

CIVL284: Materials of Construction

Year and Semester	:	2, Fall 2020-2021
Credit Hour	:	(3,2) 4
Pre/Co requisite(s)	:	--
Course web page	:	https://staff.emu.edu.tr/ozgureren/en

Catalog Description:

Production, types, uses in construction, properties and related tests for the following materials are covered: gypsum, lime, cement, aggregates. Properties of fresh and hardened concrete and concrete mix design calculations. Bricks, building stones, plasters, steel, timber and polymers will also be covered.

Prerequisite by Topic:

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Textbook:

1. CIVL284 Materials of Construction, Lecture Notes, Prepared by Özgür Eren. (can be downloaded from the course web site)
2. CIVL284 Materials of Construction Laboratory Manual. (can be downloaded from the course web site)

References:

1. A. M. Neville, J J Brooks, Concrete Technology, 2002.
2. T. W. Marotta, Basic Construction Materials, Sixth Edition, Prentice-Hall, 2002.
3. Design of Normal Concrete Mixes, Second Edition, BRE, UK, 1997.

Course Objectives:

- Learn and understand properties and types of gypsum, lime, and cements.
- Learning aggregates and importance of aggregates in concrete.
- Testing methods and properties of fresh and hardened concrete.
- Types and uses of clay bricks, building stones and plasters and metals.
- Paints, polymers and wood for construction will be discussed in detail.
- Proportioning of concrete mixtures (concrete mix design).

Course Outcomes:

At the end of the course the students will be able to:

1. Carry out different experiments on construction materials such as cement, aggregate, fresh and hardened concrete, bricks and timber in a team of not more than five students.
2. Discuss experiment results and present results in a graphical way in technical report.
3. Design, mix and test concrete samples with different standard specifications.
4. Describe the manufacturing, characteristics, and properties of a number of different materials like bricks, timber, polymers, stones, steel and plasters.
5. Collaborative study practice and independent learning.

Weekly Teaching Plan:

Week 1	Introduction to materials of construction (3 Classes) Course objectives, course description, Introduction to construction materials.
Week 2-3	Lime and Gypsum (6 Classes) Production of lime and gypsum. Hardening of gypsum. Properties of gypsum. Practice of calcinations of lime. Classification of quicklime. Hydration of lime. Hydraulic lime.
Week 4-6	Cements and aggregates (9 Classes) History of cements. Raw materials of Portland cement. Chemical composition and main chemical compounds of cement. Manufacturing. Physical properties and types (EN, ASTM). General classification of aggregates. Particle shape and texture. Mechanical and physical properties.
Week 7-8	Fresh and hardened concrete (6 Classes) Workability and measurement of workability. Segregation and bleeding. Mixing time and compaction methods. Mixing water quality. Shrinkage of hardened concrete. Durability aspects. Testing and evaluation of hardened concrete.

- Week 9 Concrete Mix Design (3 Classes)**
Workability of concrete. The compressive strength of concrete and concrete classes. Variability of concrete strength during production. Characteristic strength. Margin for mix design. The mix design process. Trial mixes. Examples on mix design.
- Week 10-12 Bricks, Building Stones, plasters (6 Classes)**
Manufacturing. Types of bricks. Mortars for brick-walls. Properties of bricks and brick-walls. Types of natural building stones. Production of finished stone. Finishes on stone slabs and panels. Stone selection. Bond patterns in stone masonry walls. Glass masonry units. Fire resistance of masonry walls. The plastering process. Classes of gypsum plasters. Lightweight aggregates. Lime. Factors affecting the choice of plaster. Plasterboards. Common defects in plastering.
- Week 12-13 Steel, wood and polymers (6 classes)**
Mechanical properties of metals. Extraction of metals. Carbon content of steel. Strength of timber. Stress grading. Moisture content. Timber seasoning. Classification of trees. Manufacturing of lumber. Softwood and hardwood lumber classification. Plywood. Classification of polymers. Thermoplastics. Thermosetting plastics. Chemically setting plastics. Types of plastics. Manufacture of organic plastics. Plastics in construction.

Course Professional Component:

Mathematics and basic sciences: 3.5

Engineering topic and design: 0.5

General education: 0

Computer Usage:

Students are encouraged to use the Internet to search for various topics, including contents of similar courses offered elsewhere. MS Excel software is used in the lab and for solving homework problems. Students can reach the teaching material, solved problems, data sheets, past exam papers etc. on the allocated Web site.

Teaching Techniques:

Power point presentation and multimedia tools are used in online classes. Tutorials are organised to establish a closer contact with students online.

Laboratory/Studio Works:

Laboratory sessions are organized in parallel to theoretical study given in classrooms. Recorded videos of experiments together with test data will be will shared online with students and reports will be submitted online until due date.

Grading Policy:

Homework (2)	10%
Quiz (5)	25%
Laboratory study (lab reports)	25%
Final Examination	40%

Attendance is compulsory and absenteeism of more than 70% of classes will cause grade "F". Students with poor interest, poor attendance, lack of two examination or lack of two experiments are graded NG.

Contribution of the course to program educational objectives and outcomes:

The course helped achieve the following educational objectives:

- Produce graduates with contemporary engineering knowledge, environmental awareness, ethics and necessary technical and computer skills for a successful professional life,
- Produce graduates with advanced knowledge, skills and practical information that will equip them with the necessary tools either for work in industry or pursuing further studies in the areas of civil engineering.