

Module Information					
معلومات المادة الدراسية					
Module Title	Pavement Engineering		Module Delivery		
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input type="checkbox"/> Seminar		
Module Code	UOMU023056				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		UGIII			Semester of Delivery
Administering Department		Building and Construction Techniques Engineering	College	Al-Mustaqbal university	
Module Leader	Tameem M. Hashim		e-mail	tameemmohammed@uomus.edu.iq	
Module Leader's Acad. Title		Senior Lecture	Module Leader's Qualification		MSc.in Civil Engineering /Road and Transportation
Module Tutor			e-mail		
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date			Version Number		

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None		Semester
Co-requisites module	None		Semester

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. This course aims to provide a good understanding to highway design to understand, roadway classification, pavements types 2. To prepare them to carry out practical investigation and analysis at later stages of graduation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	upon completion of this course the students will: 1- To apply the knowledge of horizontal and vertical curves. 2- To identify sight distance for different types of curves. 3- To learn superelevation on horizontal curve. 4- To learn the method of design the rigid and flexible pavement. 5- To identify AADT, ADT and DHV 6- Perform road pavement design and analysis classifies mass movements, describe factors causing mass movements and propose. 7- Analyze and design various earth retaining structures for internal and external stability. 8- Identify the reason for real field slope and retaining wall failures and propose measures to mitigate such failures in the future. 9- To learn about drainage systems, culverts, siphon, ditches and filters. 10- To learn about highway furniture and control devices
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Highways classification according their function, locations and pavements types [3hrs] Highway alignments and alternatives, points of inflections, topography terrain maps, cross-section elements, profiles, and horizontal and vertical curves [3hrs] Horizontal curve, angle of inflection. [3hrs] Super elevation concepts. [3hrs] Vertical curves, crest and sag curves, under crossing clear distance, minimum length and grades. [3hrs] Sight distances, stopping and passing, at grade intersection, at vertical curves, relation between length of curve and required sight distance and between middle ordinate distances. [3hrs] Traffic volumes, counting, traffic volume correction factors, level of service (LOS) , AADT, ADT , DHV. [3hrs] Traffic loads, equivalent single axle load (ESALs), tandem axle load, load damage factor, growth factor, and stresses on pavements. [3hrs] Design of flexible pavement, pavement layers[2hrs]

	<p>Examples for design of flexible pavement[3hrs]</p> <p>Design of rigid pavement, pavement layers, chart for design[3hrs]</p> <p>Examples for design of the rigid pavement[3hrs]</p> <p>Drainage systems , culverts , siphon , ditches and filters [2hrs]</p> <p>Highway furniture and control devices [3hrs]</p>
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Learning and Teaching Strategies			
استراتيجيات التعلم والتعليم			
Strategies	Assessment is based on		
	1- Exams.		
	2- Student feedback.		
	3- Seminars.		
	4- Reports in Lab.		
Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem)	63	Structured SWL (h/w)	4.21
الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem)	37	Unstructured SWL (h/w)	2.21
الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem)	100		
الحمل الدراسي الكلي للطالب خلال الفصل			

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Pract.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Highways classification according their function, locations and pavements types
Week 2	Highway alignments and alternatives, points of inflections, topography terrain maps, cross-section elements, profiles, and horizontal and vertical curves.
Week 3	Horizontal curve, angle of inflection.
Week 4	Super elevation concepts.
Week 5	Vertical curves, crest and sag curves , under crossing clear distance , minimum length and grades.
Week 6	Sight distances, stopping and passing, at grade intersection, at vertical curves, relation between length of curve and required sight distance and between middle ordinate distances.
Week 7	Traffic volumes , counting , traffic volume correction factors , level of service (LOS) , AADT, ADT , DHV
Week 8	Traffic loads, equivalent single axle load (ESALs), tandem axle load, load damage factor, growth factor, and stresses on pavements.
Week 9	Design of flexible pavement, pavement layers
Week 10	Examples for design of flexible pavement
Week 11	Design of rigid pavement, pavement layers, chart for design
Week 12	Examples for design of the rigid pavement
Week 13	Drainage systems , culverts , siphon , ditches and filters
Week 14	Highway furniture and control devices
Week 15	Preparatory week before the final Exam
Week 16	Final exam

Delivery Plan (Weekly Practical. Syllabus)

المنهاج الاسبوعي للعملي

	Material Covered
Week 1	Sieve Analysis Test
Week 2	The Relationship between Dry Density and Optimum Water Content of Subbase Aggregate
Week 3	Specific Gravity of Cement, Sand and Gravel
Week 4	California Bearing Ratio (CBR)
Week 5	Penetration of Bitumen
Week 6	Flash Point of Bitumen
Week 7	Softening Point of Bitumen
Week 8	Ductility of Bitumen
Week 9	Thin Film Oven Test
Week 10	Aging Test of Bitumen
Week 11	Marshall Mix Design
Week 12	Stability Test of HMA Mixture
Week 13	Flow Test of HMA Mixture
Week 14	Air Voids Test of HMA Mixture
Week 15	Solvent Extraction Test

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		Yes
Recommended Texts	<ol style="list-style-type: none"> 1. Traffic & Highway Engineering - Garber & Hoel 2009(1) 2. The Handbook o Highway Engineering 3. Pavement Analysis and Design by Yang H Huang - www- by EasyEngineering.net 4. Pavement Engineering Principles and Practice by Rajib B. Mallick and Tahar El-Korchi, 2th Edition, 2013. 	No

	5. A Policy on Geometric Design of Highway and Streets, The Green Book, 6 th Edition, 2011. 6. Principles of Highway Engineering and Traffic Analysis, Fred L. Mannering and Scott S. Washburn, 5 th Edition, 2012 7. Transportation Infrastructure Engineering A Multimodal Integration SI Edition, 2011, Lester A. Hoel, Nicholas J. Garber And Adel W. S Adek	
Websites		

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				