



Module (Course Syllabus) Catalogue

College/ Institute	Erbil Technology College	
Department	Construction and Materials Engineering department	
Module Name	Materials Testing	
Module Code	MAT233	
Degree	Technical Diplon <input type="checkbox"/>	Bachelo <input checked="" type="checkbox"/>
	High Diplom <input type="checkbox"/>	Master <input type="checkbox"/>
		PhD <input type="checkbox"/>
Semester	3	
Qualification	Doctorate	
Scientific Title	Lecturer	
ECTS (Credits)	7	
Module type	Prerequisite <input type="checkbox"/>	Core <input checked="" type="checkbox"/>
		Assist. <input type="checkbox"/>
Weekly hours		
Weekly hours (Theory)	(2)hr Class	(.....)Total hrs Workload
Weekly hours (Practical)	(3)hr Class	(.....)Total hrs Workload
Number of Weeks	12	
Lecturer (Theory and Practical)	Dr.Guler Fakhraddin Muhyaddin	
E-Mail & Mobile NO.	guler.muhyaddin@epu.edu.iq (07504480587)	
Websites		

Course Book

Course Description	Introduction to civil engineering materials laboratory and design of experiments, with focus on mechanical and physical properties of construction materials; including measurement of strains using mechanical gauges and electrical resistance strain gauges; experiments on metals, aggregates, Portland cement, cement mortar and concrete block..
Course objectives	<ol style="list-style-type: none">1. To give students the background required to pursue further studies in materials processing, design and related engineering fields.2. To develop an understanding of the differences between engineering materials through the application of laboratory experiments to determine their physical and mechanical behaviour.3. To introduce students, the failure modes and the use of destructive and4. nondestructive testing techniques of engineering materials.
Student's obligation	<p>Student's obligation throughout the academic year is attendance, they make assignments at every midterm, moreover, they do an experimental test then they should prepare reports upon the experimental test, finally they should do the final assignment or exam during the academic study.</p> <p>It can be very helpful to study with a group. This type of cooperative learning is encouraged; however, be sure that you have a thorough understanding of the concepts besides the mathematical steps used to solve a problem. You must be able to work through the problems on your own.</p>
Required Learning Materials	In the lecture during the academic study, am using (data show) for giving full detailing, beside that will be using the white board to solution the examples, and giving the students a hard copy of the lecture, finally, I will give the students a take home.



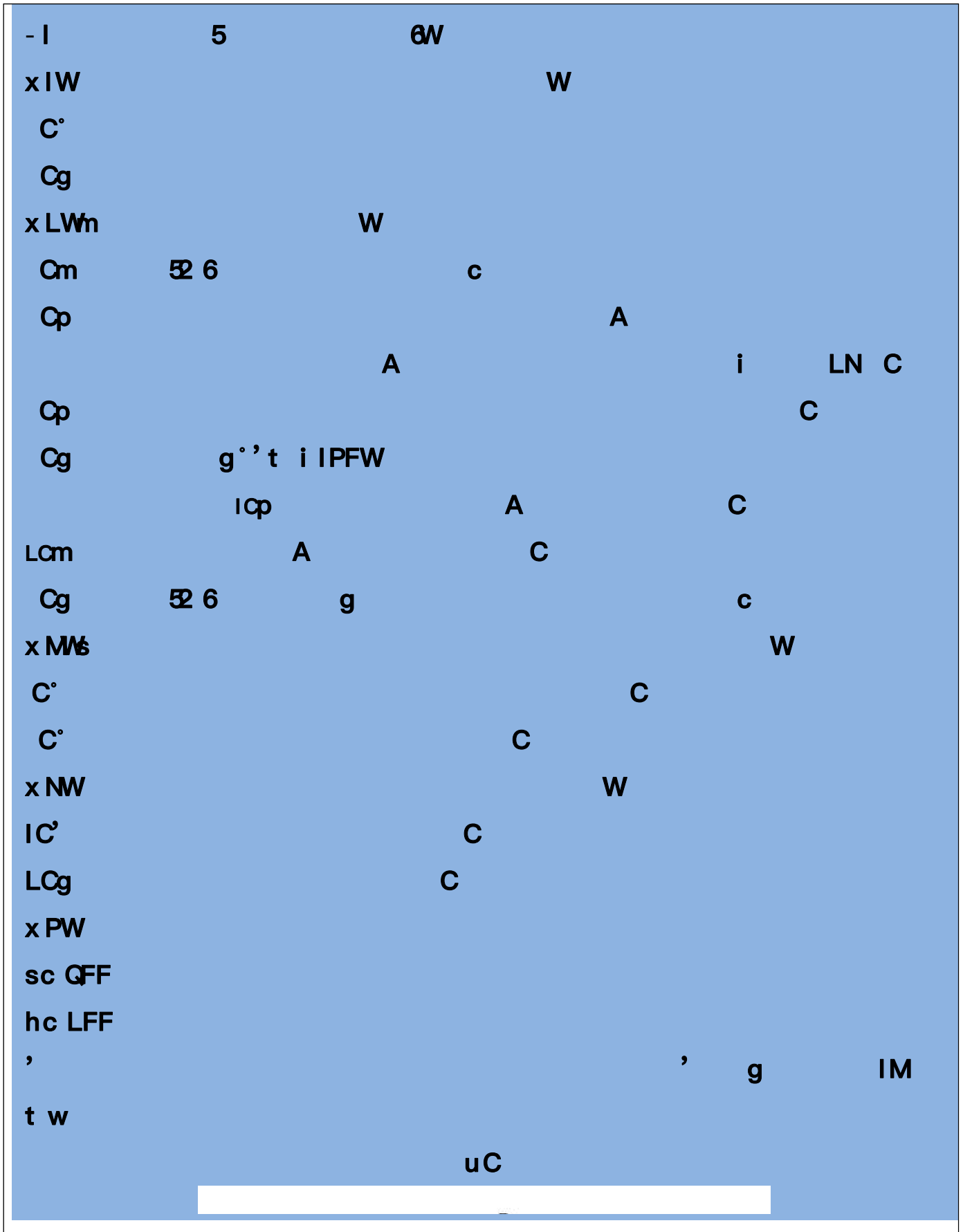
Evaluation	Task	Weight (Marks)	Due Week	Relevant Learning Outcome	
	Paper Review				
	Assignments	Homework	14%		
		Class Activity	2%		
		Report	24%		
		Seminar			
		Essay			
		Project			
	Quiz	4%			
	Midterm Exam	16%			
	Final Exam	40%			
	Total	100%			
<p>Specific learning outcome:</p>	<p>One of the main objectives of the course is to familiarize the students with the fundamental concepts of Materials Science and Engineering which will be used as background knowledge for the understanding of specialized courses in the field of Materials Science and Engineering that follow. Thus this course provides an introduction to the type of materials, structure, properties, characteristics and applications, with special emphasis on the relationships between internal structure and properties. At the end of this course the student should be able to:</p> <ol style="list-style-type: none"> 1. Classify the materials 2. Understand the basic properties that characterize the behaviour of materials 3. Understand the type of loadings/environment that materials should withstand 4. Select appropriate type of material for specific application 5. Offer different approaches to modify structure/microstructure in order to get desired properties. 				

