Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	**College of Engineering**	
Department	**Highway Engineering**	
Module Name	**Geotechnics for Highway**	
Module Code		
Degree	**Technical Diploma** ☐ **Bachelor** ☐ **High Diploma** ☐ **Master** √ **PhD** ☐	
Semester	**Spring Semester /2nd Semester**	
Qualification	**MSc**	
Scientific Title	**Assistant Lecturer**	
ECTS (Credits)	**6**	
Module type	**Prerequisite** ☐ **Core** √ **Assist.** ☐	
Weekly hours	**3**	
Weekly hours (Theory)	**(3) hr Class**	**(150) Total hrs Workload**
Weekly hours (Practical)	**(0) hr laboratory**	
Number of Weeks	**15**	
Lecturer (Theory)	**Zina M. Dawood**	
E-Mail & Mobile NO.	**Zina.dawood@epu.edu.iq**	
Assistant Lecturer	**Ahmed S. Ali**	
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Websites	**N/A**	

Course Book

Course Description	**This course is a postgraduate course. Studying geotechnics in highway engineering is essential for understanding the behaviour of soil that can support the loads imposed by roads, ensuring stability. It aids in planning earthwork activities and optimizing construction practices for a solid and stable highway base. Geotechnical knowledge is crucial for assessing and mitigating slope instability and preventing landslides along highways. Additionally, it informs material selection and considers environmental factors, contributing to the overall safety, durability, and sustainability of highway infrastructure. In summary, geotechnics plays a pivotal role in addressing challenges and making informed decisions for the successful completion of highway construction projects.**
Course objectives	**Knowledge of the strain-stress relationship is fundamental to understanding how materials, such as pavement materials, behave under load. This is crucial for designing durable and safe highway structures. Also, to consider the strain-stress behavior of materials when designing highway components, such as bridges, tunnels, and overpasses.** **Seismic Design: In seismically active regions, understanding waves is essential for designing highway structures that can withstand seismic forces, ensuring the safety of the infrastructure during earthquakes.** **Slope Stability: Highways often traverse hilly terrain. Retaining walls are used to support soil and prevent landslides or slope failures. Knowledge of retaining wall design is essential for ensuring the stability of highway structures. In urban areas, where space is limited, retaining walls can be used to create level surfaces for highways by supporting or holding back soil.**
Student's obligation	**Attending the lecture is a fundamental part of the course. You are responsible for material presented in the lecture whether or not it is discussed in the textbook. You should expect questions on the exams to test your understanding of concepts discussed in the lecture and in the homework assignments.** **It can be beneficial 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.** **In addition, the students should write a scientific project and prepare a nice presentation that can be discussed on campus.**
Required Learning Materials	**books, handouts, folders, stationery, printing, and copying facilities.**

Evaluation	**Task**		**Weight (Marks)**	**Due Week**	**Relevant Learning Outcome**
	Paper Review				
	Assignments	**Homework**	**-**		
		Class Activity	**5**	**2**	**Intellectual skills**
		Report	**5**	**2**	**Cognitive skills**
		Seminar	**10**	**4**	**Presentation skills**
		Essay	**-**		
		Project	**-**	**2**	**Writing skills**
	Quiz 2		**10**	**2**	**understanding skills**
	Midterm Exam		**20**	**2**	**Knowledge and understanding skills**
	Final Exam		**50**	**1**	**Knowledge and understanding skills**
	Total		**100**		
Specific learning outcome:	**1. strain-stress behaviour of materials when designing highway components, such as bridges, tunnels, and overpasses.** **2. Understanding waves in seismically active regions for designing highway structures.** **3. Ensuring the safety of the infrastructure during earthquakes.** **4. Understanding of the retaining wall design for ensuring the stability of highway structures and determining the lateral loads from soils.**				
Course References:	**Useful references:** 1. Advanced Soil Mechanics, by Braja M. Das, third edition, CRC Group, 2008. Or newer editions for all 2- Principles of Soil Dynamics, by Braja M. Das and G. V.Ramana, second edition, 2011. 3- Fundamentals of Soil Dynamics, by Braja M. Das, 1983, Elsevier. 4- Geotechnical Engineering Handbook, by Braja M. Das, J. Ross Publishing, 2011.				

	5- Principles of Foundation Engineering, by das 6- Dynamics of Structure and Foundation – A Unified Approach, by Indrajit Chowdhury and Shambhu P. Dasgupta, 2009, CRC Press, Balkema. 7- Journals and review (internet)

Course topics (Theory)	Week	Learning Outcome
Introduction to Geotechnical Engineering & Stresses and Strains in a Soil Mass	**1**	**Foundation Eng. description**
Three dimensional problems	**2**	**Knowledge skills**
Mechanical behaviour of road materials	**3**	**Knowledge skills**
Rock mechanics	**4**	**Knowledge skills**
Nature and Type of Dynamic Loading on Soils	**5**	**Knowledge skills**
Fundamentals of Vibration	**6**	**Knowledge skills**
Waves in Elastic Medium	**7**	**Knowledge skills**
Earthquake and Ground Vibration	**8**	**Knowledge skills**
Lateral Earth Pressure on Retaining Walls	**9**	**Knowledge skills**
Liquefaction of Soil	**10**	**Knowledge skills**
Railway Track Foundation Design	**11**	**Knowledge skills**
Climate Change Effect	**12**	**Knowledge skills**
Practical Topics	**N/P**	**Learning Outcome**

Questions Example Design

1. **Stress-strain distribution**
2. **Influence of soil parameters on liquefaction potential.**
3. **Calculate the increase in vertical soil stress under the road.**

Extra notes: