Module (Course Syllabus) Catalogue

2025-2026

College/ Institute	Erbil Technology College	
Department	Department of Road Construction	
Module Name	Road Construction	
Module Code	ROC401	
Degree	Technical Diploma ■ Bachelor ☐ High Diploma ☐ Master ☐ PhD ☐	
Semester	4	
Qualification		
Scientific Title		
ECTS (Credits)	5	
Module type	Prerequisite ☐ Core ■ Assist. ☐	
Weekly hours	4	
Weekly hours (Theory)	(2)hr Class	(24)Total hrs Workload
Weekly hours (Practical)	(2)hr Class	(24)Total hrs Workload
Number of Weeks	16	
Lecturer (Theory)	Firas Fawzi Jirjees	
E-Mail & Mobile NO.	firas.jirjees@epu.edu.iq	
Lecturer (Practical)	Firas Fawzi Jirjees	
E-Mail & Mobile NO.	firas.jirjees@epu.edu.iq	
Websites	https://epu.edu.iq/	

Course Book

Course Description	This course is one of the major courses for the second year students in road construction department and aims to introduce students with the road construction process starting the path selection and alignments, main types of pavement, pavement thickness design, road construction process and finally illustrate types of failures and maintenance process, the following points represent main course articles: 1. In preliminary road design, selecting the best path for a new road is traditionally a long process. A variety of factors can require that road engineers design multiple alternative paths to be considered. 2. There are several types of road pavements each type has different layers and materials and construction process. Some of roads are paved by concrete or asphalt or stones, it depends on the classification of road as well as the location and geographical nature and topographical factors. 3. Pavement thickness design is very important in determining the required thickness of various pavement layers to protect a given soil condition for a given wheel load. 4. Pavement construction process should be highly controlled to ensure fulfilment of the required specifications as well as maintain high level of quality while construction. 5. Various types of failures occur in the flexible pavement which ranges from minor to major defects. The causes of failure should be identified in order to minimize the early damage and ensure durability of constructed roads. 6. Roads require continuous maintenance from the moment of the completion of its implementation in order to remain valid for passage in its original form throughout its useful design life. **Official Course language is: English language** **Passing score is: 60 out of 100** **Course weekly hours: 4 hours (2 theoretical + 2 Practical)** **Score distribution: 60% (during the year evaluations and exams) + 40% (end of the year exams)**
Course objectives	This course is prepared to provide a comprehensive understanding about the main principles of road construction in such a way that the tutees will gain theoretical and practical experience that enable them to work after graduation according to scientific approach also to achieve the following objectives: a) Knowledge of engineering process for selecting the best path for a new road and the factors affecting it. b) Identifying types of pavement and make comparison between them especially in terms of layers and load distribution pattern.

	c) Knowledge pavement thickness design according to internationally approved sources. d) Identifying the stages of road construction and mentioning specifications of each layer. e) Practical application of some of the main laboratory tests in road constriction field such as Marshall Test, core test, Asphalt extraction test, etc. f) Identify the types of failures in the roads, causes and how to repair. g) Showing the process of roads construction and maintenance through site visits to road projects under construction or while maintenance.
Student's obligation	a) Students should attend the theoretical lectures (2 hours weekly) and also should attend the practical (tutorial or scientific visits lectures) at the laboratory (2 hour weekly). b) Students requested to match deadlines for submitting their reports and assignments given by the lecturer. c) Students should be ready for unannounced short quizzes from previous lectures. d) Students are requested to provide detailed reports for the scientific visits arranged to the projects under construction. e) Students should prepare themselves for the semester's major exams both the theoretical and practical parts (announced exams). f) Missed classes will not be compensated including the quizzes and the scheduled assignments.
Required Learning Materials	• Presentations • Incorporating images and videos • Using real-world examples • Using lab equipment and instruments • Computer-Assisted Learning such as ebooks

	Task		Weight (Marks)	Due Week	Relevant Learning Outcome
Evaluation	Paper Review				
	Assignments	Homework	**5%**	3-14	3, 4
		Class Activity	**2%**	3-14	1-6
		Report	**10%**	3-14	1-6
		Seminar		5	1, 2, 3
		Essay			
		Project		10	6
	Quiz		**8%**	3, 5, 9, 11	1-6
	Lab.		**10%**	3-14	4, 5
	Midterm Exam		**25%**	7, 8	
	Final Exam		**40%**	15, 16	
	Total		**100%**		

Specific learning outcome:

By the end of the academic course, students will be able to:

1- Identifying factors affecting selecting the best road path as well as knowledge about horizontal and vertical alignments.
2- Define the main types of pavements and specifications of each type and compare between them.
3- Calculate the required pavement thickness and determine the thickness of each layer based on the concept of ESAL of traffic and CBR of soil.
4- Practicing the laboratory testing related with road construction process such as Asphalt Mix design (Marshall Test), field Core test, Asphalt extraction test, etc.
5- Realize the process of road construction and knowledge of specifications of each layer.
6- Recognize the types of usual defects that may happen in pavement, causes and maintenance process.

Course References:

1- Highway Design Manual, Republic of Iraq, Road & traffic Division, 1982.
2- S.O.R. B. (STANDARD SPECIFICATION FOR ROADS & BRIDGES)/IRQ.1983.
3- Earth Roads, John M. Morris MBE, Granfield University, Second Edition, 1995.
4- Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types, Asphalt Institute Manual Series No. 2 (MS-2), Sixth Edition, 1997.
5- هندسة التبليط الاسفلتي، نامق حويز احمد – محمد حسين رسول، الطبعة الثالثة المنقحة، 2013م.
6- دليل تجارب وفحوصات الأسفلت-المعهد الفني اربيل
7- Earth Roads, John M. Morris MBE, Granfield University, Second Edition, 1995.
8- Asphalt in Pavement Maintenance, Asphalt Institute Manual Series No. 16 (MS-16), Third Edition, 2001.
9- Internet reference مواصەفاتی گشتی ڕێگاوبان https://talarsaz.com/onlinebooks/general-specification-for-roads/html5forpc.html?page=0
10- Short videos for road construct and road equipment from internet. https://www.youtube.com/results?search_query=road+construct+and+road+equipment

ECTS:

Y. H. R.

Erbil Polytechnic University
Erbil Technology College
Department of Road Construction
Program: Technical Diploma (120 ECTS)

Select Min.
1 ECTS = 27 working hours

Lecturer Name: Firas Fawzi Jirjees

Total No. of Weeks/Semester: 20 weeks

Module Name: Road Construction | ECTS = 5 | Theory 2 | Practical 2 | Tutorial

Module Code: ROC401 | Group: All

ECTS Workload Calculation Form

Activity	S	Description		Activity Type	No.	T.F. Range Min	T.F. Range Max	Specefic T. F.	Time Factor	Workload
Course		Theory	In class	f	12				2	24
	1		Online	f	0				2	
	2	Preparation (1-2) * Theory Hr.		h	12	2	4	2	2	24
	3	Practical		f	12				2	24
	4	Preparation (1-1.5) * Practical Hr.		h	12	2	3	2	2	24
	5	Tutorial		f	12					
	6	Preparation (0.5-1.5) * Tutorial Hr.		h	12					
Site Visists and Lab Experiments	7	Scientific/Field Trips		f						
	8	Practical/Lab Reports		h	4	1	2	1.5	1.5	6
Assignment	9	Homework		h	2	1	4	1.5	1.5	3
	10	Report		h	0	1	4		1	
	11	Seminar		h	1	2	10	6	6	6
	12	Paper		h						
	13	Essay		h						
	14	Project/Poster		h						
Assessment	15	Quiz		h	3	1	2	1	1	3
	16	Mid Term	Theory	f	1				1	1
	17		Preparation (1.5-3) * Theory Hr.	h	1	3	6	4	4	4
	18		Practical	f	1				1	1
	19		Preparation (1-2) * Practical Hr.	h	1	2	4	2	2	2
	20	Final	Theory	f	1				2	2
	21		Preparation (3-5) * Theory Hr.	h	1	6	10	6	6	6
	22		Practical	f	1				1	1
	23		Preparation (2-4) * Practical Hr.	h	1	4	8	4	4	4
Face to face hours (f)/12 week		4.4		Face to face hours (f)						53
Home hours (h)/16 week		6.8		Home hours (h)						82
Total hours/16 week		10.1		Total hours						135
ECTS (Total hours 135 / 27) ≈ 5									Accept	5

