

Faculty Development Program (FDP) - 2024

IRISET is planning to conduct Faculty Development Program (FDP) of 02 weeks duration from 14.10.24 to 25.10.24 on Railway Signal Engineering and Automatic Train Protection system (Kavach). Interested Faculty from Engineering colleges (Asst Professors/ Professors) may attend the course. Course is being conducted in Hybrid mode (ie 1st week is online and 2nd week is on campus at IRISET, Hyderabad). The FDP programme is free of cost. The accommodation & mess facility (for out station faculty) can be provided on chargeable basis. (Approx. Rs 400/- per day per room for accommodation and Rs 415/- per day per person towards mess charges). The faculty will have to arrange their own transport to reach IRISET.

A google form <https://forms.gle/BGYtM1w97fm9wDJN6> is created wherein colleges can submit the details of faculty interested in attending the above programme.



भारतीय रेल सिग्नल इंजीनियरी और दूरसंचार संस्थान

INDIAN RAILWAYS INSTITUTE OF SIGNAL ENGINEERING AND TELECOMMUNICATIONS

Curriculum

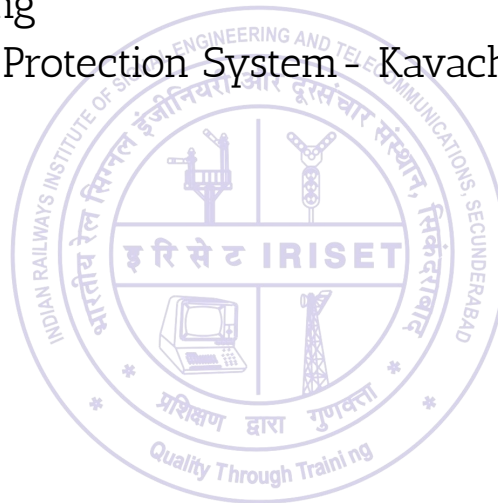
01. Signal Engineering

02. Automatic Train Protection System: Kavach



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Curriculum for Academics

Subject 01: **Signal Engineering**
 Target Group: Bachelor of Technology - 2nd Year Students
 Instructional Hours : 50hrs [Classroom Hours: 38 hrs, Laboratory Hours: 12 hrs]
 Pre-requisites : Physics & Mathematics

The students will learn the railway signalling principles. They will learn in detail signalling elements, subsystems and their working, their failsafe and safety aspects. They will be introduced to various systems of train working, interlocking features and general requirements of signalling.

Curriculum

#	Topic	Subtopic	Detailing	Theory Hrs	Lab Hrs	Description
1	General Signalling	Opening of Railways	Duties of Commissioners, Sanction to Open Railway for Public Carriage of Passengers, Requirements & Recommendations for Signalling and Interlocking Installations, Catechism for Signalling and Interlocking Installations, for 25KV AC, Spl layouts : Isolation, Ruling gradients, Slip, Catch sidings	4		Signalling in general - requirements of opening of railways, requisite schedule of dimensions for safe working of trains, meaning of signal aspects, positioning of signals on station layouts, requisite overlaps for train working will be elaborated.
		Schedule of Dimensions	General, Station Yards, Electric Traction 25KV AC 50 Cycles, Clearances required for 25KV single phase AC Electric Traction, Standard and Moving Dimension Diagrams	2		
		General Rules	Definitions, Type of Signals; Adequate Distance, System of Working, Absolute Block system, Automatic Block System, Block Working, Level Crossings, Station Working Rules	4		

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2	Railway Signalling	Station Layouts	MACLS, Signal Aspects, Location of Signals; Station Layouts: Single Line, Double Line, 2-Road, 3-Road, 4-Road	2		Basic station layouts, Signalling Elements and their role and function in overall signalling interlocking, introduction to signalling interlocking plans and various signal controls will be detailed.
		Signalling Elements	Level Crossings, Cables, Power Supply Arrangements, Track Circuits & Axle Counters, Block Instruments, Point machines, Relays, Relay Interlocking; and Electronic Interlocking, Requirement of Signalling in 25KV AC Electrified Area.	2		
		Signalling Interlocking Plan	Essentials of Interlocking, Train Detection, Level Crossing Gate, Point Switching, Signal, Block Control, Aspect Control Chart	2		
3	Signalling Equipment		Details of Relays, Signal Cables, Signals, Control Panel & Operation - Safety features, Working	2	1	Signalling Elements - their build, components, subsystems, working, circuit progression and various safety aspects will be explained..
			Details of Point Machines - Components, Working, Circuit Progression, Testing, Safety features,	4	2	
			Level Crossing Gates - Working, Circuit Progression, Safety features	2	1	
			Details of Track Circuits, Axle Counters - Single section, Multi-section, Subsystems; Working and Application,	4	2	
			Details about Block Instruments - Types, Working, Circuit Progression, safety features	4	2	
			Data Acquisition System - Interfaces, Fault	4	2	

