

## 6.1 COMPUTER NETWORKS

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### RATIONALE

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. A diploma holder in computer engineering should therefore understand the function of networks. Knowledge about hardware and software requirements of networks is essential.

### DETAILED CONTENTS

1. Networks Basics ( 6 hrs)
  - Concept of network
  - Models of network computing
  - Networking models
  - Peer-to –peer Network
  - Server Client Network
  - LAN, MAN and WAN
  - Network Services
  - Topologies
  - Switching Techniques
  
2. OSI Model (8 hrs)
  - Standards
  - OSI Reference Model
  - OSI Physical layer concepts
  - OSI Data-link layer concepts
  - OSI Networks layer concepts
  - OSI Transport layer concepts
  - OSI Session layer concepts
  - OSI presentation layer concepts
  - OSI Application layer concepts
  
3. Introduction to TCP/IP (10 hrs)
  - Concept of physical and logical addressing
  - Different classes of IP addressing, special IP address
  - Sub netting and super netting
  - Loop back concept
  - IPV4 and IPV6 packet Format
  - Configuring IPV4 and IPV6
  
4. Protocol Suites ( 3 hrs)
  - Models and Protocols
  - Network IPX/SPX

- Intranet Protocols
5. Network Architecture (8 hrs)
- ARC net specifications
  - Ethernet Specification and Standardization:  
10 Mbps (Traditional Ethernet), 10 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet), Introduction to Media Connectivity (Leased lines, ISDN, PSTN, RF, VSAT, Optical and IPLC)
6. Network Connectivity (6 hrs)
- Network connectivity Devices
  - NICs
  - Hubs
  - Repeaters
  - Multiplexers
  - Modems
  - Routers and Protocols,
  - Firewall
  - ATM
  - VOIP and Net-to-Phone Telephony,
  - Laws and Protocols
7. Network Printing (3 hrs)
- Print Services
8. Network Administration / Security (9 hrs)
- Client/Server Technology
  - Server Management
  - RAID management and mirroring
  - Hauffman codes
  - Cryptography
9. Network Trouble Shooting Techniques (6 hrs)
- Trouble Shooting process
  - Trouble Shooting Tools: PING,IPCONFIG, IFCONFIG, NETSTAT, TRACEROOT,  
Wiresharp/ Dsniffer/ Pcop
10. Wireless Networking (05 hrs)
- Basics of Wireless: Wireless MAN, Networking, Wireless LAN, Wi-Fi, WiMax(Broad-band Wireless) and Blue-Tooth technology.

## LIST OF PRACTICALS

1. Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
2. Recognition and use of various types of connectors RJ-45, RJ-11, BNC and SCST
3. Recognition of network devices (Switches, Hub, Routers of access points for WiFi)
4. Making of cross cable and straight cable
5. Install and configure a network interface card in a workstation.
6. Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation
7. Managing user accounts in windows and LINUX
8. Study and Demonstration of sub netting of IP address
9. Use of Netstat and its options.
10. Connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
11. Installation of Network Operating System(NOS)
12. Visit to nearby industry for latest networking techniques

### Required Software

- Windows Server/Linux Server

### Required Tools and Supplies

- 1) Crimping tool, crone Tool, Cable tester,
- 2) RJ 45 connectors, RJ-11, BNC, SCST
- 3) Coaxial Cable, UTP, STP, OFC cable
- 4) Screwdriver Kit
- 5) Switch/Hub
- 6) Manageable Switch

## INSTRUCTIONAL STRATEGY

This subject deals with both theory and practicals. The students should be made to practically establish LAN with various hardware and software and their integration.

## RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
2. Data Communications and Networking by Forouzan, (Edition 2<sup>nd</sup> and 4<sup>th</sup> ),Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Data and Computer Communication by William Stallings, Pearson Education, New Delhi
4. Local Area Networks by Peter Hudson
5. Understanding Local Area Network by Neil Jenkins
6. Area Networks by Stan Schatt, Prentice Hall of India, New Delhi
7. Network+ Lab manual,- BPB Publications -by Tami Evanson
8. Networking Essentials – BPB Publications New Delhi

9. Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.
10. Linux – The complete Reference by Richard Peterson, Tata McGraw Hill Education Pvt Ltd, New Delhi.
11. Linux – Install and Configuration Black Book by Dee Anneblanc and Issac Yates, IDG Books India Private Limited, Delhi.
12. Unleashed Linux by TechMedia Publishers, New Delhi
13. Computer Network by J.S. Katre, Tech-Max Publication, Pune

#### **SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	Networks Basics	6	10
2	OSI Model	8	10
3	Introduction to TCP/IP	10	15
4	Protocol Suites	3	05
5	Network Architecture	8	15
6	Network Connectivity	6	10
7	Network Printing	3	05
8	Network Administration / Security	9	15
9	Network Troubleshooting Techniques	6	10
10	Wireless Networking	5	05
<b>Total</b>		<b>64</b>	<b>100</b>

## 6.2 ELECTIVE

### 6.2(a) OPTICAL FIBRE COMMUNICATION

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#### RATIONALE

Progressing from communication over copper wire to today's fibre optic communication, we have increased our ability to transmit more information, more quickly and over longer distances. This has expanded our boundaries and is finding a good slot in communication system. Optical fibers has replaced existing transmission media due to its advantages. As a result the technicians are supposed to have knowledge of optical communication. This subject will provide basic concepts and requisite knowledge and skill required.

#### DETAILED CONTENTS

- |    |   |          |
|----|---|----------|
| 1. | Introduction  | (12 hrs) |
|    | <ul style="list-style-type: none"> <li>▪ Historical perspective, basic communication systems, optical frequency range, advantages of optical fibre communication, application of fibre optic communication</li> <li>▪ Electromagnetic spectrum used, Advantages and disadvantages of optical communication.</li> <li>▪ Principle of light penetration, reflection, critical angle.</li> </ul> |          |
| 2. | Optical Fibers and Cables   | (08 hrs) |
|    | <ul style="list-style-type: none"> <li>▪ Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables.</li> <li>▪ Optical Fibers cable connectors and splicing techniques</li> </ul>  |          |
| 3. | Losses in Optical Fiber Cable:  | (08 hrs) |
|    | <ul style="list-style-type: none"> <li>a) Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending loses.</li> <li>b) Dispersion: Types and its effect on data rate.</li> </ul>  |          |
| 4. | Optical Sources   | (10hrs)  |
|    | <p>Characteristics of light used in optical communication, principle of operation of LED, different types of LED structures used and their brief description, Injection laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD.</p>   |          |
| 5. | Optical Detectors   | (08hrs)  |
|    | <p>Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), Noise in detectors</p>  |          |

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|----|--|----------|
| 6. | Optical Amplifiers   | (10 hrs) |
|    | Types of optical amplifiers, semiconductor & fiber optical amplifiers Functional types, principal of operation of SOA, types of SOA. FPA, TWA, SOA applications, advantages, Drawbacks, EDFAS, Raman amplifiers. |          |
| 7. | Optical Fiber System   | (08 hrs) |
|    | Optical transmitter circuit, optical receiver circuit, optical power budgeting, Multiplexing: WDM (Wavelength Division Multiplexing), Modulation in fibre optics   |          |

### **LIST OF PRACTICALS**

1. Setting up of fiber analog link
2. Setting up to optic digital link
3. Measurement of bending losses in optical fibers
4. To observe and measure the splice or connector loss
5. To measure and calculate numerical aperture of optical fiber
6. To observe characteristics of optical source
7. To observe characteristics of optical defector
8. To connect a fiber with connector at both ends
9. Introduction to various components and tools used in optical fiber communication

### **INSTRUCTIONAL STRATEGY**

This subject gives the complete knowledge of optical fibre communication techniques. The teacher should make the students aware about the historical development, optical sources and optical fibre system in addition to applications of optical fibre in communication system. Since this subject deals with theory and practical, the theory should be re-enforced by visit to sites and industries like HFCL having optical fiber installations in addition to practical work in the laboratory.