(Min. 12 weeks active lecturing (Including Min Term exams with no stoppingof lectures)+ 3 weeks Final & Re-sit Exams (Including one week break inbetween)

Select time factor range from (Min., Av. or Max) in cell J2, if necessary write specefic time factor in column J.

f: Face to face activity hours h: Household activity hours

Firas Fawzi Jirjees

Lecturer Name and Signature

Department Head Signature and Stamp

Course topics (Theory)	Week	Learning Outcome
✓ Path Selection for new Road/Highway ✓ Identifying factors affecting selecting the best road path. ✓ Horizontal and vertical alignments.	1	1
✓ Main types of pavements ✓ Comparison between flexible and rigid pavement ✓ Load distribution pattern ✓ Ideal Pavement Requirements	2	2
✓ Conventional Flexible Pavements structure ✓ Layers of Flexible Pavement	3	2
✓ Rigid Pavement structure and layers ✓ Types of Rigid Pavements, joints, steel reinforcement.	4	2
✓ Pavement thickness design ✓ Factors Affecting Pavement Thickness Design ✓ The effect of Earth's natural soil resistance (subgrade CBR) ✓ Load Equivalency factor (LEF) and Equivalent single Axle Load (ESAL)	5	3
✓ Calculate and Convert the traffic volumes to equivalent single axle load. ✓ Introducing ASHTTO method for the design of flexible pavement.	6	3, 4
S4-Mid Term Exam- Preparation	7	
S4-Mid Term Exam	8	
✓ Introducing CBR method for the design of pavement thickness.	9	3, 4
✓ Calculation of Soil sub-grade Compaction% ✓ Placement of Subbase course/Base Course ✓ Bituminous Prime Coat & Tack Coat ✓ Hot Mix Asphalt (HMA) laying	10	4, 5
✓ Compaction Process of Hot Mix Asphalt ✓ Factors Affecting Hot Mix Asphalt Compaction ✓ Surface regularity, density checking, thick checking	11	4,5
✓ General causes of pavement failure ✓ Types of failures in flexible pavement & causes	12	6
✓ Maintenance of flexible pavement failures	13	6
✓ Types of failures in Rigid pavement & causes ✓ Maintenance of rigid pavement failures	14	6
✓ S4-Final Exam- Preparation (First attempt)	15	
✓ S4-Final Exam (First attempt)	16	

Practical Topics	Week	Learning Outcome
✓ Introduce general laboratory and field laboratory devices, equipment to the students.	1	1
✓ Aggregate Gradation “SIEVE ANALYSIS” ✓ Standard Test Method for Sieve Analysis of aggregates	2	2
✓ Blending of Aggregates ✓ Trail & error method of aggregate blending	3	2
✓ Marshall Method for the design of asphalt mix of the surface layer (Flexible pavement).	4	2
✓ Preparing Marshall Samples and put it in Marshall molds with a desired compaction.	5	3
✓ Testing the stability and Flow value of the Marshall samples for the surface layer and compare the values of stability, flow, air voids, voids filled with asphalt with SORB specification.	6	3, 4
S3-Mid Term Exam- Preparation	7	
S3-Mid Term Exam	8	
✓ Core Testing: the standard way to take the samples (cores) using core drilling machine and field examination of road pavements. ✓ Examine specific gravity of asphalt mixes and core samples ✓ Calculate the degree of compaction for paved road.	9	3, 4
✓ Showing videos or arranging visit to road project showing flexible pavement construction. ✓ Showing videos about examination of the paved surface by standard ruler.	10	4, 5
✓ Showing videos or arranging visit to road project showing rigid pavement construction	11	4,5
✓ Showing videos illustrating the types of failures in flexible pavement	12	6
✓ Showing videos illustrating the maintenance of flexible pavement	13	6
✓ Showing videos illustrating the types of failures in Rigid pavement and their maintenance	14	6
S4-Final Exam- Preparation (First attempt)	15	
S4-Final Exam (First attempt)	16	

Questions Example Design

Q1/A) Define the following:

1- Asphalt Bleeding

2- Rigid Pavement

Q1/ B) List the main types of failures in Flexible Pavement with at least one example of each type.

Q2/ A) Draw a typical cross section in flexible pavement and another one in rigid pavement showing the road different layers and the difference in wheel load distribution pattern.

Q2/ B) Calculate the total thickness of the flexible pavement knowing that the average daily traffic is 400 commercial vehicles/day > 4 tones, CBR value for subgrade soil = 5%, load on tire (P) = 4082 kg and tire contact area (A)= 583 cm2

1- Using the curves in (C.B.R Design Chart shown in Figure 1), explain shortly the steps taken to find the value of the paving thickness.

2 - Using the design equation (show all the steps of the solution).

$$t = \sqrt{P}\left[\frac{1.75}{CBR} - \frac{1}{\pi p}\right]^{1/2}$$

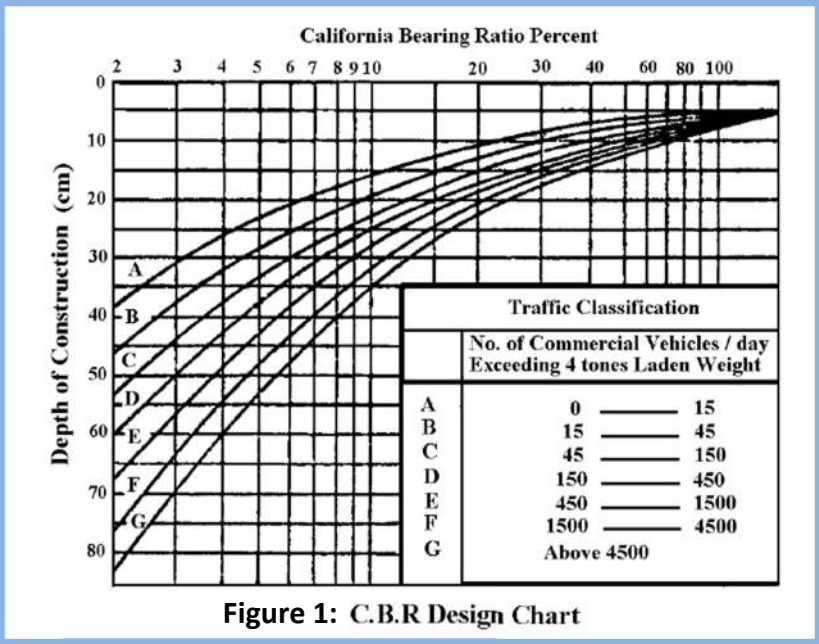

Figure 1: C.B.R Design Chart

Q3/ Choose the correct answer:

1) The increase of bituminous binder occurring on the pavement surface causes.....

(a) Bleeding (b) Patching (c) Swell (d) Block cracking

2) The Tack coat material shall be applied not more than …… in advance of placing of the bituminous binder course or surface course.

(a) 24 hours (b) 30 minutes (c) 2 hours (d) 12 hours

3) When placing the hot mix asphalt, the temperature of the asphalt mixture should not be less than …… for the surface (wearing) course.

(a) 120°C (b) 60°C (c) 110°C (d) 130°C

4) …… is considered as one of the main desirable properties of Asphalt mixes.

(a) Non-homogeneity (b) Skid resistance (c) Fluidity (d) Segregation

5) If the laboratory density of a subgrade soil = 1.930 g/cm3 and the in situ (field) density of the same soil = 1.754 g/cm3, then the soil compaction ratio equals to ……

(a) 90.9% (b) 98.8% (c) 95.5% (d) 101.2%

6) The depression formed in the wheel path surface along the way of road is called.....

(a) Shoving (b) Edge cracking (c) Potholes (d) Rutting

7) An Equivalent Standard Axle Load "ESAL" of .....cause a damage equal to (1) per pass.

(a) 16.4 ton (b) 4.1 ton (c) 12.3 ton (d) 8.2 ton

Q4/ Answer the following (short answers):

1- What is the purpose of applying prime-coat in road construction projects?

2- List three methods for determining the field density for the subgrade layer of a new road project.

3- What are the main factors that affecting the pavement design?

Extra notes:

I have no notifications

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.

Name: Signature:

Academic title: