

Automatic Train Protection System - Kavach

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

L:T:P (Hrs./week) : 2:0:1	SEE Marks : 60	Course Code:U23OE630PH
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES		COURSE OUTCOMES											
<ol style="list-style-type: none"> To provide students with a comprehensive understanding of automatic train protection technologies, focusing on the architecture and working of the Kavach system. To impart knowledge about the components and subsystems of Kavach, including both onboard and wayside equipment, communication protocols, and signaling interfaces. To equip students with the skills required to explain layout-specific plans, diagrams, and implementation strategies for deploying Kavach systems in railway networks. To enable students to simulate, test, and validate Kavach configurations using testbench environments to ensure functionality, reliability, and safety compliance. 		<p>On completion of the course, students will be able to</p> <ol style="list-style-type: none"> Acquire knowledge about the Train Protection Systems in general and Kavach - Indian Railways Automatic Train Protection System in detail. Acquire knowledge about various elements, subsystems associated with Kavach, those on the ground - wayside, those on the train - onboard and related concepts. Illustrate various plans & diagrams required for implementation of Kavach for typical station layout. Simulate, test, and evaluate the performance of the Kavach system using testbench environments, ensuring correctness of configuration, data validation, and compliance with safety standards. 											

CO-PO/PSO Mapping

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

UNIT – I: Introduction to Train Protection Systems (8 Hours)

Train Protection Systems: Auxiliary Warning Systems, European Train Control Systems Communication Based Interlocking System, Spot and Continuous Relay of Information

Working of Train Protection System – Kavach: Overview of Kavach and its Working, Features, Subsystems, Communication Interfaces, Signalling Interfaces

Subsystem: Onboard Kavach: Driver Machine Interlocking, Braking

Interface, Radio Equipment, Onboard Computer, Transponder Receiver, Odometry, GNSS, GPRS, GSM

Subsystem: Stationary Kavach Station Kavach, Track Side Equipment, Signalling Interface, Radio & Tower, GNSS, Transponders, Network Monitoring System

UNIT – II: (6 Hours)

Concepts : Location Referencing - Train position, Modes of Onboard subsystem, Train Characteristics, Mode Transitions, Braking Curves, Speed Profiles, Speed Limits, Speed Monitoring, Target Speed, Target Distance, Movement Authority, Communication Protocols, Key Management System (KMS), Messages & Language

UNIT – III: Design –Kavach: (8 Hours)

Survey, Assessment & Estimation: Station Layout, Radio Signal Strength, Tower Location, Power Requirement, Cable Survey, Loco Fitment Survey

Station Design: Kavach Scheme Plan, Kavach Control Table, Signalling Interface Diagram, Connectivity Plans for Remote Interface Units (RIUs), Power Supply Plan

Tower Design: Soil Testing, Foundation design, Super Structure Design

UNIT – IV: Installation, Deployment & Testing (8 Hours)

Stationary Kavach: Interlocking Interface, RFID Tags, Station Master Operation Console Indication Panel (SM_OCIP), GPS/GSM Antennas, Pre-commissioning Checklist, Testing

Onboard Kavach: DMI, Speed Sensors, RFID Reader, Onboard Computer, Brake Interface Unit, Pre-commissioning Checklist, Testing

Practicals at IRISET Laboratory (12 Hours)

- Testbench, Preparation and deployment of Stationary Kavach Data : Configuration involving Topographical Information - Arrangement of Signals/Markers, Transponders, Inter signal Distances, Signal Routes, Gradients, Speed Restrictions
- Verification and Validation of Onboard Data – Ceiling

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

- No. of Internal Tests : Max. Marks for each Internal Tests :
- No. of Assignments : Max. Marks for each Assignment :
- No. of Quizzes : Max. Marks for each Quiz Test :

Duration of Internal Tests: 90 Minutes

Signature

CSE