SKILL DEVELOPMENT COURSE

DIPLOMA COURSE
In
Software Technology In Railway

A Programme under

Department of Computer Science and Engineering
MIT College of Railway Engineering & Research, Barshi

In association with

Skill development center
Punyshlok Ahilyadevi Holkar Solapur University, Solapur

MIT College of Railway Engg. & Research ★ Jamgaon, Barshi ★

1	**Name of Course**	One Year Diploma Course in Software Technology in Railway
2	**Maxno.ofStudents**	30
3	**Duration**	1 Year
4	**CourseType**	Part Time
5	**No. of Days per week**	3days
6	**No. of hours per day**	2Hrs
7	**Space require**	66 m2 classroom and 66 m2 Laboratory
8	**Entry qualification**	Diploma Computer Science & Engineering / FE- Computer Science & Engineering, Computer Technology, Software Engineering, Information Technology, Computer Engineering, Bachelor of Computer Application, Bachelor of Computer Science
9	**Objective of syllabus**	To Learn Software Technologies that help Railway Industry to enhance their networks, strengthen security and Information System
10	**Employment opportunities**	Student will get jobs in Government as well as Private railway companies
	Teachers Qualification	ME/ M.Tech/Ph.D
12	**One Month Internship is Compulsory.**	

13 **Teaching Scheme :**

Sr. No	Subject	Subject Code	Clock Hour/ Week	
			Theory	Practical
1	Data Communication	RCS001	2	2
2	Computer Networks	RCS002	2	2
3	Cyber Security	RCS003	2	2
4	Passenger Information System	RCS004	2	2
5	Mobile Commuting	RCS005	2	2
6	Railway Project work	RCS006	0	4

14 **Examination Scheme – Final Examination will be based on syllabus of One years.**

Paper	Subject	Subject Code	Theory			Practical			Total	
			Duration (Hr.)	Max	Min	Duration (Hr.)	Max	Min	Min	Max
1	**Data Communication**	RCS001	3	80	32	2	20	8	40	100
2	**Computer Networks**	RCS002	3	80	32	2	20	8	40	100
3	**Cyber Security**	RCS003	3	80	32	2	20	8	40	100
4	**Passenger Information System**	RCS004	3	80	32	2	20	8	40	100
5	**Mobile Commuting**	RCS005	3	80	32	2	20	8	40	100
6	**Railway Project work**	RCS006	0	0	0	2	100	40	40	100
Total				400	160		200	80	240	600

NOTE :- ***COMBINE PASSING (BOTH THEORY & PRACTLCAL)***

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SYLLABUS

Sr. No	Course Name	One Year Diploma Course in Software Technology In Railway		
1	Paper Title	Data Communication		
2	Paper Number	RCS001		
3	Objective of Paper	1.To introduce Data Communication Fundamentals such as Data, Signals, Transmission medias		
		2. To explain uses of Computer Network, OSI Reference model, DNS.		
		3. To demonstrate different physical media and devices.		
		4. To introduce Data Transmission Protocol.		
		5. To introduce different routing algorithms and congestion control in network Layer.		
4	Expected Outcome from Paper	1. Send data through various data communication modes.		
		2. Describe OSI reference model, DNS		
		3. Identify and classify different physical media and devices.		
		4. Describe Data Transmission Protocol.		
		5. Simulate different routing algorithms in Network Layer.		
5	Content	**Unit**	**Content**	**Hour**
		Unit-I	Introduction, Data representation, Data components, Fundamental characteristics of data communication, Data flow, Data Transmission, Network, Categories of networks, Topology	8
		Unit-II	Introduction Network Architecture, LAN, Ethernet , LAN Devices, Interfaces and Connectors, Computer Terminals and Servers, Standard Organization, OSI Model, DNS	10
		Unit-III	Introduction to Data and Signal, Encoding, Transmission Media Categories	6
		Unit-IV	Introduction to Data link control, LAN Protocols, Media Access, Ethernet, PoE, Connecting Devices, VLAN	6
				30
	Practical List	1	Study of Networking Devices.	2
		2	Simulation of different Framing methods. (Character count, starting and ending flag etc)	2
		3	Implementation of Shortest path routing algorithm.	2
		4	Implementation of Flow – based routing algorithm.	2
		5	Given the IP address find out class, subnetsmask, netid and hostid.	2
				10
Reference Book	1. Data & Computer Communication (Unit 1) --William Stallings. (seventh edition) PHI publications. 2. Computer Networks (Unit 2, 3, 4, 5,6)--Andrew S. Tanenbaum (third edition) PHI publications. 3. http://122.252.230.113/content/notes/tel/TA3hl.pdf			

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Sr. No	Course Name	One Year Diploma Course in Software Technology In Railway		
1	Paper Title	**Computer Network**		
2	Paper Number	RCS002		
3	Objective of Paper	1. To introduce in IPv4 and IPv6 addressing.		
		2. To introduce Transport layer protocols: TCP, UDP and SCTP.		
		3. To introduce RailNet		
		4. To introduce Wireless LAN.		
		5. Maintenance and Trouble Shooting Procedure		
4	Expected Outcome from Paper	1. Identify different addressing modes using IPv4.		
		2. Implement client-server paradigm for socket interfaces using UDP, TCP & SCTP.		
		3. Describe RailNet System		
		4. Describe IEEE 802.1, WLAN Architecture		
		5. Trouble shoot Network issues		
5	Content	**Unit**	**Content**	**Hour**
		Unit-I	TCP/IP Protocol, UDP Protocol, IP Communication, IP Address, IP Routing, WAN Devices, MPLS	8
		Unit-II	Fault Diagnosis, Troubleshooting, Network Diagnostic Tools	4
		Unit-III	Introduction, Implementation, Railnet Arrangement, Railnet Security, IP Scheme, E-mail Addressing, LAN Infrastructure, TPaaS	10
		Unit-IV	IEEE802.11, Transmission Technology, WLAN Architecture, WLAN application and standards, Wireless LAN Security, Securing Access Points Aps, Wi-MAX	8
				30
Practical List				
1	Configuration of Network-Assigning IP Address, Subnet-Mask, Default Gateway, DNS Server Addresses & Testing Basic Connectivity.			2
2	Connectionless Iterative Server: C Implementation of Client-Server Programs Using Iterative UDP Server, Iterative TCP Server\, Concurrent TCP Server			2
3	Diagnosis of different Network Issues			2
4	Study of TPaaS			2
5	Study of IEEE 802.11			2
				10

Reference Book	
	1. Internetworking with TCP/IP Vol III. Client-Server Programming & Applications: Douglas E. Comer
	2. R2. Data and Computer Communications: William Stallings
	3. Data Communication and Networking: Behrouz A. Forouzan
	4. http://122.252.230.113/content/notes/tel/TA3hl.pdf

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Sr. No	Course Name	One Year Diploma Course in Software Technology In Railway		
1	Paper Title	**Cyber Security**		
2	Paper Number	**RCS003**		
3	Objective of Paper	1. Extensive overview of cyber security issues, tools and techniques in cyber security domains.		
		2. Provide concepts of computer security, cryptography, secure protocols, detection and othersecurity techniques		
		3. Provide understanding in essential techniques in protecting Information Systems, ITinfrastructure		
		4. Introduce Cyber Act, CERT.		
4	Expected Outcome from Paper	1. Apply security technologies and policies to protect digital information.		
		2. Identify & evaluate Information security threats &vulnerabilities in information system andapply security measures to real time scenario		
		3. Demonstrate the use of standards and cyber laws to enhance information security in thedevelopment process and infrastructure protection		
		4. Describe Cyber Act. CERT		
5	Content	**Unit**	**Content**	**Hour**
		Unit-I	Cyber Security – Introduction to Cyber threats / Crimes Vulnerabilities, Threats and Attacks, Introduction, Threats, Types of attackers, Classes of attacks, Malwares (Viruses, Worms, Trojans etc.) CRYPTOGRAPHY Introduction - Science of cryptography, Types of Keys, Categories of Cryptography, Steganography	6
		Unit-II	Security Services by Cryptography Message Confidentiality, Message Integrity, Hashing Algorithm, Digest Lengths, RSA algorithm, Digital Signature and Digital Certificate, Self-signed Digital Certificates, Entity Authentication	6
		Unit-III	WIRELESS SECURITY Introduction, Types of WLAN IEEE 802.11 or Wi-Fi Protocols, Major issues with Wireless Networks ,Wireless Network Topologies, WLAN Security, Types of designs of WLANs, Wi-Fi Heat Maps	6
		Unit-IV	ENDPOINT SECURITY- Introduction, Antivirus software, Anti-malware software, Application white-listing, Device control, Endpoint Data Loss Prevention, Enterprise mobile device management, Host-based intrusion detection/prevention system, Storage encryption, Vulnerability assessment Patch management	6
		Unit-V	CYBER ACT Introduction, Important objectives of Information Technology Act, 2000 , Offences, Penalties, Compensation and Adjudication under IT, Act, 2000 CERT-In Introduction, Stakeholders of CERT-In, Policies and procedures of CERT-In, Information security policy of Government of India	6
				30

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Practical List		
1	Implementation of Substitution Cipher	2
2	Write a program to simulate RSA algorithm.	2
3	Study different cybercrimes	2
4	Case Study on Cyber Act	2
5	Case Study on CERT-In	2
		10

Reference Book	1. Williams Stallings–Cryptography and Network security principles and practices. Pearson 2. Behroz A. Forozan, Debdeep Mukhopadhyay, "Cyber and Network Security" McGraw Hill 3. Education, 2nd Edition.Data Communication and Networking: Behrouz A. Forouzan 4. http://122.252.230.113/content/notes/tel/TA4.pdf

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Sr. No	Course Name	One Year Diploma Course in Software Technology In Railway		
1	Paper Title	PASSENGER INFORMATION SYSTEM		
2	Paper Number	RCS004		
3	Objective of Paper	1. Overview of Railway Reservation System 2. Development of various modules that integrate reservation system 3. Provides in-depth knowledge relate to Database System 4. Learning of application that can generate information of passenger		
4	Expected Outcome from Paper	1. Passenger Information System can be developed based on new entities 2. More ease and security based application can be developed and integrated in real-time system 3. Adaption to new technology can enable growth of information system		
5	Content	**Unit**	**Content**	**Hour**
		Unit-I	**Introduction to Passenger Information Systems:** Introduction, Types of Passenger Information systems, Commercial Classification of Stations in Railways, Minimum Essential Amenities (S&T), Desirable Amenities (Telecom.).	**5**
		Unit-II	**Video Information Systems:** TV Display system, Touch Screen Enquiry Kiosk, Types of Touch Screens, Connectivity Diagram, Electronic Reservation Chart System	**4**
		Unit-III	**Integrated Passenger Information Systems Rev 2.0:** Introduction, Schematic Diagram of IPIS, Specifications of System, MDCH & PDCH, Display Boards, Connectivity Diagrams, Central Data Controller & Specifications	**5**
		Unit-IV	**True colour Boards Integrated Passenger Information Systems:** Introduction, Schematic Diagram of IPIS, Specifications of System, MDCH & PDCH, Display Boards, Connectivity Diagrams, Central Data Controller & Specifications	**5**
		Unit-V	**Integrated Passenger Information Systems Rev 3.0:** Introduction, System Requirements - Hardware & Software, Schematic Diagram of IPIS, Comparative Study of Rev 2.0, 3.0 & 4.0 **Integrated Passenger Information Systems Rev 4.0:** Introduction, Components of the System, General Requirements, Zigbee Network, Connectivity Diagrams, Fault Diagnosis & Maintenance	**6**
		Unit-VI	**GPS Based Digital Clocks:** Introduction, RDSO Specification for GPS clock, General Requirements, Schematic Diagram, **Video Surveillance Systems:** Introduction, Analog & Digital CCTV System, Types of Cameras, IP Based Surveillance System, Schematic Diagram, Components of VSS & Software, Integrated Security & Surveillance System (ISS)	**5**
		Practical	i. PI-01 Study of Passenger Information System ii. PI-02 Display of Trains Information iii. PI-03 Addition/Deletion To/From Train List iv. PI-04 Message Display on IPIS System v. PI-05 Audio Announcements over PIS Network vi. PI-06 Study of PIS Network Configuration vii. PI-07 Troubleshooting of PIS Network viii. PI-08 GPS Clock a study ix. Seminar/Assignment/Workshop	**10**

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			x. MiniProject	
6	**Reference Book**	1. Specification for Integrated Passenger Information System (IPIS) RDSO/SPN/TC-61/2015 Rev-4.0 issued by Telecom Directorate/RDSO approved by ED/Telecom. 2. Specification for Integrated Passenger Information System (IPIS) RDSO/SPN/TC-61/2012 Rev-3.0 issued by Telecom Directorate/RDSO approved by ED/Telecom. 3. Specification of Digital Clock with GPS Synchronization Specification No. RDSO/SPN/TC/62/2008 Revision 3.0 Approved by Executive Director/ Telecom/ RDSO 4. Specification of IP based video surveillance system Specification No. RDSO/SPN/TC/65/2019 Revision 5.0 Approved by Executive Director/Telecom/RDSO 5. Railway Board's Letter No. 2018/LM (PA)/03/06 for the latest categorization of Stations over Indian Railways.	