### **RECOMMENDED BOOKS**

1. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi
2. Optical fiber Communication by J. Gower , Prentice Hall of India, New Delhi
3. Optical fiber Communication by Gerd Keiser, McGraw Hill International Editions
4. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi
5. Optical Fiber Communication by Sangar and Sahdev, Uneek Publications, Jalandhar

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	Introduction	12	20
2	Optical Fibers and Cables	8	15
3	Losses in Optical Fiber Cable:	8	15
4	Optical Sources	10	15
5	Optical Detectors	8	10
6	Optical Amplifiers	10	15
7	Optical Fiber System	8	10
	<b>Total</b>	<b>64</b>	<b>100</b>

## 6.2(b) VLSI SYSTEM DESIGN

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### RATIONALE

In Now-a-days thousands of Digital ICs are embedded on one Single chip with the help of VLSI technology with the help of this technology the Power Consumption of ICs can be reduced (as some devices even works on IV).The size of the overall circuit reduced due to embedding of thousand of Digital IC on one VLSI chip. The VLSI chips are 100 times faster than microprocessors. And so every Industry is using this technology so every student should have some knowledge about this technology.

### DETAILED CONTENTS

1. Overview of VLSI: (12 hrs)  
Introduction to Computer-aided design tools for digital systems. Hardware-description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, Logical operators. Types of delays, Entity and Architecture declaration. Introduction to behavioural, dataflow and structural models.
2. VHDL Statements: (12 hrs)  
Assignment statements, sequential Statements and process, Conditional statements, Case statements, concept and use of Concurrent statements.
3. Combinational Circuit Design: (14 hrs)  
VHDL models and simulation of combinational circuits such as Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc.
4. Sequential Circuit Design: (14 hrs)  
VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.
5. Introduction to CPLDs and FPGAs: (12 hrs)  
Programmable logic devices : ROM, PLAs, GAL, PEEL, CPLDs and FPGA. FPAAs (Field Programmable Analog Array)

### LIST OF PRACTICALS

#### Combinational Design Exercises

1. Design of Gates
  - a. Design of AND gate
  - b. Design of OR gate
  - c. Design of XOR gate



2. Design of XOR gate using other basic gates
3. Design of 2:1 Mux using other basic gates
4. Design of 2 to 4 Decoder
5. Design of Half-Adder, Full Adder, Half Subtractor, Full Subtractor
6. Design of 3:8 Decoder
7. Design of 8:3 Priority Encoder
8. Design of 4 Bit Binary to Grey code Converter
9. Familiarisation of VLSI and Tools with software like Ex-VLSI

### Sequential Design Exercises Using VHDC

9. Design of Synchronous 8-bit Johnson Counter
10. Design of ALU (Additional, subtraction, Multiplication, Division)

### RECOMMENDED BOOKS:

1. VLSI Technologies by SZE, Tata McGraw Hill Education Pvt Ltd , New Delhi
2. IEEE Standard VHDL Language Reference Manual(1993)
3. "Digital System Design using VHDL":Charles. H. Roth; PWS(1998)
4. VHDL-IV Edition: Perry; Tata McGraw Hill Education Pvt Ltd , New Delhi
5. VLSI Design for Analog by Geiger, Tata McGraw Hill Education Pvt Ltd , New Delhi

### Recommended Software:

Xilinx Synthesis Software (web pack) freely available on internet. On Xilinx.com  
 VLSI System Design is wind software for designing (System Designing).  
 VLSI Learning Resource like Ex-VLSI

### INSTRUCTIONAL STRATEGY

This subject is very important for designing Digital Systems. For this, the students need to have strong base understanding of fundamental concepts of digital electronics. The teacher is required to lay more emphasis on programming practice in VHDL.

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Overview of VLSI	12	20
2	VHDL Statements	12	15
3	Combinational Circuit Design	14	25
4	Sequential Circuit Design	14	25
5	Introduction to CPLDs and FPGAs	12	15
<b>Total</b>		<b>64</b>	<b>100</b>

## 6.2(c) DIGITAL SIGNAL PROCESSING

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### RATIONALE

Digital signal processing (DSP) is an emerging area, which has a great scope and a lot of job potential in the industry. DSP chips are being widely used in communication industry, consumer electronics etc.

