UNIVERSITÀ DEGLI STUDI DI PALERMO

SCHOOL	POLYTECHNIC SCHOOL
ACADEMIC YEAR	2016/2017
SECOND CYCLE (7TH LEVEL) COURSE	BUILDING ENGINEERING
SUBJECT	STRUCTURAL PROBLEMS IN MONUMENTS AND HISTORICAL BUILDINGS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50355-Edilizia e ambiente
CODE	05793
SCIENTIFIC SECTOR(S)	ICAR/09
HEAD PROFESSOR(S)	LA MENDOLA LIDIA Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**LA MENDOLA LIDIA** Monday 12:00 14:00 presso la stanza del Prof. La Mendola - sita al secondo piano - Edificio 8 - DICAM

DOCENTE: Prof.ssa LIDIA LA MENDOLA

TEACHING METHODS	Front lessons; exercises in class; visits to the Laboratory of Structures of DICAM.
ASSESSMENT METHODS	Oral examination. The interview is aimed at determining the student's ability to process the knowledge gained by using them to solve problems and the ability to express the teaching content using a technically correct language. The vote is expressed in thirtieths with possible praise, according to the scheme reported at the bottom of the degree program homepage, i.e. "Metodi di valutazione".
LEARNING OUTCOMES	Knowledge and understanding Knowledge regarding: - the most common types of structural elements of ancient masonry buildings - the structural diagnostic methodologies - the methods of structural analysis and verification of the structural elements of the building historic and monumental buildings - the safety assessment criteria - rehabilitation or reinforcement structural design The understanding regarding: - skills in interpreting the crack patterns that provide information on the causes of damage - the choice of the most suitable methods for checking the global behaviour - identifying and conducting of local verification on parts of the structure - the choice of traditional and / or innovative intervention techniques more effective and appropriate to be taken. Applying knowledge and understanding The skills transferred to the student are: - the interpretation of the most common structural problems of historical buildings - the planning of specific experimental tests necessary for the structural diagnostic - the modeling of the behaviour under the most frequent load conditions as well as under earthquakes of the types most spread throughout the country - the safety assessment related to the regulatory guidelines - the design of appropriate interventions of consolidation and/or structural reinforcing on the existing constructions Making judgements - The student will have acquired the ability to choose and apply the most suitable verification and/or intervention criteria for existing masonry buildings. - The student will be able to choose the project intervention of structural rehabilitation in compliance with the current building codes, also respecting the historical value of the building, evaluating the effectiveness of different design solutions. Communication - The students will have acquired the ability to communicate and express issues concerning the mechanical response of existing masonry buildings. - The student will be able to hold conversations on topics related to the structural safety and the planning and design of interventions of consolidation or structural reinforcement, to envisage ideas and offer solutions to both specialists and non-specialists. Learning skills - Based on the gained knowledge, the student will be able to learn from sources from the scientific literature and keep abreast of new techniques and new materials used in the consolidation systems. - During the course, the student will be addressed in order to gain awareness of the importance of a constant update for the maintenance of a good level of knowledge and professionalism.
EDUCATIONAL OBJECTIVES	The course has the objectives to provide the criteria and methods for identification and verification of the behavior of monumental and historical masonry buildings under different loading conditions.
PREREQUISITES	Continuum mechanics of elastic systems De-Saint Venant beam theory Constitutive laws of brittle and ductile materials Structural analysis methods for framed structures Design and verification of structural members according to the semi-probabilistic limit state method Forces acting on buildings Static linear analysis with response spectrum method Ductility, behaviour factor and capacity design
SUGGESTED BIBLIOGRAPHY	- Michele VINCI, Metodi di calcolo e tecniche di consolidamento per edifici in muratura, Analisi – Esempi di calcolo – Particolari costruttivi, Dario Flaccovio Editore, 2012. - Liborio CAVALERI, Valerio RADICE, Specificita' nella valutazione della capacita' delle strutture murarie di nuova costruzione, Aracne Editrice s.r.l., 2013.

	- Dispense didattiche su argomenti ed esercizi svolti a lezione, fornite nel corso dello svolgimento dell'insegnamento.

SYLLABUS

Hrs	Frontal teaching
6	Diagnostic and monitoring of masonry structures. Historic investigation. Geometric survey and crack patterns. Mechanical characterization of materials: masonry and timber. Tests in situ and in laboratory. Survey and monitoring of cracks. Measurement technology.
4	Analysis of instability. Interpretation of the crack pattern through the stress state analysis. Masonry failure criteria. Collapse of foundations. Damage due to earthquake.
6	Design models. Typological classification of buildings for housing. Failure of masonry walls. Models and analysis methods for vertical and horizontal loads.
4	Analysis of specialized typologies and simplified safety assessment methods. Identification of the most vulnerable substructures. Verifications against local failure mechanisms.Arches and vaults.
2	Stability of the masonry column. Domains of stability and resistance curves.
6	Strategies and types of intervention. Techniques for the repair and strengthening of buildings damaged by the earthquake. Analysis of the behavior as a result of the consolidation. Use of innovative materials.

Hrs	Practice
2	Illustration of laboratory tests during the visit of the Laboratory of Structures of DICAM.
4	Verifications of masonry panels and spandrel beams. Out-of-plane verifications.
6	Plane and out-of-plane failure mechanisms. Linear cinematic analysis.
2	Design of steel ties.
2	Composite timber-concrete floor systems.
4	Nonlinear static analysis.
4	Consolidation project with the use of FRP.