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Sr. No	Course Name	One Year Diploma Course in Software Technology In Railway		
1	Paper Title	Mobile Commuting		
2	Paper Number	RCS005		
3	Objective of Paper	i.	To learn mobile train radio networks for communication	
		ii.	Obtain Knowledge related to Very High Frequency	
		iii.	To learn structure of cellular mobile in Railways	
		iv.	Provide understanding of Base Station Subsystems Equipment	
4	Expected Outcome from Paper	i.	To apply learnings of mobile network in railway sector	
		ii.	Understand and implement GSM concept in transport system	
5	Content	**Unit**	**Content**	**Hour**
		Unit-I	**Scenarios of Mobile train radio communication on Indian Railways:** Emergency Communication, Why train radio communication, Need for Mobile Communication,	3
		Unit-II	**Very High Frequency (VHF) Mobile Radio Communication:** Introduction, Application of VHF Communication on IR, Mode of Operations, VHF Radio Specification, VHF sets on Indian Railways, limitations of VHF Communication, Installation of VHF Communication, Maintenance of VHF Communication set, Test meters required at centralized repair center, Failure Report	5
		Unit-III	**Cellular Mobile Radio Communication Systems:** Introduction, Objectives in the design of cellular systems, Cellular Geometry, Determination of number of cells per cluster, Frequency reuse	3
		Unit-IV	**GSM (Global System for Mobile Communication):** Evolution of GSM, GSM system Architecture, System entity functions, Base stations subsystems, Network and Switching Subsystem, GSM Radio Spectrum, Multiple Access technique in GSM, GSM Radio Interface, GSM Logical Channels, Digital Transmission in GSM, GSM TDMA Frame Structure, GSM Modulation, Mapping of Data between different interfaces, GSM Protocols on Interface, Mobile Subscriber numbering Plans, Call management, Handover in the GSM,	7
		Unit-V	**GSM for Railways (GSM –R):** Introduction, Applications of GSM –R, The GSM-R Network & its structure, Quality Requirements of GSM –R, Features of GSM-R, Location Dependent Addressing, Enhanced multilevel Precedence and Preemption (eMLPP), Voice Broadcast Service (VBS) & Voice Group Call Service (VGCS), Implementation of GSM –R, Numbering Plan Principles, GSM –R System Planning Phases, GSM – R Type Approvals, RAM requirements for GSM –R	7
		Unit-VI	**GSM –R BSS Equipment:** Base Transceiver Station Model BS-240/240, Base Station Controller, Transcoding and Rate Adaption Unit, The Radio Commander, LMT, The Mobile-equipment of GSM –R, Operational Purpose Handheld, General Purpose Handheld	5
		Practical	i. MC-01 Study of GSM ii. MC-02 Study of GSM –R iii. MC-03 Study of BTS iv. MC-04 Study of BSC v. Seminar/Assignment/Workshop vi. Mini Project	10
6	Reference			

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	Book	i. Wireless Communication –Principles and practice - Theodore S. Rappaport (PEARSON) ii. Mobile and Personal Communication Systems and Services - Raj Pandya –(PHI) iii. Mobile Computing-Technology, Applications and Service Creation-Asoke K Talukder, Hasan Ahmed and Roopa R Yavagal.(MGH)

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Sr. No	Course Name	One Year Diploma Course in Software Technology In Railway	
1	Paper Title	Railway Project work	
2	Paper Number	RCS006	
3	Objective of Paper	To carry out a thematic design project in one of the specializations of Railway track	
		To carry out a project that will make the students aware of the different facets of Railway track	
		To explore the skill and abilities of student to work in team	
4	Expected Outcome from Paper	Develop an ability to apply the basic knowledge of mathematics, science and engineering to real-life problems	
		Identify the real life problem and present the solution by conducting experimental/ analytical study and in and off the laboratory	
		Apply modern tools such as different application software, modern instrumentation for the most precise study of the project undertaken	
		Demonstrate a commitment to teamwork while working with other students of diverse culture and different intellectual backgrounds	
5	Content Practical	Student shall submit the report and prepare presentation for defense. The topic for the Project Work may be from any Civil Engineering and inter-disciplinary area related to Railway Engineering. **Guidelines for Project contents:** **a) Project Report:** Project report should be of 25 to 50 pages (More pages can be used if needed). Entire Report has to be segmented chapter wise as per the requirement. 1. Introduction (History, Importance of Project Area, Problem identification, Objective of the Project) 2. Literature Review 3. Design/ Experimentation/ Model/Actual work carried out for the same. 4. Observation/ Analysis/ Findings/Results 5. Discussion on Results and Conclusion **b) Presentation:** The group has to prepare a power point presentation on project report and present it in front of the faculty of department along with the demonstration of the project. One copy of the report should be submitted to Institute/ Department, One copy to Guide and one copy should remain with each student of the project group	**Hour** **40**

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