Course Modules Of The Subject Taught For The Session 2024-25 (Even Semester)

Course Syllabi with CO's

Faculty Name **: Bharathi B**			Academic Year: 2024-25				
Department: Civil Engineering							
Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs of Pedagogy
				L	T	P	
BCV613D	**Design and Construction of Highway Pavements**	**Core**	**Highway Engineering**	**3**	**-**	**-**	**40 hours**
Objectives	**Course objectives:** This course will enable students to; • To impart a fundamental understanding to the basics of highway geometric design features • To introduce the evaluation of pavement material characteristics to identify their suitability for construction • To study the principles and design of flexible and rigid pavements according to IRC specifications • To skill up for executing pavement construction with quality control and assurance alongwith Plants and Machinery selection						

Topics Covered as per Syllabus

Module 1:

Introduction and Subgrade Materials: Overview of highway - Classification of roads, Pavement Layers – Components and Functions, Highway alignment and Survey, road development in India, Components and Geometric Standards of Highway Design

Pavement subgrade material: Soils, Soil Characteristic Evaluation, desirable properties, tests (Virtual) - Liquid Limit, Plastic limit, Shrinkage Limit, Grain size analysis - Wet sieve and Hydrometer analysis, Water Content, Specific gravity, Free swell index, Relative density, Heavy compaction, California Bearing Ratio.

Module-2

Pavement Materials

Stone aggregates: Desirable properties, tests (Virtual) - Sieve analysis, Specific gravity, Water absorption, Bulk density, Wet Sieve analysis, Aggregate crushing value, Aggregate impact value, Combined Flakiness and Elongation index, Aggregate abrasion value, Soundness of aggregate, Characteristic evaluation

Bituminous binders: Desirable properties, tests (Virtual) - Specific gravity, Penetration, Softening Point, Ductility, Elastic recovery, Flash point, Separation, Loss on heating, Matter soluble in trichloro ethylene,Absolute, Kinematic and Rotational Viscosity, Aging of Bitumen, Characteristic evaluation.

Bituminous paving mix: Desirable properties, tests (Virtual) - Stripping value of coarse aggregate, Stone polishing value of coarse aggregate, Maximum specific gravity of bituminous mix, Marshall stability & flow, Binder content, Bulk specific gravity and density, Indirect tensile strength, Resilient Modulus (indirect tension test), Resistance of compacted asphalt mixtures to moisture-induced damage, Characteristic evaluation

Cement: Desirable properties, tests (Virtual) - Consistency, Initial Setting Time, Final Setting Time, Mortar Cube compressive strength, Fineness of cement, Specific gravity of cement, Soundness of cement, Characteristic evaluation

Concrete: Desirable properties, requirements, tests (Virtual) - Workability, Compressive Strength, Flexural strength, Characteristic evaluation

Module-3

Principles and Design of Pavements

Flexible Pavement: Introduction, composition, factors governing design, design of flexible pavements as per IRC; Bituminous mix design (Marshall method), IIT Pave Software; Case study - Design Problem

Rigid pavement: Introduction, composition, factors governing design, DLC and PQC mix design; design of concrete pavements as per IRC; Joints; Case study – Design Problem

Module-4

Plants and Machinery: Introduction; Asphalt Hot Mix Plant, Concrete Batching Plant, Wet Mix Macadam Plant, Earthmoving and Excavation Equipment, Paving Equipment, Slipform Paver, Paver Milling and Road Marking Equipment; Factors affecting output of Plant & Equipment; Initiatives to improve quality

Construction Planning: Concept of Highways, Planning; Schedules in Planning; Monitoring; Software in Planning

Module-5

Subgrade and Base Layer: Construction Practices and Quality Control; Granular Sub-base Construction Activities; Cement Treated Sub-base Construction Activities

Flexible Layers: Wet Mix Macadam; Construction Practices of Wet Mix Macadam; Hot Mix Asphalt; Construction Practices of Hot Mix Asphalt Layer, Quality Control of Flexible Layers

Rigid Layers: Dry Lean Concrete; Construction Practices of Dry Lean Concrete; Pavement Quality Concrete; Construction Practices of Pavement Quality Concrete, Quality Control of Rigid Layers

Pavement Evaluation: Introduction, Pavement Condition Survey, Pavement Evaluation Functional and Structural, Distresses - Flexible and Rigid Pavement, Overlay Design of Flexible Pavement

Suggested Learning Resources

Books

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017
2. Partha Chakraborty, "Principles of Transportation Engineering", PHI Learning,
3. Principles and Practices of Highway Engineering by Kadiyali L.R and Dr.Lal N.B., Khanna Publishers, New Delhi, 2003
4. Relevant IRC and IS Codes of Practices, MoRTH Specification

Web links and Video Lectures (e-Resources):

- NPTEL and YouTube Videos.

Course Outcomes	At the end of the course, the student will be able to : 1. Develop an understanding of the fundamentals of pavement layer behaviour. 2. Comprehend the material specifications by interpreting the relationship between material properties and pavement behaviour. 3. Conduct different tests on road construction materials to evaluate their characteristics 4. Carry out the design of flexible and rigid pavements 5. Acquire skilful knowledge of pavement construction practices, plant and machinery selection and quality control

For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks. The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered

Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code:	BCV613D	Title: Design and Construction of Highway Pavement						Faculty Name:		Bharathi B				
List of Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3	-	1	-	-	-	-	-	-	-	-	1		
CO-2	1	1	-	1	-	-	-	-	-	-	-	1		
CO-3	2	-	-	-	-	-	-	-	-	-	-	1		
CO-4	2	1	-	-	-	-	-	-	-	-	2	1		
CO-5	1			1								1		

Note: 3 = Strong Contribution 2 = Average Contribution 1 = Weak Contribution - = No Contribution