

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NCED522	Pavement Geotechnics	3	0	0	3

Course Objective
To provide knowledge and equip the students with fundamental knowledge about the geotechnical aspects associated with the design and construction of pavements, techniques of subsurface exploration, and characterization parameters.
Learning Outcomes
<ul style="list-style-type: none"> ➤ Fundamental understanding of pavement distresses and geotechnical aspects of pavement construction. ➤ Different techniques of subsurface exploration before pavement construction and geotechnical inputs in pavement designs. ➤ Knowledge of resilient and permanent strain response of subgrade soils and granular materials under repeated loadings with influencing factors. ➤ Application and methods used for design of unpaved and paved roads with Geosynthetics.

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1	Introduction: Pavement system and types of pavements; Geotechnical components and their functions; Distresses in pavements; Geotechnical influences on distresses in flexible and rigid pavements; Key geotechnical issues in pavement performance.	6L	Fundamental knowledge about the pavement system, its different components and geotechnical factors related to the design, construction and performance of pavements
2	Geotechnical Exploration and Testing for Pavements Geophysical methods; In-situ testing methods in context of pavement construction; Correlations with pavement design parameters; Borings and Samplings for pavement constructions: Test pits; frequency and spacing.	6L	Knowledge about different techniques of sub-surface exploration at the site before pavement construction.
3	Pavement design and Geotechnical aspects Design Elements; Equivalent single wheel load; Equivalent axle load factor; Design methodologies and geotechnical inputs; Subgrade Characterization: CBR; Stabilometer (R) Value; Modulus of Subgrade Reaction (k);	12L	Knowledge and understanding about the geotechnical characterization parameters, design methodologies for pavements and FEM for pavement analysis and design.

	Resilient Modulus (M_r) and correlation with basic properties; Permanent deformation characteristics.		
4	Deformation characteristics: Resilient and Permanent strain models; Influence of deviatoric and confining stress; compaction density, loading frequency; Unconsolidated and Consolidated Undrained cyclic response; pore water pressure variation and influence.	8L	Understanding and knowledge about the response of subgrade soil to cyclic loading or repeated traffic loadings
5	Design with Geosynthetics: Empirical method: Modified CBR method; AASHTO (1993) procedure; Analytical method: Giraud and Noiray method; Laboratory method; Membrane encapsulated subgrade in paved and unpaved roads; Subgrade conditions with special treatments.	10L	Learning different methods of pavement design with the addition of Geosynthetics.
	Total Contact Hours	42L	

Text Books

1. Bernardo, C. (2018). "Geotechnics of Roads: Fundamentals", CRC Press, London, UK: 9781032059495
2. Nishantha, B. and Manjriker, G. (2018). "Geotechnical Aspects of Pavement Engineering", Momentum Press, New York, ISBN-13, 978-1-60650-540-3 (print) ISBN-13: 978-1-60650-541-0 (e-book).

References Books

1. Geotechnical Aspects of Pavements, FHWA NHI-05-037, Federal Highway Administration, U.S. Department of Transportation.
2. Berg, R.R., Christopher, B.R., and Perkins, S., 2000. "Geosynthetics Reinforcement of the Aggregate Base/Subbase Courses of Pavement Structures", Geosynthetics Materials Association, County Road B, West Roseville.
3. Koerner, R.M. (2005). "Designing with Geosynthetics", Pearson Prentice Hall, New Jersey, ISBN 0-13-145415-3.
4. IRC 37-2018. "Guidelines for the Design of Flexible Pavements", Indian Road Congress, New Delhi.
5. AASHTO., 1993. AASHTO guide for design of pavement structures: Washington, D.C.