i y s y W	1. American Standards (ASTM). 2. Iraqi Standard Specifications (IQS). 3. NCCLR (sampling manual) the National Center for Laboratories and Structural Research. 4. British Standards (BS EN). 5. IQ-NCCLR sampling Booklet. 6. International Standards Organization (ISO). 7. Iraqi Standards for Roads and Bridges (SORB). 8. Construction Materials Experiments Manual, Khalil Hassan Yunis and Tahseen Taha Hamad, Technical Institutes Authority - Erbil Technical Institute - Civil Technology Department, 2003.
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Course topics (Practical)	Week	Learning Outcome
Introduction on the material lab + Normal consistency of hydraulic cement.	Week 1	The students will more familiar with the material and instruments (equipment's) used during the course and find normal consistency of hydraulic cement. by determining the amount of water required to prepare cement pastes for Initial and final time of setting test
Initial and final setting time of cement	Week 2	determination of the time of Setting of cement by means of the Vicat needle
Fineness test of cement	Week 3	determination of the finesses of hydraulic cement by means of the 150 μm (No.100) and 75 μm (No.200) sieves.
Compressive strength of cement mortar	Week 4	determination of the compressive strength of cement mortars, using 2 in (50 mm) cube specimens.
Tensile strength of cement mortar	Week 5	determination of the tensile strength of cement mortars employing. The Briquet specimens
Reducing Field Sample of Aggregate to Test Sample and Sieve Analysis of fine and coarse aggregates	Week 6	To obtain laboratory samples of aggregates from stockpiles plus determination of the particle size distribution the fine and coarse aggregate by sieving.
Midterm Exam	Week 7	Midterm Exam
Specific Gravity and Absorption of Coarse Aggregate	Week 8	determination of Specific Gravity and Absorption of coarse aggregate. The specific gravity may be expressed as bulk specific gravity, bulk specific gravity SSD or apparent specific gravity..
Specific Gravity and Absorption of fine Aggregate	Week 8	determine Bulk and Apparent Specific Gravity and Absorption of fine aggregate
Resistance to Degradation of Small-	Week 9	cover testing sizes of coarse of

size coarse Aggregate by Abrasion in the Los Angeles Machine		(12.5mm) for resistance to degradation using the Los Angeles testing machine
Standard consistency test for gypsum	Week 10	obtain the quantity of water required to obtain a plaster paste with standard consistency, and this quantity of water used for other tests:(setting time and compressive strength tests for gypsum)
Water Absorption Test for concrete Block	Week 11	Obtain percentage of water absorption of concrete blocks.
Compressive strength test for concrete blocks	Week 12	find maximum strength for concrete blocks
Steel bar tension test	Week 13	To study the behavior of reinforcing steel when increasing the force to failure as well as to get the curve of stress and strain.
Course topics (Theory)	Week	Learning Outcome
Introduction to materials testing course and learning outcomes	Week 1	to familiarize the students with the fundamental concepts of Materials Science and Engineering which will be used as background knowledge for the understanding of specialized courses in the field of Materials Science and Engineering that follow.
Cement+ Normal consistency of hydraulic cement	Week 2	General information about cement as a building material and normal consistency of hydraulic cement by determining the amount of water required to prepare cement pastes for Initial and final time of setting test
Cement+ Initial and final setting time of cement	Week 3	General information about cement as a building material and determination of the time of Setting of cement by means of the Vicat needle.
Cement+ Density and specific gravity of cement+ Fineness test of cement	Week 4	General information about cement as a building material, find the density of cement and its specific gravity plus determination of the finesses of hydraulic cement by means of the 150 μm (No.100) and 75 μm (No.200) sieves.
Cement+ Compressive strength of cement mortar +Tensile strength of cement mortar	Week 5	General information about cement as a building material, determination of the compressive strength of cement mortars, using 2 in (50 mm) cube specimens. plus, determination of the tensile strength of cement mortars employing the Briquet

		specimens.
Aggregate+ Reducing Field Sample of Aggregate to Test Sample and Sieve Analysis of fine and coarse aggregates	Week 6	General information about Aggregate as a building material and obtaining laboratory samples of aggregates from stockpiles plus determination of the particle size distribution the fine and coarse aggregate by sieving.
Midterm Exam	Week 7	Midterm Exam
Aggregate+ Specific Gravity and Absorption of fine Aggregate	Week 8	General information about Aggregate as a building material plus determination of Bulk and Apparent Specific Gravity and Absorption of fine aggregate
Aggregate+ Resistance to Degradation of Small-size coarse Aggregate by Abrasion in the Los Angeles Machine	Week 9	General information about Aggregate as a building material cover testing sizes of coarse of (12.5mm) for resistance to degradation using the Los Angeles testing machine
Gypsum+ Standard consistency test for gypsum	Week 10	General information about Gypsum as a building material obtain the quantity of water required to obtain a plaster paste with standard consistency, and this quantity of water used for other tests:(setting time and compressive strength tests for gypsum)
Block+ Water Absorption Test for concrete Block	Week 11	General information about Block as a building material and Obtain percentage of water absorption of concrete blocks.
Block+ Compressive strength test for concrete blocks	Week 12	General information about Block as a building material and find maximum strength for concrete blocks
Steel+ Steel bar tension test	Week 13	General information about Steel as a building material and study the behavior of reinforcing steel when increasing the force to failure as well as to get the curve of stress and strain.



W

x IW

To study the behavior of reinforcing steel when increasing the force to failure as well as to get the curve of stress and strain.

b. This test method covers the determination of Specific Gravity and Absorption of coarse aggregate. The specific gravity may be expressed as bulk specific gravity, bulk specific gravity SSD or apparent specific gravity. The bulk specific gravity and absorption are based on aggregate after 24hour soaking in water.

x LW

a. m $\frac{W_s}{W_c}$ c m $\frac{W_s}{W_c}$ Weight of sieve + cement)- Weight of sieve/ (Weight of cement) x100.

b. p A 15.6- 26.7 i

LN C

c. Reducing Field Sample of Aggregate to Test Sample p

d. g $\frac{W_p}{W_t}$ i IPFW
Cp A 45 C
LCm A 375 C

e. g $\frac{W_p}{W_t}$ g c wt of passing sieve
(1.7mm) x 100 Wt. of initial sample

x MW

p

1. Balance: For fine aggregate accurate for 0.5gm. For coarse aggregate accurate for 0.5gm.
2. Containers to carry the sample.
3. Oven.
4. Mechanical Sieve shaker.
5. Two sets of sieve: -For fine aggregate [No.4, No.8, No.16, No.30, No.50,

No.100]

For coarse aggregate [37.5mm, 19mm ,9.5mm, No.4, No.8] In addition to a pan and a cover for each set.

ii.

1- A cylindrical mold of non-absorbent and corrosion-resistant material with a height (51mm) and inner diameter (35mm).

2- A square glass plate with length of(250mm).

3- Metal roller or spatula.

4- A clean and dry pot for mixing of non-absorbent and corrosion-resistant material

5- Timer with accurately (1) seconds.

.....
x NW

IC

Tensile strength $\sigma_t = \text{Load causing failure}(P) / \text{Area at the fracture}(A)$

2.

Absorption% = $[(B - A) / A] \times 100$

g=Weight of oven-dry test sample in air,(gm).

h= Weight of S.S.D. sample in air,(gm).

x PW

Compressive strength (MPa) = $P_{\text{max.}} / A$

$A = L \times B$

= 200×600

= 1200mm^2

$13 = P_{\text{max}} / 1200$

$P_{\text{max}} = 13 \times 1200$

= 15600 N .

Extra notes:

A sample of exam paper and its answer will be attached. For the students to be familiar with exam.

External Evaluator

The course book prepared by my colleague is properly arranged and covers the main requirements of the lesson. The lecturing procedures are identified properly. The assessment scheme and forms of teaching are arranged in a way that the student could understand clearly. It can be said that student will be satisfied with this course book and it promises a good outcome.

Approved

Dr. Saad Khalis Essa

