Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: Building Materials + Laboratory			
ACADEMIC YEAR: 2019-2020			
TYPE OF EDUCATIONAL ACTIVITY: Characteristic			
TEACHER: Milena Marroccoli (3 ECTS) and Antonio Telesca (3 ECTS)			
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Language: Italian			
ECTS: 6	n. of hours: 60	Campus: Potenza School of Engineerlng: Program: Professional Course in Building and Land Management Techniques	Semester: I

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The aim of the course is to give the students the main basics related to structure, properties and technological applications of selected materials, belonging to metals, ceramics, polymers and composites, suitable for different applications in the construction field. Achieving this knowledge will allow them the most advantageous and correct use of these materials.

Knowledge and ability to understand

At the end of the course the student will obtain the knowledge needed in order to understand the correlations between atomic structure, microstructure, macrostructure and operational behavior of the materials usually employed in the construction sector.

Ability to use knowledge and understanding

At the end of the course the student will be able to develop a range of professionalizing skills the will allow him to choose the most suitable material to be used in a particular exposure environment.

Autonomy of judgment

After passing the exam, the student will have acquired the necessary tools to interpret the experimental tests carried out on construction materials, foreseeing and analysing in a critical way their behaviour during the implementation. Moreover, thanks to the obtained knowledge, the student will be able to consult and enrich the scientific literature on the topic and to understand and apply the technical standards related to building materials.

Communicative abilities

The student will be able to hold a conversations about the choice and the implementation of building materials that are more suitable for a particular employment and also have less impact on the environment, proposing autonomous solutions and ideas also to interlocutors not expert in the field.

Ability to learn

The student will be aware of the need to be constantly and independently updated in order to maintain a high level of preparation and competence.

PRE-REQUIREMENTS

None

SYLLABUS

The classes of materials. Primary and secondary chemical bonds. The crystal structure of metals and ceramics. Coordinates of Atomic Positions, Directions and Planes. Dense Planes and Directions. Defects in Crystalline solids. Dislocations Mechanism of Plastic Deformation.

Strengthening a Metal: solid solution hardening, precipitate and dispersion strengthening, cold work-hardening, the dislocation yield strength . Increasing the ductility by annealing

Notes on mechanical properties. Stresses and strains. Linear and non linear Elasticity. Anelastic

behaviour. Engineering and true stress-strain curves. Plastic deformation of metals. Hardness. Fracture. Fatigue. Creep.
Notes on thermal properties. Heat capacity. Thermal expansion. Thermal conductivity. Thermal stresses.
Phase Diagrams. Analysis of Binary Phase Diagrams. The Binary Eutectic Phase Diagram. Intermediate Compounds and Intermediate Phases. Peritectic solidification. Eutectoidic transformation.
Metals. Cast iron and steel manufacturing process. The Iron-Carbon System. Steels. Carbon content influence on the technical behaviour of steels. Cast iron. Thermal treatments on steels. Non-ferrous alloys.
Building steels.
Ceramics. Chemical and physical properties of clay. Masonry bricks. Manufacturing process, structure and physical-mechanical tests. Tiles, gres and porcelain. Common and special glass: manufacturing process, structure and use. Non-hydraulic binders. Gypsum and aerial lime: manufacturing process, structure and use. Hydraulic binders. Hydraulic lime: manufacturing process, structure and use. Portland cement manufacturing process. Hydration reactions. Physical, chemical and mechanical properties of cement paste and mortar. Blended cements. Classification of cements. European legislation and tests on cements. Innovative binders with reduced environmental impact. Concrete. Constituents and mix design. Concrete workability. Pouring, compaction and aging of concrete. Exposure classes. Resistance tests. Results analysis.
Polymers. Thermoplastics and thermosetting polymers. Manufacturing process, structure, properties and application fields
Composites. Manufacturing process, structure, properties and application fields. Mechanical characteristics under different conditions.
Laboratory activity. Evaluation of physical and mechanical characteristics of cementitious pastes and mortars

TEACHING METHODS
Theoretical lessons, Classroom tutorials, Laboratory tutorials.

EVALUATION METHODS
Written examination.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL
Notes from lectures
G. Frigione, N. Mairo – Materiali per l'edilizia, Ulrico Hoepli Editore.
W. D. Callister, D. G. Rethwisch - Materiali per l'ingegneria civile e industriale, Edizioni Edises

INTERACTION WITH STUDENTS
Wednesday 3-5 pm. Other appointments can be arranged with students by e-mail.

EXAMINATION SESSIONS (FORECAST)[1]
2020 Year
4/2; 20/3; 8/5; 12/6; 2/7; 17/9; 6/11; 11/12

SEMINARS BY EXTERNAL EXPERTS YES □ NO x

FURTHER INFORMATION

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