



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN COMPUTER HARDWARE & MAINTENANCE

SEMESTER: **FOUR**

COURSE CODE: **401**

NAME OF COURSE: **DATA COMMUNICATION**

COMMON WITH PROGRAM (S): **COMPUTER HARDWARE & MAINTENANCE**

SCHEME: Jul.09

PAPER CODE:

RATIONALE

This course will allow students to develop background knowledge as well as core expertise in data communication technologies, which is one of the fastest growing industries. It forms an integral part of the modern Information and Communications Technology. Principles of DC play an important role in designing any modern telecom infrastructure.

A growth of telecommunications and networking is a dramatic increase in the number of professions, where an understanding of DCN is essential for success. Today, students wanting to understand the concepts and mechanisms underlying DCN infrastructures come from a variety of academic and professional backgrounds.

The students will be exposed to communication principles, different types of media, modulation techniques, multiplexing, switched networks, wireless communication, fiber-optic Communications and the state-of-art networking applications.

At the end of the course the students would know:

- Evolution of data communication and networking paradigms
- Principles of data communication, channel characteristics, signaling, modulation and encoding, and multiplexing (SONET/SDH)
- Various transmission media, their comparative study, fiber optics and wireless media Categories and topologies of networks.
- Layered architecture of OSI .
- Channel error detection and correction.
- Emerging technologies, such as mobile telephony etc .



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SCHEME OF STUDIES AND SPECIFICATION TABLE

Lectures: **5** Hrs. per week

Practical: **2** Hrs. per week

SCHEME OF STUDIES

S.No.	TOPICS	THEOR Y (HRS)	PRACTIC AL (HRS)	TOTA L (HRS)
1	<i>Introduction</i>	06		
2	<i>Data, Signals and Transmission Media</i>	08		
3	<i>Analog and Digital Transmission</i>	14		
4	<i>Multiplexing, Spreading and Switching</i>	10		
5	<i>Error Detection and Correction</i>	08		
6	<i>Telephone and Cable Networks</i>	08		
7	<i>Cellular and Satellite Networks</i>	08		
8	<i>SONET/SDH</i>	06		
		75	30	



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COURSE CONTENT

Lectures: 5 Hrs. per week

S.No.	COURSE CONTENT	HOURS OF STUDY
1	INTRODUCTION 1.1 DATA COMMUNICATIONS: Components, Data Representation, Dataflow 1.2 NETWORKS: Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks, Interconnection of Networks: Internetwork. 1.3 PROTOCOLS AND STANDARDS: Protocols, Standards, Standards Organizations. 1.4 LAYERED TASKS: Sender, Receiver, and Carrier, Hierarchy 1.5 THE OSI MODEL: Layered Architecture, Peer-to-Peer Processes, Encapsulation.	02 Hrs.
2	DATA, SIGNALS AND TRANSMISSION MEDIA 2.1 ANALOG AND DIGITAL: Analog and Digital Data, Analog and Digital Signals, Periodic and Non-periodic Signals. 2.2 PERIODIC ANALOG SIGNALS: Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth. 2.3 DIGITAL SIGNALS: Bit Rate, Bit Length, Digital Signal as a Composite Analog Signal, Transmission of Digital Signals, 2.4 TRANSMISSION IMPAIRMENT, Attenuation, Distortion, Noise 2.5 DATA RATE LIMITS: Noiseless Channel: Nyquist Bit Rate, Noisy Channel: Shannon Capacity, Using Both Limits. 2.6 PERFORMANCE: Bandwidth, Throughput, Latency (Delay), Bandwidth-Delay Product. 2.7 GUIDED MEDIA: Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable. 2.8 UNGUIDED MEDIA: WIRELESS: Radio Waves, Microwaves, Infrared.	04 Hrs.