### DETAILED CONTENTS

1. Introduction (8 hrs)  
Signal systems Basic elements of a digital signal processing system. Classification of signals, continuous time versus discrete time signals  
Concept of frequency in continuous time and discrete time signals
2. Discrete time signals and systems: (8 hrs)  
Block diagram representation of discrete time systems, Linearity , Stability and Causality. Convolution and correlation of signals.
3. Implementation of discrete time systems, Recursive and non-recursive FIR systems. (8 hrs)
4. Z-transform and its application to LTI systems: Direct and inverse Z transform, properties of Z transform. (8 hrs)
5. Design of Filter structures-Direct Form I, II, cascade and Parallel form (8 hrs)
6. Introduction to Fourier Transform. (10 hrs)  
Discrete Fourier transform, properties of DFT (No proof), Multiplication of time DPTS and circular convolution, use of DFT in linear filtering
7. Fast Fourier transforms: Efficient computation of DFT; FFT, DIT algorithm (8 hrs)
8. Introduction to IIR and FIR filters, Application of DSP baffles system (6 hrs)

### LIST OF PRACTICALS

1. Plotting of different Discrete Signals using MATLAB
2. Convolution using Mat Lab or C program
3. Correlation using Mat Lab or C program
4. Divide and conquer Mat Lab or C program
5. Introduction to ADSP 21 XX DSP Chip
6. Demo programs of ADSP 21 XX

7. Building and Simulations small programs (5 programs) using 21 XX simulator

### INSTRUCTIONAL STRATEGY

Lectures with hardware practical and programming practice. Visits to the industry.

### RECOMMENDED BOOKS

1. Theory and Applications of Digital Signal Processing by Rabiner and Gold; Prentice Hall of India
2. Digital Signal Processing Using MATLAB by Vinay K Ingle and John G Proakis; Vikas Publishing House, New Delhi
3. Digital Signal Processing (Principles, Algorithms and Applications) by John G. Proakis and G Monolakis; Prentice Hall of India
4. Digital Signal Processing by AV Oppenheim and RW Ronald W Schafer; Prentice Hall of India
5. DSP a computer based approach Mitra Sanjit TMH Publication
6. DSP a Practical approach by Ifeachor, Emmanuel Pearson Education.

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No	Topic	Time Allotted (hrs)	Marks Allocation
1.	Introduction	8	15
2.	Discrete Time Signals and Systems	8	15
3.	Implementation of Discrete Time System	8	10
4.	Z-Transform and its Application	8	15
5.	Design of Filter structures-Direct Form I, II, cascade and Parallel form	8	10
6.	Discrete Fourier Transform	10	15
7.	Fast Fourier Transform	8	10
8.	Introduction to IIR and FIR filters	6	10
<b>Total</b>		<b>64</b>	<b>100</b>

### 6.3 MICROWAVE AND RADAR ENGINEERING

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#### RATIONALE

This subject includes an exposure to microwaves engineering, radar systems, fibre optics and satellite communication. In microwaves industry, job opportunities are available in of assembly, production, installation, repair and maintenance of microwave transmitters and receivers. The knowledge of radar systems allows opportunities with civil and defence organizations dealing with aircraft and shipping. Fibre optics is the latest thrust area in communication with vast opportunities in the private sector.

#### DETAILED CONTENTS

- |    |  |          |
|----|--|----------|
| 1. | Introduction to Microwaves   | (02 hrs) |
|    | Introduction to microwaves and its applications, Classification on the basis of its frequency bands (HF, VHF, UHF, L, S, C, X, KU, KA, mm, SUB, mm)  |          |
| 2. | Microwave Devices  | (10 hrs) |
|    | Basic concepts of thermionic emission and vacuum tubes, Effects of inter-electrode capacitance, Lead Inductance and Transit time on the high frequency performance of conventional vacuum tubes, and steps to extend their high frequency operations.  |          |
|    | Construction, characteristics, operating principles and typical applications of the following devices (No mathematical treatment)  |          |
|    | - Multi cavity klystron  |          |
|    | - Reflex klystron  |          |
|    | - Multi-cavity magnetron   |          |
|    | - Traveling wave tube  |          |
|    | - Gunn diode and   |          |
|    | - Impatt diode   |          |
| 3. | Wave guides  | (06 hrs) |
|    | Rectangular and circular wave guides and their applications. Mode of wave guide; Propagation constant of a rectangular wave guide, cut off wavelength, guide wavelength and their relationship with free space wavelength (no mathematical derivation). Impossibility of TEM mode in a wave guide. |          |
| 4. | Microwave Components   | (08 hrs) |
|    | Constructional features, characteristics and application of tees, bends, matched termination, twists, detector, mount, slotted section, directional coupler, fixed   |          |

and variable attenuator, isolator, circulator and duplex, coaxial to wave guide adapter.

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|----|--|----------|
| 5. | Microwave antennas   | (04 hrs) |
|    | Structure characteristics and typical applications of Horn and Dish antennas   |          |
| 6. | Microwave Communication systems  | (08 hrs) |
|    | a) Block diagram and working principles of microwave communication link.   |          |
|    | b) Troposcatter Communication: Troposphere and its properties, Tropospheric duct formation and propagation, troposcatter propagation.  |          |
| 7. | Radar Systems  | (08 hrs) |
|    | <ul style="list-style-type: none"> <li>▪ Introduction to radar, its various applications, radar range equation (no derivation) and its applications.</li> <li>▪ Block diagram and operating principles of basic pulse radar. Concepts of ambiguous range, radar area of cross-section and its dependence on frequency.</li> <li>▪ Block diagram and operating principles of CW (Doppler) and FMCW radars, and their applications.</li> <li>▪ Block diagram and operating principles of MTI radar.</li> <li>▪ Radar display- PPI</li> </ul> |          |
| 8. | Introduction to VSAT transponders multiple access techniques, VSAT and its features  | (02 hrs) |

### LIST OF PRACTICALS

1. To measure electronics and mechanical tuning range of a reflex klystron
2. To measure VSWR of a given load.
3. To measure the Klystron frequency by slotted section method
4. To measure the directivity and coupling of a directional coupler.
5. To plot radiation pattern of a horn antenna in horizontal and vertical planes.
6. To verify the properties of magic tee.
7. To carry out installation of a dish antenna.

### NOTE:

Visit to the appropriate sites of microwave industries, radar installations and communication stations should be made to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

## INSTRUCTIONAL STRATEGY

Microwave and radar is a very important subject and requires both theoretical as well as practical exposure. The teaching should be supplemented by visits to the microwave stations and using suitable audio visual aids.

## RECOMMENDED BOOKS

1. Microwave Devices and Components by Sylio, Prentice Hall of India, New Delhi
2. Electronics Communication by Roddy and Coolen
3. Electronics Communication System by KS Jamwal, Dhanpat Rai and Sons, Delhi
4. Microwave Engineering by Das, Tata McGraw Hill Education Pvt Ltd , New Delhi

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction to Microwaves	02	5
2	Microwave Devices	10	20
3	Wave guides	06	10
4	Microwave Components	08	15
5	Microwave antennas	04	10
6	Microwave Communication systems	08	15
7	Radar Systems	08	15
8	Introduction to VSAT	02	10
	<b>Total</b>	<b>48</b>	<b>100</b>

## 6.4 WIRELESS AND MOBILE COMMUNICATION

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### RATIONALE

The wireless/mobile communication technology though complex but is spreading at a very fast rate. People use more of mobile phones in comparison to land line phones. It is expected that with in very short period almost every body will be using mobile communication. Technology is also changing very fast. Therefore, the students should know the functioning of wireless/mobile system/equipment to keep themselves abreast of this latest application of communication.

### DETAILED CONTENTS

- |    |   |          |
|----|---|----------|
| 1. | Wireless Communication                                  | (12 hrs) |
|    | 1.1 Basics  |          |
|    | 1.2 Advantages of wireless communication                |          |
|    | 1.3 Electromagnetic waves.                              |          |
|    | 1.4 Frequency Spectrum used.                            |          |
|    | 1.5 Paging system.                                      |          |
|    | 1.6 Cordless Telephone System.                          |          |
|    | 1.7 Cellular Telephone System                           |          |
|    | 1.8 Comparison of above wireless communication systems. |          |
|    | 1.9 Propagation considerations                          |          |
|    | a) Range  |          |
|    | b) Atmospheric Effect                                   |          |
|    | c) Geographic Effect                                    |          |
|    | d) Fading   |          |
|    | e) Doppler Effect                                       |          |
| 2. | Cellular Concept  | (12 hrs) |
|    | 2.1 Cell area   |          |
|    | 2.2 Capacity of cell                                    |          |
|    | 2.3 Frequency Response                                  |          |
|    | 2.4 Co-channel Interference                             |          |
|    | 2.5 Adjacent channel Interference                       |          |
|    | 2.6 Power Control for reducing Interference             |          |

- 2.7 Improving coverage and capacity in cellular system
  - a) Cell Splitting.
  - b) Sectoring
  - c) Repeater for Range Extension.
  
- 3. Multiple Access Techniques for Wireless Communication (16 hrs)
  - 3.1 Introduction to Multiple Access.
  - 3.2 Frequency Division Multiple Access (FDMA)
  - 3.3 Time Division Multiple Access (TDMA)
  - 3.4 Code Division Multiple Access (CDMA)
  - 3.5 Spread Spectrum Multiple Access (SSMA)
  - 3.6 Frequency Hopping spread Spectrum (FHSS).
  - 3.7 Comparison of FDMA/TDMA/CDMA
  
- 4. Mobile Communication Systems (24 hrs)
  - 4.1 Advanced Mobile Phone System (AMPS)
    - a) Operation of AMPS
    - b) Working of AMPS Phone System
  - 4.2 Introduction of Global Systems for Mobile Communication (GSM) and its architecture, Introduction of CDMA System, comparison of CDMA and GSM Systems
  - 4.3 Introduction of GPRS and GPS System.
  - 4.4 Introduction to DTH, Blue tooth, Wi-Fi and RDFI.

### **LIST OF PRACTICALS**

1. Study the features, specification and working of cellular mobile
2. Signal strength measurement of various points from a transmitting antenna/cordless phone
3. Measurement of range for a cordless phone
4. Visit of a Mobile Switching Centre(MSC) in the nearest M.S. facility provider
5. Demonstration of Base Trans Receiver(BTS) with nearby cellular tower
6. Observing call processing of GSM trainer Kit.
7. Observing call processing of CDMA trainer Kit.
8. Practice of setting GPRS on Mobile phone



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|---|-----------------------|
| 9. Repair of a (GSM) and a (CDMA) mobile phones           | Demonstration<br>only |
| 10. Measurement of cell boundary (time consuming project) |                       |
| 11. Data transfer using blue tooth                        |                       |

### INSTRUCTIONAL STRATEGY

Wireless and Mobile Communication is having significant impact in Electronics Market. For the proper awareness of this subject it is must to provide the students the detail functioning of wireless/mobile system/equipment. Ffor this visits must be arranged to BTS/MSC (Mobile Switching Centre) providers. The theory classes need to be application based in addition to industrial visits in the BSNL, Vodafone, Airtel, SPICE , TATA indicom etc

### RECOMMENDED BOOKS

1. Wireless Communications, Principles and Practice, by Theodore S.Rappaport.
2. Wireless Communications by Singal, Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Wireless Communications by Misra, Tata McGraw Hill Education Pvt Ltd , New Delhi
4. Introduction to Wireless and Mobile Systems, by Dharma Prakash Agarwal, Qing-An zeng.
5. Wireless Communications and Networking, by William Stallings.
6. Mobile and Personal Communication Systems and Services, by Raj Pandya, Prentice Hall of India, New Delhi
7. Mobile Communication by John Schiller, Prentice Hall of India, New Delhi
8. Wireless Communications by Pahalwan, Pearson Publishers
9. Wireless and Mobile Communication VK Sangar, Ishan Publications.

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Wireless Communication	12	22
2	Cellular Concept	12	23
3	Multiple Access Techniques for Wireless Communication	16	25
4	Mobile Communication Systems	24	30
<b>Total</b>		64	100

## 6.5 BASICS OF MANAGEMENT

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### RATIONALE

The diploma holders are generally expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Topics like Structure of Organization, Leadership, Motivation, Ethics and Values, Customer Relationship Management (CRM), Legal Aspects of Business, Total Quality Management (TQM), Intellectual Property Rights (IPR) etc. have been included in the subject to provide elementary knowledge about these management areas.

### DETAILED CONTENTS

1. Principles of Management (06 hrs)
  - 1.1. Introduction, definition and importance of management.
  - 1.2. Functions of Management  
Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling.
  - 1.3. Concept and Structure of an Organization  
Types of industrial organization
    - a) Line organization
    - b) Functional organization
    - c) Line and Functional organization
  - 1.4. Hierarchical Management Structure  
Top, middle and lower level management
  - 1.5. Departmentalization  
Introduction and its advantages.
2. Work Culture (06 hrs)
  - 2.1. Introduction and importance of Healthy Work Culture in organization
  - 2.2. Components of Culture
  - 2.3. Importance of attitude, values and behaviour  
Behavioural Science – Individual and group behaviour
  - 2.4. Professional ethics – Concept and need of Professional Ethics
3. Leadership and Motivation (06 hrs)
  - 3.1. Leadership
    - a) Definition and Need of Leadership

- b) Qualities of a good leader
  - c) Manager vs. leader
- 3.2. Motivation
  - a) Definition and characteristics of motivation
  - b) Factors affecting motivation
  - c) Maslow's Need Hierarchy Theory of Motivation
- 3.3. Job Satisfaction
- 4. Legal Aspects of Business: Introduction and Need (06 hrs)
  - 4.1. Labour Welfare Schemes
    - a) Wage payment : Definition and types
    - b) Incentives: Definition, need and types
  - 4.2. Factory Act 1948
  - 4.3. Minimum Wages Act 1948
- 5. Management Scope in different Areas (12 hrs)
  - 5.1. Human Resource Development
    - a) Introduction and objective
    - b) Manpower Planning, recruitment and selection
    - c) Performance appraisal methods
  - 5.2. Material and Store Management
    - a) Introduction, functions and objectives of material management
    - b) Purchasing: definition and procedure
    - c) Just in time (JIT)
  - 5.3. Marketing and Sales
    - a) Introduction, importance and its functions
    - b) Difference between marketing and selling
    - c) Advertisement- print media and electronic media
    - d) Market-Survey and Sales promotion.
  - 5.4. Financial Management – Introduction
    - a) Concept of NPV, IRR, Cost-benefit analysis
    - b) Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty, Provident Fund
  - 5.5. Maintenance Management
    - a) Concept

- b) Preventive Maintenance
- 6. Miscellaneous Topics (12 hrs)
  - 6.1. Customer Relationship Management (CRM)
    - a) Definition and Need
    - b) Types of CRM
    - c) Customer satisfaction
  - 6.2. Total Quality Management (TQM)
    - a) Inspection and Quality Control
    - b) Concept of Quality Assurance
    - c) TQM
  - 6.3. Intellectual Property Rights ( IPR)
    - a) Introduction, definition and its importance
    - b) Infringements related to patents, copyright, trade mark

### **INSTRUCTIONAL STRATEGY**

It is observed that the diploma holders generally take up middle level managerial positions, therefore, their exposure to basic management principles is very essential. Accordingly students may be given conceptual understanding of different functions related to management. Some of the topics may be taught using question answer, assignment or seminar method. The teacher will discuss success stories and case studies with students, which in turn, will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organizations. Appropriate extracted reading material and handouts may be provided.

### **RECOMMENDED BOOKS**

1. Principles of Management by Philip Kotler TEE Publication
2. Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM Publishing Co, New Delhi.
3. Financial Management by MY Khan and PK Jain, Tata McGraw Hill Education Pvt Ltd , New Delhi
4. Modern Management Techniques by SL Goel: Deep and Deep Publications Pvt Limited , Rajouri Garden, New Delhi.
5. Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr.: Prentice Hall of India Pvt Ltd, New Delhi.
6. Essentials of Management by H Koontz, C O' Daniel , Tata McGraw Hill Education Pvt Ltd, New Delhi
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi

8. Total Quality Management by DD Sharma, Sultan Chand and Sons, New Delhi.
9. Intellectual Property Rights and the Law by Dr. GB Reddy.
10. Service Quality Standards, Sales & Marketing Department, Maruti Udyog Ltd.
11. Customer Relationship Management: A step-by-step approach, Mohamed & Sagadevan Oscar Publication, Delhi
12. Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi.

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Sr No</b>	<b>Topic No.</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allotted (%)</b>
1.	Principles of Management	06	15
2.	Work Culture	06	10
3.	Leadership and Motivation	06	15
4.	Legal Aspects of Business: Introduction and Need	06	10
5.	Management Scope in different Areas	12	25
6.	Miscellaneous Topics	12	25
	<b>Total</b>	<b>48</b>	<b>100</b>

## 6.6 MAJOR PROJECT WORK

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- - 8

### RATIONALE

Major Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period with a view to:

- i) Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study.
- ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- iii) Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
- iv) Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

Some of the project activities are given below:

- a) Projects related to designing small electronic equipment / instruments.
- b) Projects related to increasing productivity in electronic manufacturing areas.
- c) Projects related to quality assurance.

- d) Projects connected with repair and maintenance of plant and equipment.
- e) Projects related to design of PCBs.
- f) Projects related to suggesting substitutes of electronics components being used.
- g) Projects related to design of small oscillators and amplifier circuits.
- h) Projects related to design, fabrication, testing and application of simple digital circuits and components.
- i) Projects related to microprocessor/microcontroller based circuits/ instruments.

**A. SOME OF THE PROJECTS BASED ON ABOVE AREAS ARE LISTED BELOW FOR THE BENEFIT OF STUDENTS:**

1. Microprocessor/Microcontroller based rolling display/bell and calendar
2. Microprocessor based stepper motor control.
3. Speed control of DC Machines by Microprocessor/Microcontrollers
4. Temperature monitoring using Microprocessor/Microcontroller based systems.
5. Microprocessor/Microcontroller based liquid level indicator and control
6. Fabrication and assembling of digital clock.
7. Fabrication of PCB circuits using ORCAD/ EAGLE Software.
8. Fabrication of ON line/OFF line UPS of different ratings and inverters
9. Design, fabrication and testing of different types of experimental boards
10. Repair of oscilloscope, function generator
11. Design and developing web sites of organizations
12. Installation of computer network (LANS).
13. Microprocessor/Microcontroller based solar tracking system
14. GSM based car or home security system
15. Bank token display using microcontroller
16. Printer sharing unit
17. Microprocessor/Microcontroller Based A/D converter
18. Microprocessor/Microcontroller Based D/A converter
19. Simulation of half wave and full wave rectifiers using Simulation Software
20. Simulation of class A, Class B, Class AB and Class C amplifiers

21. Simulation of different wave forms like sine, square, triangular waves etc.
22. GPS based vehicle tracking system
23. Calculate Bit Error Rate (BER) of various modulation techniques
24. Design ALU using CPLD/FPGA
25. Design Display System using CPLD/FPGA
26. Electronic Weighing Machines

**B. FABRICATION AND TESTING (AT LEAST TWO OF THE FOLLOWING):**

- 1 Voltage Stabilizer for Refrigerator, Air-Conditioner
- 2 Emergency Light using SCR
- 3 Power amplifier
- 4 Low cost intercom for home
- 5 Analog computer
- 6 Regulated power supply (+ 12V and + 6V) using 7812, 7912 and 7806, 7906
- 7 Automatic battery charger using SCR
- 8 Burglar Alarm
- 9 Automatic street light/dressing table light
- 10 Inverter circuit 500 watt.
- 11 Microprocessor/Microcontroller Based A/D converter
- 12 Microprocessor/Microcontroller Based D/A converter
- 13 Simulation of half wave and full wave rectifiers using Simulation Software
- 14 Simulation of class A, Class B, Class AB and Class C amplifiers
- 15 Inverter/Emergency light circuit using power transistors
- 16 SCR based automatic battery charger
- 17 SCR operated illumination controller
- 18 SCR operated automatic water level controller
- 19 SCR based speed controller for DC shunt motor
- 20 Three phase full wave rectifier using power diodes
- 21 Timer circuit using 555-IC
- 22 SCR controlled rectifier circuit
- 23 Speed control circuit of DC shunt motor using SCR



- 24 Inverting and non-inverting amplifiers using OP AMP(741)  
 25 Comparator circuits using OP AMP (741)

**NOTE:**

**The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher**

A suggestive criterion for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max.** Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10%	10	8	6	4	2
2.	Planning and execution of considerations	10%	10	8	6	4	2
3.	Quality of performance	20%	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20%	20	16	12	8	4
5.	Sense of responsibility	10%	10	8	6	4	2
6.	Self expression/ communication skills	5%	5	4	3	2	1
7.	Interpersonal skills/human relations	5%	5	4	3	2	1
8.	Report writing skills	10%	10	8	6	4	2
9	Viva voce	10%	10	8	6	4	2
<b>Total marks</b>		<b>100</b>	<b>100</b>	<b>80</b>	<b>60</b>	<b>40</b>	<b>20</b>

The overall grading of the practical training shall be made as per following table.

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared "not eligible to receive diploma". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

**Important Notes**

- 1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**
- 2. The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**
- 3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**
- 4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition.