioration causes in reinforced concrete-, steel-, wood- and masonry-structures. Structural diagnosis techniques: destructive (drilling cores) and non-destructive evaluations. Interpretation of results of laboratory findings and of non-destructive tests.
Structural types: analysis of the most common structural types and identification of the main structural parts.
Computational methods for reinforced concrete structures: suggestions by technical rules.
Seismic action effects: probabilistic approach in safety assessment of buildings.
Static theory of reinforced concrete: semi-probabilistic method at ultimate-limit-states.

Expected results

Students are required to acquire the basic concepts of structural analysis, design and safety in accordance with the latest Italian and International standards. Students should therefore acquire all the necessary skills to define a new structural intervention strategy that, starting from the computational model adopted, eventually provides implementing requirements in accordance with suggestions given by the current technical rules with emphasis to the strength of structures under seismic actions.

Course structure and teaching

Lectures *(hours/year): 50*
Exercises *(hours/year): 30*

Student's independent work

Exercises, Applicative work and practical tests.

Testing and exams

The acquired knowledge will be verified through applicative works developed during and / or at the end of the course and through an oral exam concerning theoretical and general concepts. The final will take into account the degree of student learning as well as the capacity of the student to apply and argue the acquired knowledge.

Suggested reading materials

In Italian:
S. Di Pasquale, C. Messina, L. Paolini, B. Furiozzi- *Nuovo Corso di Costruzioni- Vol. 1-7*. Le Monnier 2009
F. P. Beer, E. R. Johnston, *Scienza delle Costruzioni, introduzione alla meccanica dei materiali*, Ed.McGraw-Hill libri Italia s.r.l., Milano, 1997.
E. Viola, *Esercitazioni di Scienza delle Costruzioni – vol. I:* Strutture Isostatiche e Geometria delle Masse, Ed. Pitagora, Bologna, 1977.
Esercizi svolti -- http://www.pau.unirc.it/scheda_persona.php?id=612.

Cosenza E., Manfredi G., Pecce M., Strutture in Cemento Armato, Hoepli, 2010;
Raffaele Pucinotti, Patologia e diagnostica del cemento armato, Dario Flaccovio Editore (2006).
Bursi Oreste S.; Pucinotti Raffaele; Zanon Gabriele, Progettazione di Giunzioni e Strutture Tubolari in Acciaio, Dario Flaccovio Editore (2012).
Lessons' notes

In English:
F. P. Beer, E. R. Johnston, J.T. DeWolf, D.F. Mazurek. *Mechanics of Materials*, McGraw-Hill Education, 7th Edition, 2014.
E.P. Popov. *Engineering mechanics of solids*, Prentice Hall 2nd Edition, 1998.
R. Park, T. Paulay. *Reinforced concrete structures*, New York, London, etc.: Wiley, 1975.
T. Paulay, M.J.N. Priestley. *Seismic design of reinforced concrete and masonry buildings*, New York, Wiley 1992.