

Signal Engineering (Open Elective - III)

SYLLABUS FOR B.E. V – SEMESTER (CSE, CSE (AI&ML), ECE, EEE, IT & Mechanical)

L:T:P (Hrs./week) : 2:0:1	SEE Marks : 60	Course Code: U240E530PH
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To provide fundamental knowledge of railway signaling systems and their role in ensuring safe and efficient train operations.	On completion of the course, students will be able to
2. To develop understanding of signaling components such as signals, relays, track circuits, axle counters, and point machines.	1. Explain the principles and concepts of railway signaling and train working systems.
3. To familiarize students with station layouts, train working systems, and block signaling methods.	2. Analyze the functioning of various signaling components and their safety features.
4. To impart knowledge on interlocking principles, safety mechanisms, and modern electronic interlocking systems.	3. Apply interlocking principles to ensure safe train movement in different station layouts.
5. To enable practical exposure to signaling equipment, testing procedures, and real-time railway signaling operations.	4. Evaluate the performance and operation of signaling equipment such as relays, track circuits, axle counters, and block instruments.
	5. Demonstrate practical skills in handling, testing, and analyzing railway signaling systems and associated subsystems.

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1												2
CO2	3	3	2		1										2
CO3	3	3	3	1	2										2
CO4	3	3	2	2	2										2
CO5	3	2	2	3	3										2

UNIT – I: Introduction to General Signaling (8 Hours)

Opening of Railways: Duties of Commissioners, Sanction to Open Railway for Public Carriage of Passengers, Requirements & Recommendations for Signaling and Interlocking Installations, Catechism for Signaling and Interlocking Installations, for 25KV AC, Spl layouts: Isolation, Ruling gradients, Slip, Catch sidings

Schedule of Dimensions: General, Station Yards, Electric Traction 25KV AC 50 Cycles, Clearances required for 25KV single phase AC Electric Traction.

General Rules: Definitions, Type of Signals; Adequate Distance, System of Working, Absolute Block system, Automatic Block System, Block Working, Level Crossings, Station Working Rules.

UNIT – II: Railway Signaling (6 Hours)

Station Layouts: MACLS, Signal Aspects, Location of Signals; Station Layouts: Single Line, Double Line, 2-Road, 3-Road, 4-Road.

Signaling Elements: Track Circuits & Axle Counters, Block Instruments, point machines, Relays, Relay Interlocking and Electronic Interlocking, Requirement of Signaling in 25KV AC Electrified Area.

Signaling Interlocking Plan: Essentials of Interlocking, Train Detection, Point Switching, Signal, Block Control, Aspect Control Chart.

UNIT – III: Signaling Equipment – I (8 Hours)

Details of Relays, Signal Cables. Signals, Control Panel & Operation – Safety features, Working.

Details of Point Machines – Components, Working, Circuit Progression, Testing, Safety features,

Level Crossing Gates – Working, Circuit Progression, Safety features

Details of Track Circuits, Axle Counters – Single section, Multi-section, Subsystems; Working and Application.

UNIT – IV: Signaling Equipment – II (8 Hours)

Details about Block Instruments – Types, Working, Circuit Progression, safety features Data Acquisition System – Interfaces, Fault Logic.

Details of Integrated Power Supply, CLS Panel, Lightning and Surge Protection.

Practicals at IRISSET Laboratory (12 Hours)

1. Relays, Signal Cables. Signals, Control Panel & Operation.
2. Point Machines - Components, Working, Circuit Progression, Testing.
3. Level Crossing Gates - Working, Circuit Progression.
4. Track Circuits, Axle Counters - Single section, Multi-section, Subsystems; Working and Application.
5. Block Instruments - Types, Working, Circuit Progression.
6. Data Acquisition System - Interfaces, Fault Logic.
7. Integrated Power Supply, CLS Panel, Lightning and Surge Protection.

The break-up of CIE : Internal Tests + Assignments + Quizzes

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| 1. No. of Internal Tests | : 2 | Max. Marks for each Internal Tests | : 30 |
| 2. No. of Assignments | : 3 | Max. Marks for each Assignment | : 5 |
| 3. No. of Quizzes | : 3 | Max. Marks for each Quiz Test | : 5 |

Duration of Internal Tests: 90 Minutes