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			Logic			
			Details of Integrated Power Supply, CLS Panel, Lightning and Surge Protection	2	2	
			Total	38	12	



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Subject O2: **Automatic Train Protection System - Kavach**
 Target Group: Bachelor of Technology - 2nd Year Students
 Instructional Hours : 50hrs [Classroom Hours: 38 hrs, Laboratory Hours: 12 hrs]
 Pre-requisites : Network Layers, TDMA/FDMA/SDMA
 Assumptions: Signal Engineering

The students will learn about the Train Protection Systems in general and Kavach - Indian Railways Automatic Train Protection System in detail. They will learn various elements, subsystems associated with Kavach, those on the ground - wayside, those on the train - onboard and related concepts. The students will be able to design various plans & diagrams required for implementation of Kavach for typical station layout. The students will be able to simulate & validate the system designs on the testbench.

Curriculum

#	Topic	Subtopic	Detailing	Theory Hrs	Lab Hrs	Description
1	Introduction to Train Protection Systems	Train Protection Systems	Auxiliary Warning Systems, European Train Control Systems Communication Based Interlocking System, Spot and Continuous Relay of Information	2		Various types of existing Train Protection Systems will be elaborated.
2	Train Protection System - Kavach	Working	Overview of Kavach and its Working, Features, Subsystems, Communication Interfaces, Signalling Interfaces	4		Overall view of Kavach, its subsystems at block diagram level will be explained.
		Subsystem: Onboard Kavach	Driver Machine Interlocking, Braking Interface, Radio Equipment, Onboard Computer, Transponder Receiver, Odometry, GNSS, GPRS, GSM	4		Onboard subsystems and their working will be elaborated.

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		Subsystem: Stationary Kavach	Station Kavach, Track Side Equipment, Signalling Interface, Radio & Tower, GNSS, Transponders, Network Monitoring System	4		Stationary subsystems and their working will be explained.
		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	6		Important concepts related to Train Protection Systems will be detailed.
3	Design -Kavach	Survey, Assessment & Estimation	Station Layout, Radio Signal Strength, Tower Location, Power Requirement, Cable Survey, Loco Fitment Survey	4		Assessment of various requirements for Radio, Power, Locating Transponders, Remote Interface Units will be explained.
		Station Design	Kavach Scheme Plan, Kavach Control Table, Signalling Interface Diagram, Connectivity Plans for Remote Interface Units (RIUs), Power Supply Plan	8		Plans and Tables will be designed for a typical station layout.
		Tower Design	Soil Testing, Foundation design, Super Structure Design	2		Civil Engineering inputs for tower erection.
4	Installation,	Stationary Kavach	Interlocking Interface, RFID Tags,	2		Implementation aspects of

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	Deployment & Testing		Station Master Operation Console Indication Panel (SM_OCIP), GPS/GSM Antennas, Pre-commissioning Checklist, Testing			Stationary Kavach will be elucidated.
		Onboard Kavach	DMI, Speed Sensors, RFID Reader, Onboard Computer, Brake Interface Unit, Pre-commissioning Checklist, Testing	2		Implementation aspects of Stationary Kavach will be detailed.
5	Simulation		Testbench, Preparation and deployment of Stationary Kavach Data : Configuration involving Topographical Information - Arrangement of Signals/Markers, Transponders, Intersignal Distances, Signal Routes, Gradients, Speed Restrictions; Verification and Validation of Onboard Data - Ceiling		12	Preparation of data and deployment for simulation on the test bench will be demonstrated.
			Total	38	12	