

**Department of Civil and Environmental Engineering**  
**CIVL2005 – Construction Materials**  
**Syllabus**

Coordinating Unit:	Department of Civil and Environmental Engineering, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	CIVL2005	Year of Study:	2 <sup>nd</sup>
Course Title:	Construction Materials		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	Nil		
Prerequisite Knowledge:	Nil		
Duration:	One semester	Credit Units:	3
Class/Laboratory Schedule:	2 hours of lecture and 2 hours of laboratory work per week.		
Laboratory/Software Usage:	Construction Materials Laboratory		
Course Description:	<p>This course is designed to provide undergraduate civil engineering students fundamental principles of the behavior, physical and engineering properties of various common civil engineering materials, including natural stones, sands, aggregates, cement, concrete and steel. Selection and design of materials based on their intended use in design and construction are emphasized. The laboratory sessions are designed to provide students a hand-on experience on various material testing concepts and procedures. Written reports and oral presentation of experimental results will be required.</p>		
Course Objectives:	<ol style="list-style-type: none"> <li>1. learn how to characterize and determine the basic mechanical and non-mechanical properties and behavior of widely used construction materials.</li> <li>2. To get familiar with standard quality laboratory testing procedures and proper control of testing equipment for determining the properties and behavior of common construction materials.</li> <li>3. To understand and master the fundamental knowledge of construction materials.</li> </ol>		

<p>Learning Outcomes (LO):</p>	<p>Upon completion of this course, students should be able to:</p> <ol style="list-style-type: none"> <li>1. achieve mastery of the fundamental knowledge of construction materials. [POs: a,b];</li> <li>2. demonstrate ability to make selection of materials based on their properties, behavior and intended use in design and construction. [POs: a,b]</li> <li>3. demonstrate understanding of the state-of-the-art concrete technology including analyze and design and produce concrete mixtures according to BS standard, concrete placing techniques, the use of different types of cement and admixtures for producing good quality concrete. [POs: a,b];</li> <li>4. conduct lab experiments for determining the properties and the behavior of construction materials for the use in civil engineering construction [POs: a,b,k];</li> <li>5. evaluate, analyze and interpret the data obtained through standard laboratory testing procedures. [POs: a,b];</li> <li>6. collaborate lab work in groups and divide responsibilities among group members. [POs: d]</li> <li>7. have experience in writing technical reports and making presentations [POs: g];</li> </ol>		
<p>Texts &amp; References: <i>(* recommended textbook(s))</i></p>	<ol style="list-style-type: none"> <li>1. Michael S. Mamlouk and John P. Zaniewski (2011)*, Materials for Civil and Construction Engineers, 3<sup>rd</sup> Edition, Prentice Hall</li> <li>2. Somayaji, Shan. Civil Engineering Materials, 2<sup>nd</sup> Edition, Prentice Hall.</li> <li>3. A.M. Neville, Properties of Concrete, 5<sup>th</sup> Edition, Longman.</li> <li>4. Handout provided by the instructor</li> </ol>		
<p>Student Assessment:</p>	<ul style="list-style-type: none"> <li>• Laboratory work and Reports 30%</li> <li>• Oral presentations: 10%;</li> <li>• Midterm Exam: 30%</li> <li>• Final Examination: 30%</li> </ul>		
<p>Learning Outcome Assessment:</p>	<ul style="list-style-type: none"> <li>• Reports and oral presentations.</li> <li>• Midterm and final examination.</li> <li>• Course evaluation</li> </ul>		
<p>Pedagogical Methods:</p>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input checked="" type="checkbox"/> Lecture  <input type="checkbox"/> Guest speakers  <input type="checkbox"/> Case study  <input type="checkbox"/> Role playing  <input checked="" type="checkbox"/> Student presentation  <input type="checkbox"/> Project  <input type="checkbox"/> Simulation game  <input type="checkbox"/> Exercises and problems         </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Service learning  <input type="checkbox"/> Internship  <input type="checkbox"/> Field study  <input type="checkbox"/> Company visits  <input type="checkbox"/> e-learning  <input checked="" type="checkbox"/> Independent study  <input type="checkbox"/> Others: ____         </td> </tr> </table>	<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Guest speakers <input type="checkbox"/> Case study <input type="checkbox"/> Role playing <input checked="" type="checkbox"/> Student presentation <input type="checkbox"/> Project <input type="checkbox"/> Simulation game <input type="checkbox"/> Exercises and problems	<input type="checkbox"/> Service learning <input type="checkbox"/> Internship <input type="checkbox"/> Field study <input type="checkbox"/> Company visits <input type="checkbox"/> e-learning <input checked="" type="checkbox"/> Independent study <input type="checkbox"/> Others: ____
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Course Content: (topic outline)	Week no.	Topics	Experiments no.	LO no.
	1	<b>Course and Lab Introduction</b> Syllabus review; introduction to traditional and new materials used in construction industry; introduction to construction materials lab; lab equipment and safety	--	--
	2,3	<b>Constituent Materials of Concrete (aggregates and sands)</b> Natural rocks; aggregate sources; geological classification; aggregate uses; types of aggregates and sands; aggregate properties; handling aggregates;	1,2	1,2,4,5 7
	4,5	<b>Constituent Materials of Concrete (cement and water)</b> Portland cement production; chemical composition of Portland cement; basic characteristics of Portland cements; types of Portland cement; mixing water; water-cement ratio;	3,4,5	1~7
	6,7	<b>Portland cement concrete</b> Proportioning of concrete mixes; introduction to mix design; factors affecting the Mix Design; mixing placing and handling fresh concrete;	3,4,5	1~7
	8,9	<b>Properties of Fresh Concrete</b> Workability; workability tests ; factors affecting workability; bleeding; segregation; curing concrete; admixtures for concrete;	6,7,8	1~7
	10	<b>Midterm Exam</b>	6,7,8	1~7
	11,12	<b>Properties of Hardened Concrete</b> Creep; compressive strength; factors influencing strength; deformation; permeability ;durability; shrinkage; non-destructive testing;	6,7,8	1~7
	13,14	<b>Steel</b> Steel production; heat treatment of steel; structural steel; cold form steel; reinforcing steel; Steel fastening products; mechanical testing of steel; welding; steel corrosion;	9	1,2

Percentage Content of:	Mathematics and Basic Sciences	Engineering Subjects	Complementary Studies	Total	
	0	100	0	100	
Timetabled work in hours per week:	Lecture	Tutorial	Laboratory	Other	Total
	2	---	2	---	4

Contribution to Programme Outcomes:	Programme Outcomes		Contribution to POs	
			Primary	Secondary
	(a)	an ability to apply knowledge of mathematics, science, and engineering appropriate to the degree discipline		✓
	(b)	an ability to design and conduct experiments, as well as to analyse and interpret data	✓	
	(c)	an ability to design a system, component or process to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability		
	(d)	an ability to function on multi-disciplinary teams		✓
	(e)	an ability to identify, formulate and solve engineering problems		
	(f)	an ability to understand professional and ethical responsibility		
	(g)	an ability to communicate effectively		✓
	(h)	an ability to understand the impact of engineering solutions in a global and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public		
	(i)	an ability to stay abreast of contemporary issues		
	(j)	an ability to recognise the need for, and to engage in life-long learning		
	(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice appropriate to the degree discipline	✓	
	(l)	an ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations		
Course Instructor:	<u>Mr. Iat Meng Wan</u> (Please refer to the following link for the consultation hours of the course instructor: <a href="http://www.fst.umac.mo/cee/contacthour.html">http://www.fst.umac.mo/cee/contacthour.html</a> )			