Course Content

Module 1	MODULE TITLE	FUNDAMENTALS OF HIGHWAY MATERIAL TESTING
Lectures 6 hrs		Tutorial 6 hrs

Learning Outcomes:

I. Ability to describe the role of highway material engineer

II. Ability to describe experimental errors, sampling and equipment calibration

III. Ability to describe basic statistics

IV. Ability to interpret test results

Outline syllabus

Role of a Civil Engineering Laboratory in Civil Engineering/ Role of Materials Testers in Civil Engineering/ Operations of a Civil Engineering Laboratory/ Basic knowledge of construction/ Types and handling of Laboratory apparatus/ Importance of correct set-up of apparatus/ Importance of calibration/ Laboratory safety practice/ Basic properties of soils, gravel, bitumen, asphalt, cement, concrete and aggregate/ Sampling theory/ Calculation of volumes, densities etc/ Basic Quality Assurance/ Record keeping/ Essentials of management/ Quality assurance and specifications/ Daily programming of testing/ Measurement methods/ Interpretation of test results/ Introduction to statistics

Assessment scheme: 100% Continuous Assessment [assignment on presentation of test results including statistics and data analysis and results interpretation]

Module 2	MODULE TITLE	SOIL TESTING
Lectures 9 hrs		Practical 18 hrs

Learning Outcomes:

I. Ability to describe the Basic Soil Mechanics principals

II. Ability to describe the design parameters related to highway design

III. Ability to perform soil testing related to highway construction

Outline syllabus

Introduction to soil and rock mechanics/ Mass volume relationships/ Testing and classification of soils for highway construction/ Introduction to soil compaction/ Measurement of the strength of soil/ Selection of fill material and quality controlling of field soil compaction

Lab Assignments

Soil sampling/ Determination of the moisture content/ Determination of the particle size distribution of soil/ Determination of Atterberg Limits (LL, PL &PI)/ Determination of the linear shrinkage/ Determination of the moisture density relationship/ Determination of the CBR of treated and untreated materials / Determination of the UCS of treated materials/ Determination CBR by DCP test/ Determination of the field density by nuclear method/ Determination of the field density by sand replacement method/ Determination of the field density by core cutter method

Assessment scheme: 20% on Final Examination and 80% Continuous Assessment [Assignment on basic soil mechanics, preparation of test reports]

Module 3	MODULE TITLE	AGGREGATE AND CONCRETE TESTING
Lectures 12hrs		Practical 15 hrs

Learning Outcomes:

I. Ability to understand the properties of cement, aggregate and concrete

II. Ability to perform tests on cement, aggregate and concrete

III. Ability to perform concrete mix design

Outline Syllabus

Properties of cement and aggregates/ Concrete mix design/ Properties of fresh and hardened concrete

Lab assignments

Testing of cement for strength, setting time and soundness/ Determination of the aggregate crushing value/ Determination of the 10% fineness value/ Sieve analysis of fine and coarse aggregates / Determination of the flakiness index of coarse aggregate / Determination of ALD of coarse aggregate / Determination of the dry bulk density, apparent relative density and water absorption of fine and coarse aggregates/ Concrete mix design and testing of fresh and hardened concrete including flexural strength, splitting tensile strength and compressive strength

Assessment scheme: : 20% on Final Examination and 80% Continuous Assessment [Assignment on basic mix design calculation and preparation of test reports]

Module 4	MODULE TITLE	BITUMIOUS MATERAIL TESTING
Lectures 15 hrs		Practical 15 hrs

Learning Outcomes:

I. Ability to describe the properties of bituminous material and hot mix asphalt

II. Ability to perform bitumen and hot mix asphalt testing

III. Ability to perform asphalt mix design

Outline syllabus

Types of Bitumen / Properties of Bitumen/ Bitumen Classification/ Type of Surfacing/ Volumetric Properties of Hot Mix Asphalt/ Asphalt Mix Design

Lab Assignment

Determination of penetration value of bitumen / Determination of the softening point of bitumen / Determination of ductili of bitumen / Loss on heating of bitumen (Thin Film Oven Test)/ Viscosity of bituminous binders/ Determination of bind content / Determination of bulk relative density / Determination of the theoretical maximum relative density (Rice) Determination of the void content / Determination of the stability and flow by means of Marshall method / Determination the relative compaction of an asphalt mixture/ Determination of Binder Content by extraction and Ignite Method/ Tests c bituminous emulsions

Assessment scheme: : 20% on Final Examination and 80% Continuous Assessment [Assignment on asphalt mix design and preparation of test reports]