



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2021/2022
BACHELOR'S DEGREE (BSC)	BUILDING ENGINEERING, INNOVATION AND RETROFITTING
INTEGRATED COURSE	BUILDING RECOVERY - INTEGRATED COURSE
CODE	20422
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	ICAR/09, ICAR/11
HEAD PROFESSOR(S)	COLAJANNI PIERO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	COLAJANNI PIERO Professore Associato Univ. di PALERMO PENNISI SILVIA Professore Associato Univ. di PALERMO
CREDITS	12
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	<p>COLAJANNI PIERO</p> <p>Monday 15:30 17:30 Edificio 8, Dipartimento di Ingegneria, Area Strutture, II piano</p> <p>Wednesday 15:30 17:30 Edificio 8, Dipartimento di Ingegneria, Area Strutture, II piano</p> <p>Thursday 10:30 12:30 Edificio 8, Dipartimento di Ingegneria, Area Strutture, II piano</p> <p>PENNISI SILVIA</p> <p>Monday 10:00 13:00 Edificio 8 Piano Terra, Geotecnica, stanza n. 4. Inviare prima mail all'indirizzo silvia.pennisi@unipa.it</p>

PREREQUISITES	<p>The basic notions of mathematics, geometry, chemistry of the materials and sketch are recommended with the purpose to understand and to apply with profit the concepts related to the safety of worksites that will be object of the course. Moreover, the basic knowledge of the mechanics of elastic continuum, the De Saint-Venant beam theory, the behavior and calculation methods of structural elements in c.a. and safety checks according to the semi-probabilistic limit state method are required in order to understand the calculation procedures of structural recovery interventions.</p>
LEARNING OUTCOMES	<p>At the end of the course students will be expected to have acquired knowledges about the technical organization of a yard, in the globality of the problems connected, from the logistics to the safety; they will be expected to have acquired besides knowledge of the definitions, the techniques and the materials of the building recovery through the descriptions of the materials used (physical ownership and mechanics) more commonly and of the constructive techniques and of recovery of constructive elements, both of the buildings in masonry and in reinforced concrete. Students will be expected to have acquired knowledges on the principal dynamics of patogenesis that interest the existing buildings and on the methodologies of intervention to eliminate its conclusive causes, as well as the methodologies of planning of the maintenance of the buildings. It will learn to understand the relationships that tie the phenomena studied in the course and many matters and thematic treated in the courses preliminarily followed. He will learn about traditional and innovative structural survey techniques, the principles of static behaviour of masonry structures, analysis techniques for the knowledge of the structural organism of masonry and reinforced concrete constructions, the types and techniques of analysis of landslides, traditional and innovative methods for the structural recovery of masonry and reinforced concrete constructions.</p> <p>Applying knowledge and understanding During the course, the student will understand the complexity of the building management both during the executive phase and in the rehabilitation and structural reinforcement too. He will be solicited to develop a capacity of evaluation and application of the studied concepts. This process will be aided by the development of the implementation of a structural reinforcement plan. With the aid of the teacher, the contribution of the theoretical study and the exchange of profitable informations on the cases of study with the colleagues he should be able to choose the typology of intervention adjusted to the case in examination and to the specific context, besides compiling useful documents for intervention in housebuilding.</p> <p>Making judgments The aim of the course is to make the student able in analysis and synthesis, in evaluation of the proposed cases by direct and indirect analysis and in deciding the suitable solution for the problems he will be confronted in professional life. The student will acquire the ability to choose and apply the most suitable intervention design for the analysed masonry or reinforced concrete structure, in compliance with current regulations, independently evaluating the effectiveness of the different design solutions.</p> <p>Communicative skills Students should be able to report (in a clear and certain way) on the topics dealt with during the course and related about them. During the course group works will develop and the brainstorming will encourage the interdisciplinary aspect of the matter. They will acquire the capacity of communicate with the stakeholders.</p> <p>Learning skills This course aims at developing students awareness of the acquired competences for self-directed learning of content and methods necessary and required in their professional lives.</p>
ASSESSMENT METHODS	<p>The oral examination, during which the student will be invited to answer on questions related to the developed program and practical cases related to the treated themes, will be finalized to the evaluation of the level reached as it regards: - knowledge of the treated themes - competence in the practical application to specific cases of such concepts - ability of expression and technical language - abilities of synthesis and data processing. The final evaluation will be the weighted average between the two evaluations of the modules.</p> <p>excellent 30 – 30 with distinction Excellent knowledge of the topics and very good language skills. Good analytical skills. The student is able to use the knowledge he/she has acquired to solve problems. very good 26-29 Good grasp of the topics. Sound language skills. The student is able to use the knowledge he/she has acquired to solve problems. good 24-25 Basic knowledge of the main topics. Fair language skills with limited ability to independently use the knowledge acquired to solve problems. satisfactory 21-23 The student lacks a firm grasp but has some knowledge of the</p>

	<p>main topics. Satisfactory language skills. Low ability to independently use the knowledge acquired. sufficient</p> <p>18-20 Minimum basic knowledge of the main topics and technical language. Very low ability to independently use the knowledge acquired.</p> <p>fail The student does not have an acceptable knowledge of the topics</p>
TEACHING METHODS	<p>The teaching will be organized with lectures, exemplary classroom exercises of practical cases and discussion of the problems under the supervision of the teacher. During the latter the student will be asked to develop simple design exercises independently, partly in the classroom and partly during the hours of personal study. The lessons will be conducted with the help of slides with images and examples. In the context of exercises, the student will have the opportunity to apply the concepts covered during the course, thus developing the ability to connect the different topics with their practical application, to develop the data processing capacity.</p>

MODULE INNOVATIVE TECHNIQUES FOR STRUCTURAL RECOVERY

Prof. PIERO COLAJANNI

SUGGESTED BIBLIOGRAPHY

Dispense fornite dal docente.

Pisani, Cattaneo, D'Antino: Consolidamento delle strutture: guida ai criteri, ai materiali e alle tecniche più utilizzati, Hoepli Editore, EAN: 9788820391652

Michele Vinci, Metodi di calcolo e tecniche di consolidamento per edifici in muratura, Dario Flaccovio Editore, EAN: 9788857909509

- M. Dolce e G. Manfredi (curatori), Linee guida per la riparazione e il rafforzamento di elementi strutturali, tamponature e partizioni, Doppiavoce, Napoli.
 - ReLUIS (2010). Linee guida per il rilievo, l'analisi ed il progetto di interventi di riparazione e consolidamento sismico di edifici in muratura in aggregato. Bozza aggiornata al 12/10/2010.
 - DM 20.02.2018, Aggiornamento delle Norme Tecniche per le Costruzioni.
 - Circolare . Min. Infrastrutture e Trasporti n. 7 del 21 gennaio 2019, pubblicata in Gazzetta Ufficiale n. 35/2019, con oggetto: Istruzioni per l'applicazione dell' aggiornamento delle norme tecniche per le costruzioni di cui al decreto ministeriale 17 gennaio 2018.
 - CNR-DT 200 R1/2013, Istruzioni per la progettazione, l'esecuzione ed il controllo di interventi di consolidamento statico mediante l'utilizzo di compositi fibrorinforzati.
- CNR DT 215/2018 sulle "Istruzioni per la Progettazione, l'Esecuzione ed il Controllo di Interventi di Consolidamento Statico mediante l'utilizzo di Compositi Fibrorinforzati a matrice inorganica".

AMBIT	50107-Ingegneria della sicurezza e protezione delle costruzioni edili
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

The course provides basic notions on the design of structural retrofitting of masonry or reinforced concrete building, using traditional and innovative techniques, analyzed with reference to the prescriptions and indications of current Italian and European codes.

Through lectures, classroom exercises and individual study hours the student will acquire the awareness and critical spirit necessary to apply the knowledge learned and to know how to face and solve the problems that will arise with the identification of suitable design solutions. He will learn to know the dynamics that lead to the degradation of and the reduction of the carrying capacity of structures, and to apply the correct methods to identify and formulate the appropriate design solutions in a retrofitting and structural reinforcement intervention. This path will make him able to play the complete and interdisciplinary role in accordance with the other subjects of the Degree Course.

SYLLABUS

Hrs	Frontal teaching
4	Elements on the behavior of masonry structures and code indications: - mechanical characteristics of materials making up the masonry: - masonry buildings: vertical structural elements: behavior of the walls for vertical actions - behavior of the walls to horizontal actions in the plane and outside the plane .. - structural elements of the deck
2	Structural pathologies of masonry buildings due to durability problems, vertical actions and subsidence: Structural upheavals: definitions, types, diagnosis of landslides and masonry injuries
4	Process and techniques for the knowledge of existing masonry structures and code prescriptions: Historical investigation of the construction system; traditional and innovative survey methods and geometric control of the dimensions of structural elements; relief of structural construction details. Methods of investigation of the stress state, and determination of mechanical properties with destructive and non-destructive methods in situ and in the laboratory
3	Traditional consolidation interventions on masonry structures Bursts and stitches, simple and armed injections, reinforced partitions, pillar hoops, floor connection and stiffening systems, platform plates, consolidation and stiffening of wooden floors; consolidation and recovery of roofs and foundations. Room openings: architraves and hoops
4	Innovative consolidation interventions on masonry structures: Composition and geometry of fiber-reinforced materials with organic matrix (FRP) or inorganic (FRCM), material crisis mode; external reinforcement with fiber-reinforced materials with organic matrix (FRP) or inorganic (FRCM); confinement and active and passive reinforcement through hoops with metallic materials (CAM or similar); capacity models for reinforced masonry panels against actions in the plan.
2	Structural pathologies of buildings in c.a due to durability problems, shrinkage cracking Chemical, physical, mechanical degradation, technological causes, and incorrect design
3	Process and techniques for the knowledge of existing structures and code prescriptions: Description of the process of knowledge of existing structures in light of the current regulatory framework: - historical investigation - methods of geometric control and survey of construction details. Survey program, Determination of material properties, Concrete investigations, Non-destructive methods. Processing of concrete test results, reinforcement investigations
2	Traditional consolidation interventions on a. C.: Local interventions for repair and improvement, global interventions for improvement and adaptation

4	Innovative consolidation interventions on r.c. structures: calculation criteria for external reinforcement with fiber-reinforced materials with organic matrix (FRP) or inorganic (FRCM); crisis by delamination; beam shear and bending reinforcement, bending reinforcement of floor joists, perimeter connection interventions of infill walls; confinement and active and passive reinforcement through hoops with metallic materials. Regulatory information and guidelines CNR DT 200.
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Hrs	Practice
2	Exercises on the evaluation of the strength of masonry elements and structures
2	Exercise on interpretations of masonry building pathologies
2	Esercitations on traditional consolidation interventions on masonry structures
6	Traditional and / or innovative consolidation designs on masonry structures
2	Exercises on structural pathologies of buildings in c.a due to durability problems, shrinkage cracking
2	Esercitations on process and techniques for the knowledge of existing structures
2	Exercise on innovative consolidation interventions on r.c. structures
6	Traditional and / or innovative consolidation designs on reinforced concrete structures

MODULE BUILDING PROCESS AND BUILDING RECOVERY

Prof.ssa SILVIA PENNISI

SUGGESTED BIBLIOGRAPHY

F. Astrua, R. Nelva, Manuale del recupero edilizio, Maggioli editore, 2016, ISBN 8891616043.
E. Arbizzani, Tecnica e tecnologia dei processi costruttivi, Maggioli editore, 2013, ISBN 8891612863.
F. Ossola, Produzione edilizia: manuale per la gestione del processo edilizio, Levrotto e Bella, Torino, 2008, ISBN 978-8882181352.
F. Lanzarone, L. Gargagliano, M. Cuffaro, Progettare il recupero edilizio, Dario Flaccovio, Palermo, 2010, ISBN 978-88-579-0061-2
L. Malighetti, Recupero edilizio. Strategie per il riuso e tecnologie costruttive, il sole 24 ore, 2010. ISBN 8832477807.
E' consigliata qualsiasi edizione dei testi indicati

AMBIT	50107-Ingegneria della sicurezza e protezione delle costruzioni edili
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

At the end of the course students will be expected to have acquired and implemented the capacity of identification of the problems and resolution of the same with suitable planning solutions. This will implicate the development of the capacity of analysis of data and informations. Besides students will be expected to have acquired competences regarding the thematic faced and the capacity of synthesis of the data .

SYLLABUS

Hrs	Frontal teaching
4	The building process and its interaction with the environment
4	The building system
2	The phases of the building process (planning, project, construction and management)
4	The stakeholders of the building process (role and function)
4	The quality in the building process
4	Safety in building site
4	The building site
2	Sustainability in the whole building process

Hrs	Practice
6	Building rehabilitation (maintenance, restoration, building rehabilitation and urbanistic rehabilitation)
3	The damage of construction elements , application 1
3	Diagnosys finalized to buildings rehabilitation, application.
6	Diagnostic testes applied to building. Brainstorming and group works
3	The damage of construction elements , application 1
3	Damages interpretation in both reinforced concrete and masonry, application.