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3	<p><i>ANALOG AND DIGITAL TRANSMISSION</i></p> <p>3.1 DIGITAL-TO-DIGITAL CONVERSION: Line Coding, Line coding Schemes, Block Coding, Scrambling.</p> <p>3.2 ANALOG-TO-DIGITAL CONVERSION: Pulse Code Modulation (PCM), Delta Modulation (DM).</p> <p>3.3 TRANSMISSION MODES: Parallel Transmission, Serial Transmission.</p> <p>3.4 DIGITAL-TO-ANALOG CONVERSION: Aspects of Digital-to-Analog Conversion, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Quadrature Amplitude Modulation.</p> <p>3.5 ANALOG-TO-ANALOG CONVERSION: Amplitude Modulation, Frequency Modulation, Phase Modulation.</p>	10 Hrs.
4	<p><i>Multiplexing, Spreading and Switching</i></p> <p>4.1 MULTIPLEXING: Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing,</p> <p>4.2 SPREAD SPECTRUM: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum.</p> <p>4.3 CHANNELIZATION: Frequency-Division Multiple Access (FDMA), Time-Division Multiple Access (TDMA), Code-Division Multiple Access (CDMA).</p> <p>4.4 CIRCUIT-SWITCHED NETWORKS: Three Phases, Efficiency, Delay, Circuit-Switched Technology.</p> <p>4.5 DATAGRAM NETWORKS: Routing Table, Efficiency, Delay, Datagram Networks.</p> <p>4.6 VIRTUAL-CIRCUIT NETWORKS: Addressing, Three Phases, Efficiency. Delay in Virtual-Circuit Networks, Circuit-Switched Technology.</p> <p>4.7 STRUCTURE OF A SWITCH: Circuit Switches, Packet Switches.</p>	06 Hrs.



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5	<i>Error Detection and Correction</i> 5.1 INTRODUCTION: Types of Errors, Redundancy, Detection Versus Correction, Forward Error Correction Versus Retransmission, Coding, Modular Arithmetic. 5.2 BLOCK CODING: Error Detection, Error Correction, Hamming Distance, Minimum Hamming Distance, 5.3 LINEAR BLOCK CODES: Minimum Distance for Linear Block Codes, Some Linear Block Codes, 5.4 CYCLIC CODES: Cyclic Redundancy Check, Hardware Implementation, Polynomials, Cyclic Code Analysis, Advantages of Cyclic Codes, Other Cyclic Codes. 5.5 CHECKSUM: Idea, One's Complement, Internet Checksum.	4 Hrs.
6	<i>Telephone and Cable Networks</i> 6.1 TELEPHONE NETWORK: Major Components, LATAs, Signaling, Services Provided by Telephone Networks. 6.2 DIAL-UP MODEMS: Modem Standards. 6.3 DIGITAL SUBSCRIBER LINE: DSL, ADSL Lite, HDSL, SDSL, VDSL.	06 Hrs.



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7	Cellular and Satellite Networks 7.1 SATELLITE NETWORKS: Orbits, Footprint, Three Categories of Satellites, GEO Satellites, MEO Satellites, LEO Satellites. 7.2 CABLE TV NETWORKS and DATA TRANSFER: Traditional Cable Networks, Hybrid Fiber-Coaxial (HFC) Network, Bandwidth, Sharing, CM and CMTS, Data Transmission Schemes: DOCSIS. 7.3 CELLULAR TELEPHONY: Frequency-Reuse Principle, Transmitting, Receiving, Roaming, First Generation, Second Generation, Third Generation. 7.4 BLUETOOTH: Architecture, Bluetooth Layers, Radio Layer, Baseband Layer, L2CAP, Other Upper Layers	4hrs
8	SONET/SDH 8.1 ARCHITECTURE: Signals, SONET Devices, Connections. 8.2 SONET LAYERS: Path Layer, Line Layer, Section Layer, Photonic Layer, Device-Layer Relationships. 8.3 SONET FRAMES: Frame, Byte, and Bit Transmission, STS-I Frame Format, Overhead Summary, Encapsulation. 8.4 STS MULTIPLEXING: Byte Interleaving, Concatenated Signal, Add / Drop Multiplexer. 8.5 SONET NETWORKS: Linear Networks, Ring Networks, Mesh Networks.	10hrs



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LIST OF EXPERIMENTS

Practical: 2 Hrs. per Week

S.NO.	Name of experiments	Hours of Study
1	Observation and Study of various types Cables(Co-Axial: RG-58, RGU-59, CAT-3, CAT-5, CAT-6 Optical Fibers: Single mode, Multi Mode) and prepare a detail reports with includes Labeled diagram of each types of cable, characteristics, uses.	
2	Observation and Study of various types Connectors(Cable Connectors: BNC, BNCT, BNC Terminator, Optical Connectors: SC connector, ST connector, MT-RJ connector, UTP Connectors:RJ-11, RJ-45, 9-PIN DB-9, USB Connector.) and prepare a detail reports with includes Labeled diagram of each types of connectors, uses.	
3	Case Study of Various Spectrums used for communication and prepare a detail report.	
4	Demonstration of different types of encoding scheme (uni-polar, polar, Bi-polar, Multi level), and student must prepare a report on each types of encoding.	
5	Demonstration of ASK, FSK, PSK scheme and student must prepare a report on each types of encoding.	
6	Demonstration of different types of modulation scheme (AM, FM, PCM), and student must prepare a report on each types of encoding.	
7	Case study of 3G & 4G technologies.	
	TOTAL	30



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RECOMMENDED BOOKS

TEXT BOOK

1. Behrouz A Forouzan, Data Communication and Networking, 4e, Tata McGraw-Hill, 2008.

REFERENCES

1. William Stallings, Data and Computer Communications, 8e, Pearson Education, 2008.
2. Tomasi Wayne, Introduction to Data Communications and Networking, Pearson Education, 2007.
3. Rajneesh Agrawal and Bharat Bhushan Tiwari, Data Communication and Computer Networks, Vikas Publishing house Ltd., 2005.
4. S. Tanenbaum, Computer Networks, Fourth Edition, Pearson Education.
5. Leon-Gracia and I. Widjaja, Communication Networks, Tata McGraw Hill, 2004.
6. K. Pahlavan and P. Krishnamurthy, Principles of Wireless Networks, EEE/ Prentice Hall of India, 2003.

WEB REFRENCES:

http://highered.mcgraw-hill.com/sites/0072967757/information_center_view0/

http://www.camiresearch.com/Data_Com_Basics/data_com_tutorial.html

http://www.techbooksforfree.com/intro_to_data_com/

<http://www.malch.com/comfaq.html>

<http://williamstallings.com/>



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DIPLOMA IN COMPUTER HARDWARE & MAINTENANCE

SEMESTER: THIRD

SCHEME: Jul.09

COURSE CODE: 402

PAPER CODE:

NAME OF COURSE: HARDWARE COMPONENT & DEVICES

COMMON WITH PROGRAM (S): COMPUTER HARDWARE & MAINTENANCE

RATIONALE

The state of development and the increased use of computers within contemporary society demand that our students must be equipped with the refined skills to enter the competitive market place dominated by the sophisticated technology of computers.

The features of the computer are best learned by studying the internal hardware design, also called the architecture of the Computer.

The “Hardware Component” provides a Board Overview of the architecture of computer.

The subject deals with In-Depth knowledge of all major computer components like Microprocessors, Motherboard, Memory devices & Pheripherals

Objective:

After completion student

- √ Will be able to differentiate between various CPU available in Market & identify best CPU according to requirements
- √ Will be able to identify different types of RAM according to Packaging & Performance measuring Parameters
- √ Will be able to Setup BIOS, Motherboards & other Peripherals
- √ Will be able to Compare various motherboards according to Quality Parameters
- √ Will be able to configure various system buses
- √ Will have in-depth knowledge of Power Supplies & its performance parameters
- √ Will have in-depth knowledge of Memory device Interfacing, Basic Configuration & various types of Storage devices available in Market.
- √ Will have exposure to various international Standards dealing with IO Interfacing.
- √ Will have knowledge of various terminology & components of video ,audio System & printers.



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SCHEME OF STUDIES AND SPECIFICATION TABLE

Lectures: 4 Hrs. per week

Practical: 2 Hrs. per week

SCHEME OF STUDIES

S.No.	TOPICS	THEORY (HRS.)	PRACTICAL (HRS)	TOTAL (HRS)
1.	MICROPROCESSOR	08	06	14
2.	MEMORY	10	03	13
3.	BIOS	09	03	12
4.	MOTHERBOARD	09	09	18
5.	STORAGE DEVICES	12	03	15
6.	<i>PERIPHERALS</i>	12	06	18
	TOTAL	60	30	90



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COMMON WITH PROGRAM (S): COMPUTER HARDWARE & MAINTENANCE

COURSE CONTENT

Lectures: 4 Hrs. per week

S.No.	Course Content	Hours of study
1	<p>MICROPROCESSOR</p> <p>1.1 CPU:- RISC & CISC Microprocessor, CPU Packaging: DIP, PGA, SPGA, MCM, LCC, PLCC & Tape Carrier Package.</p> <p>1.2 Intel CPU Family: Fifth generation & Sixth Generation P6, Xeon, Celeron Processor</p> <p>1.3 AMD CPU Family Fifth, Sixth, & Seventh Generation K Series, Athlon, Thunderbid & Duron Processor</p> <p>1.4 Handling & Replacement of CPU, CPU Configuration, FSB, Core Speed, Core Voltage Configuration</p> <p>1.5 Processor Specification : Clock Speed, FSB, L1 & L2 cache, Processor over clocking</p>	08
2	<p>MEMORY</p> <p>2.1 Logical Organization of Memory: Real Mode, Protected Mode, Lower, BIOS Data Area, Upper Memory, High Memory Area, Frame Buffer, Shadow & Cache</p> <p>2.2 Memory Packaging : DTPP, STPP, SIMM, DIMM, RIMM</p> <p>2.3 RAM Types: EDO, SDRAM, VRAM, SGRM, RDRAM, DDRAM, PPRAM</p> <p>2.4 Memory Performance: Speed, Inter living & Caching</p>	10



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3	BIOS 3.1 BIOS Functions, 3.2 Cold & Warm Booting, 3.3 BIOS Error Codes, 3.4 BIOS Interrupts, 3.5 Identification of Different BIOS(AMI & AWARD BIOS) . 3.6 BIOS Memory Assignments, 3.7 BIOS Advance setup	09
4	MOTHERBOARD 4.1 Motherboard Controllers & System Resources, Memory Mapping, 4.2 Interrupts Request Line (IRQ) : Purpose, Standard Assignments, Conflicts, Sharing & ISA, PCI, PnP Configuration of IRQ 4.3 System Buses : Industry Standard Organization, Micro Channel Architecture, Enhanced Industry Standard Architecture, UESA Local Bus, Peripheral Component Interconnect, Accelerated Graphics Ports, PCI-X. 4.4 Chipsets: Northbridge & South Bridge, Function of Chipset, 4.5 Motherboard form factor & Power supplies: AT, ATX, LPX & NLX, Voltage & Signal Lines, Power Supply Quality & Specifications, Form Factors, Ribbon Cable, Adopter Card Installation.	09
5	STORAGE DEVICES 5.1 Interfaces: IDE, ATA 1 to 6, Mater Slave Configuration, SCSI, SATA, PATA. 5.2 SCSI Interface:- BUS ID, Logical Unit Number, Termination, Signaling Types, SCSI Standards, Comparison between IDE & SCSI 5.3 Magnetic Storage Devices: Basic Functioning & Encoding Schemes,	12



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5	<p>5.4 Hard Disk Drives: Cylinder, Tracks & Sectors, Zonal Bit Recording & Areal Density. Internal & External Performance Factors.</p> <p>5.5 Optical Storage Devices: Compact Disk, Compact Disk Formats, DVD,</p> <p>5.6 CD ROM Drive Components & Specifications(i.e. Speed Change Time, Seek time, Latency), Recordable Drives, CD-RW Disk</p>	
6	<p>PERIPHERALS</p> <p>6.1 I/o Ports: Serial Communication, serial Port Connectors, EIA 232 Standard with DB9 & DB 25, 6.2 Parallel port connectors, IEEE1284, Compatibility Mode, Nibble, Byte Mode, Enhanced Parallel Port , Extended Capability Port, 6.3 Universal Serial Bus, USB Connector, IEEE 1394 6.4 Video Systems: Text Mode & Graphic Mode, Video Adaptor Characteristics, 6.5 Video Standards: VGA, XGA, Super VGA 6.6 Video Adaptor Components : BUS Connector, VGA 9 PIN & 15 PIN connector, Feature Connectors, Video Memory Types 6.7 Monitors: LCD & CRT 6.8 Audio Systems: Multimedia Standards(MPC-1,MPC-2, MPC-3), Waveform sound formats & Musical Instrument Digital Interface(MIDI) Format. Audio Adapter Architecture 6.9 Printers: Laser Printer & it's Operating Mechanism, Inkjet & Dot Matrix Printer, Page Description Language, PCL & Post Script. 6.10 Network Interface Card: Types, Specification, interface & uses</p>	12
Total		60



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PAPER CODE:

NAME OF COURSE: HARDWARE COMPONENT & DEVICES

COMMON WITH PROGRAM (S): COMPUTER HARDWARE & MAINTENANCE

LIST OF EXPERIMENTS

Practical: 2 Hrs. per Week

S.NO.	Name of experiments	Hours of Study
1	Study of different CPU Packaging & CPU handling	
2	Study of different Memory Packaging & Installation of memory modules	
3	BIOS Setup	
4	Study of different system Buses	
5	Study of Power Supply Voltage & Signal Lines, Installation of SMPS.	
6	Configuring the Master & Salve setup for storage device.	
7	Study & installation of different types of Video Standards &	
8	Monitors.	
9	Study, installation & self testing of different Printers	
	Study of different types of Motherboard and CMOS clearing.	
	TOTAL	00



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BOOKS RECOMMENDED.

- 1 Peter Norton's: Inside the PC, SAMS Techmedia
- 2 Winn L. Rosch's: Hardware Bible, SAMS Techmedia
- 3 Gaig Zacker's: The complete Reference PC Hardware, Tata McGraw Hill
- 4 Bigelow: Bigelow's Troubleshooting, Maintaining & Repairing PCs, Tata McGraw Hill
- 5 Balasubramanian: Computer Installation & Servicing, Tata McGraw Hill



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DIPLOMA IN COMPUTER HARDWARE & MAINTENANCE

SEMESTER: FOURTH

COURSE CODE: 403

NAME OF COURSE: ADVANCED COMPUTER NETWORK

COMMON WITH PROGRAM (S): COMPUTER HARDWARE & MAINTENANCE

SCHEME: Jul.09

PAPER CODE:

RATIONALE

In the world of computers, networking is the practice of linking two or more computing devices together for the purpose of sharing data. Networks are built with a combination of computer hardware and computer software.

The TCP/IP protocol suite is the most widely implemented protocol on networks today. TCP/IP is the communication protocol for the internet. TCP/IP defines the rule computers must follow to communicate with each other over the internet.

This subject gives an understanding of advanced topics in the design and implementation of computer networks.. It provides an in-depth understanding of key protocols of the TCP/IP protocol suite and its relationship to emerging technologies.



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COURSE CODE: 403

NAME OF COURSE: ADVANCED COMPUTER NETWORK

COMMON WITH PROGRAM (S): COMPUTER HARDWARE & MAINTENANCE

SCHEME: Jul.09

PAPER CODE:

SCHEME OF STUDIES AND SPECIFICATION TABLE

Lectures: 5Hrs. per week

Practical: 2 Hrs. per week

SCHEME OF STUDIES

S.No.	TOPICS	THEORY (HRS.)	PRACTICAL (HRS)	TOTAL (HRS)
1	Introduction and review	06	02	08
2	Internet addresses :	08	06	14
3	ARP/RARP	10	06	16
4	Internet Protocol	12	05	17
5	UDP and TCP	12	03	15
6	Routing	09	04	13
7	Internet Multicasting	10	02	12
8	Socket Interface, DNS, Applications	08	02	10
	TOTAL	75	30	90



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NAME OF COURSE: ADVANCED COMPUTER NETWORK

COMMON WITH PROGRAM (S): COMPUTER HARDWARE & MAINTENANCE

COURSE CONTENT

Lectures: 5 Hrs. per week

S.No.	Course Content	Hours of study
1.	Introduction and review : 1.1 Review of Network Models : OSI Model, TCP/IP Protocol Suite, standards. 1.2 review of IP Addresses, 1.3 Subnetting : Need, advantage, subnet mask, creating a subnet 1.4 Supernetting: Need, advantage, creating a supernet 1.5 Class less inter domain routing (CIDR): introduction & advantage.	06
2.	ARP/RARP 3.1 Address resolution Problem- problems & need, operation, Resolution through : Direct mapping, Dynamic binding, packet format & encapsulation, proxy ARP. 3.3 Reverse address resolution protocol - problems & need, operation, packet format & encapsulation.	10



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3.	Internet Protocol Virtual network. Connectionless, unreliable, packet Delivery System. Datagram format: Datagram size, Network MTU and fragmentation, Time stamp option. IP Routing algorithm. IP Checksum. ICMP: Introduction, type of messages, message format: error reporting & query, encapsulation, debugging tools. IGMP : Introduction, Group management, Message Format, operation, encapsulation, Netstat utility	12
4.	UDP and TCP Introduction to User Data gram Protocol. Format of UDP Message Pseudo Header Multiplexing and Demultiplexing Introduction to Transmission Control Protocol Socket Interface, Ports, Collections and End points TCP Segment format Checksum computation. Establishing a TCP Connection	12
5.	Routing Vector Distance & link state routing protocol Routing Information Protocol Open SPF Protocol Gateway to Gateway Protocol	09



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6.	Internet Multicasting Hardware Broadcast, Hardware Multicast IP Multicast and Address Mapping IP Multicast to Ethernet Multicast	06
7.	DNS Applications Concept of DNS, Mapping DNS resource record, DNS Resolution DHCP, VPN, IPv6, ICMPv6 Telnet, FTP	10
	TOTAL	75



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NAME OF COURSE: ADVANCED COMPUTER NETWORK

COMMON WITH PROGRAM (S): COMPUTER HARDWARE & MAINTENANCE

LIST OF EXPERIMENTS

Practical: 2 Hrs. per Week

S.NO.	Name of experiments	Hours of Study
1.	Use of IP Addressing in networking	
2.	Designing a network system for an organization using TCP/IP Network using a. Class A address b. Class B address c. Class C address d. Telnet e. FTP f. Ping	
4.	DNS Configuration	
5	VPN configuration	
6	DHCP Configuration	
TOTAL		30

BOOKS RECOMMENDED.

- B. A. Fourozan, TCP/IP Protocol Suite, Tata McGraw Hill
- Internetworking with TCP/IP, Douglas E. Comer, Publisher- PHI, New Delhi
- TCP/IP Illustrated by Richard Stevens, Publisher- Addison – Wesley.
- Computer Networks, Andrew S Tanenbaum, Publisher- PHI, New Delhi



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SEMESTER: FOURTH

COURSE CODE: 404

NAME OF COURSE: **Microprocessor & Interface**

COMMON WITH PROGRAM (S): COMPUTER SCIENCE & ENGG

SCHEME: Jul.09

PAPER CODE:



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DIPLOMA IN COMPUTER HARDWARE & MAINTENANCE

SEMESTER: FOURTH

COURSE CODE:411/

NAME OF COURSE: ENTERPRENUERSHIP/

COMMON WITH PROGRAM (S): CME/CSE

SCHEME: Jul.09

PAPER CODE:



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
DIPLOMA IN COMPUTER HARDWARE & MAINTENANCE

SEMESTER: FOURTH

COURSE CODE 412

NAME OF COURSE: /MARKETING MANAGEMENT

COMMON WITH PROGRAM (S): CME/CSE

SCHEME: Jul.09

PAPER CODE:

