Pavement Materials Engineering

Code	Credit Hours
CE 862	3-0

Course Description

This course has been designed to provide students with the needed knowledge to characterize pavement materials. The course contents include a) Introduction to Pavement Materials, b) Roadbed Soils, c) Base and Sub-base Materials, d) Paving Materials, e) Properties and Factors Affecting Performance Characteristics of Paving Mixtures. The key types and uses of special asphalt binder and mixture products, including emulsions, cutbacks, polymer-modified binders, warm-mix asphalt (WMA), and mixtures containing recycled asphalt pavement (RAP) are also covered in this course. Conventional and performance-based binder specification and Marshall/ Superpave Mix design in detail are also included in this course.

Textbook:

1. Principles of Pavement Design, 2nd Edn by E.J. Yoder & M.W. Witczak (Chapter 7 to 13)
2. An introduction to Geotechnical Engineering by Robert D. Holtz & William D. Kovacs (Chapter 1 to 7)

Reference Book:

1. Principles of construction of Hot-Mix Asphalt Pavements, Asphalt Institute, Manual Series No.22
2. Superpave, Asphalt Institute, Superpave Series No. 2
3. Highway Materials, Soils and Concretes by Harold Atkins
4. Asphalt handbook, Asphalt Institute, Manual Series No.4
5. Soil Manual, Asphalt Institute, Manual Series No.4

Prerequisites

Nil

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10-15%
Assignments	5-10%
Mid Terms	25%
ESE	40-50%
Term Project	10%

Teaching Plan

Week No	Topics	Learning Outcomes
1- 2	Introduction to Pavement Materials	Course outlines, objectives, teaching plan, assessment methods Interrelationship between pavement materials properties and structural/functional performance of pavements Existing specifications and need for development of performance related specifications
3 - 5	Roadbed Soils	Types of soils and their value as foundation under pavement structures Strength-density-moisture considerations Principles involved in roadbed soil (subgrade) design
6 - 8	Base and Sub-base Materials	Soil aggregate mixtures Cement treated bases Lime treated bases Asphalt treated bases Design parameters, tests and specifications
9	**MID SEMESTER EXAM**	
10 -11	Paving Materials	Asphalt concrete engineering properties and their effects on pavements performance Portland cement concrete engineering properties and their effects on pavement performance Distresses related to bituminous pavements and materials Distresses related to PCC pavements and materials
12 -13	Asphalt Binder Characterization	Penetration grading system Viscosity grading system Superpave grading system Design parameters, tests and specifications
14 -16	Asphalt Mix Design	Marshall, Hveem and PCA mix designs Influence of drainage on the structural design of pavements Effect of asphalt content, void content, viscosity, penetration, type and hardness of asphalt on fatigue and rutting SUPERPAVE mix design procedures Effect of material variables on durability of concrete pavements Drainable pavement systems

17	Term Project and Presentations	Development of a comprehensive pavement materials characterization project Application of course concepts to a real-world scenario Group presentations and peer review
18	**END SEMESTER EXAM**	