

## 6.1 OPTICAL FIBRE COMMUNICATION

L T P Periods/ Weeks 4 3

### **Unit:- 1**

(10Periods)

Introduction

- Basic block diagram of optical fiber communication systems
- application of fibre optic communication , Advantages and disadvantages of optical communication. Principle of light penetration, reflection, critical angle
- .Numerical aperture or acceptance angle

### **Unit:- 2**

(10 periods)

- Optical Fibers and Cables
- Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle,

### **Unit:-3**

(08Period)

- Losses in Optical Fiber Cable
- Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending losses. Dispersion

### **Unit:-4**

(10 Periods)

- Optical Sources
- Characteristics of light used in optical communication, principle of operation of LED, principle of operation of laser diode, semiconductor laser

### **Unit:-5**

(8 Periods)

- Optical Detectors
- Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD)

### **Unit:-6**

(10 Periods)

- Optical Amplifier
- Types of optical amplifiers, semiconductor & fiber optical amplifiers Functional types

### **Unit:-7**

(8 Periods)

- Optical Fiber Systems
- Optical transmitter circuit, optical receiver circuit, Multiplexing: WDM (Wavelength Division Multiplexing), Modulation in fiber 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 detector

**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, Jalandha

**Suggested Distribution of Marks**

Unit	Time Allotted (Periods)	Marks Allocation %
I	10	18
II	10	15
III	8	15
IV	10	15
V	8	15
VI	10	10
VII	8	12
TOTAL	64	100

## 6.2 Mobile & Wireless Networks

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**UNIT I:** (08 Periods)

- Introduction to Wireless Networks
- Introduction to Mobile Communications, Mobile Data, WiFi, Bluetooth, Cable Systems,

**Unit:- 2** (10 Periods)

- Cellular Mobile Communication Systems
- Cell area, Capacity of cell , Frequency Reuse, Co-channel Interference, Adjacent channel Interference , Power Control for reducing Interference, Improving coverage and capacity in cellular system, Cell Splitting, Sectoring
- Operation of AMPS, Introduction of Global Systems for Mobile Communication (GSM) and its architecture, Introduction of CDMA System, comparison of CDMA and GSM Systems , Introduction to GPS System.

**UNIT 3:** (08 periods)

- WiFi and Next Generation WLAN
- WiFi (802.11), 802.11 standards, WiFi Protocols, Frequency Allocation, Modulation and Coding Schemes, Network Architecture, Hot Spots, Virtual Private Networks (VPNs), Mobile VPN, VPN Types, WiFi Integration with 3G/4G

**UNIT 4:** (10 Periods)

- Third Generation Mobile Services
- Introduction to UMTS, Overview of the 3GPP Release 4 Network Architecture, All-IP Network Architecture, Overview CDMA2000, TD-CDMA, TD-SCDMA, Commonality among WCDMA, CDMA2000, TD-CDMA and TD-SCDMA.

**UNIT 5:** (10 Periods)

- LTE
- Introduction to LTE standards, ,Radio Channel Components, TD-LTE, Multiple Input Multiple Output, Cell Search, Cell Reselection, Handover (X2,S1,Inter-MME), Self-Organizing Networks (SONs), Heterogeneous Network (HetNET), Remote Radio Heads(RRH),VoLTE

**UNIT 6:** (08 Periods)

- WiMAX
- Introduction to WiMAX , Frequency Planning, Features and Application, Security, QoS, Profiles, Organisation, HandOver.

**UNIT7:** (10 Periods)

- VOIP
- Introduction to VOIP ,The Basics of IP Transport, The Session Initiation Protocol (SIP), VoIP and SS7,VOIP Quality of Service

### List Of Practical

1. To configure the IP address for a computer connected to LAN and to configure network parameters of a web browser for the same computer.
2. To plan IPv6 address scheme for a local area network comprising of n terminals
3. To develop programs for implementing / simulating routing algorithms for Adhoc networks
4. To install any one open source packet capture software like wireshark etc.
5. To configure Wireless Local Loop
6. To plan Personal Area Network.
7. To configure WLAN.
8. To configure Adhoc networks
9. To install and configure wireless access points.

### Text Books

1. Clint Smith ,P>E., Daniel Collins, " Wireless Networks: Design and Integration for LTE, EVDO,HSPA, and Wimax", McGraw Hill Education,
2. Eldad Perahia , Robert Stacey," Next Generation Wireless LANs", Cambridge University Press

### Suggested Distribution of Marks

Unit	Time Allotted (Periods)	Marks Allocation %
I	08	15
II	10	20
III	08	15
IV	10	20
V	10	10
VI	8	10
VII	10	10
TOTAL	64	100

## 6.3 MICROCONTROLLER & EMBEDDED SYSTEM

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**Unit: I** ( 15 Periods)

### MICROCONTROLLER SERIES (MCS)-51

- Introduction & features of microcontroller,
- Pin details
- I/O Port structure
- Memory Organization
- External Memory

**Unit:-II** ( 15 Periods)

### INSTRUCTION SET

- Different instruction groups
- Addressing Modes
- Instruction types

**Unit:-III** (15 Periods)

### Special Function Registers (SFRS)

- Timer operation
- Serial Port operation
- Interrupts

**Unit: IV** (8 Periods)

### ASSEMBLER DIRECTIVES & INTERFACING

- Different types of Assembler directives
- Interfacing of Switches and 7- segment display.

**Unit:-V** ( 11 Periods)

### EMBEDDED SYSTEM

- Introduction, Embedded design concept.
- AVR:ATMEGA 16
  - Pin description & features.
  - Memory structure
  - Architecture
- Interfacing examples of AVR board: LED, 7- segment, LDR, Stepper motor, IR module, Temperature sensor

### LIST OF PRACTICALS

1. Familiarization of Micro Controllers (8051) kit
2. Write ALP for two 8 bit Addition.
3. Write ALP for two 8 bit Subtraction.
4. Write ALP for finding the greatest number out of 10 nos.
5. Write ALP for finding the smallest number out of 10 nos.
6. Write ALP for Ascending and Descending order sorting of 10 numbers.
7. Interfacing of switch with 8051.
8. Study of interfacing LED, 7- segment, LDR, Stepper motor, IR module, Temperature sensor.

### RECOMMENDED BOOKS

1. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson education.
2. Ayala Kenneth:- The 8051 microcontroller, Third Edition, Cengage Learning
3. A. V. Deshmukh: Microcontroller (Theory and Application), TMH.
4. Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.
5. V. Udayashankara and M. S. Mallikarjunaswamy: 8051 Microcontroller, TMH, New Delhi.
6. The AVR microcontroller & embedded system using Assembly & C by M A Mazidi, Naimi: Pearson Education India

### Suggested Distribution of Marks

Unit	Time Allotted (Periods)	Marks Allocation %
I	15	25
II	15	25
III	15	25
IV	08	10
V	11	15
<b>TOTAL</b>	<b>64</b>	<b>100</b>

## 6.4 Satellite Communication

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**UNIT-1** (08 Periods)  
PRINCIPLES OF SATELLITE COMMUNICATION

- GeoSynchronous satellite, Satellite frequency allocation & Band spectrum
- Advantages of satellite communication, Active & Passive satellite.

**UNIT-2** (08Periods)

COMMUNICATION SATELLITE LINK DESIGN

- Introduction, General link design equations,
- C/N & G/T ratio
- Atmospheric & Ionosphere effects on link design, Complete link design.

**UNIT-3** (12 Periods)

ANALOG SATELLITE COMMUNICATION

- Introduction, Baseband analog(Voice) signal
- FDM techniques, S/N & C/N ratio in frequency modulation in satellite link
- Single channel per carrier(SCPC) systems,
- Analog FM/FDM TV satellite link
- Inter modulation products & their effects in FM/FDM systems

DIGITAL SATELLITE COMMUNICATION:

- Introduction, Base band signal, Digital modulation technique-ASK , PSK, QPSK, BFSK.

**UNIT-4** (12Periods)

MULTIPLE ACCESS TECHNIQUES:

- Introduction, TDMA, TDMA-Frame structure
- TDMA-Burst structure
- TDMA-Frame efficiencyTDMA compared to FDMA, CDMA .

**UNIT-5** (10Periods)

SATELLITE ORBITS

- Introduction, Synchronous orbit, Orbital parameters
- Satellite location with respect to earth, Look angles, Eclipse effect
- Satellite placement in geostationary orbit, Satellite stabilization.

**UNIT-6** (08 Periods)

- Communication Satellite Subsystem

Electric Power Supply, Attitude and Orbit Control

- Propulsion Sub System, Repeaters /satellite. Transponder, Telemetry
- Tracking and command Subsystem, thermal control system. Satellite Earth Station

**UNIT-7**

(06 Periods)

- Earth station Subsystem,
- Small earth station, Large Earth Station, Very small Aperture Terminal. TVRO
- MSAT( Mobile Satellite Communication technique) Satellite communication.

**List of Practical**

1. Study of direct communication link between Uplink Transmitter and Downlink Receiver using tone signal.
3. Study an AUDIO-VIDEO satellite link between Transmitter and Receiver.
4. Transmit and receive three separate signals (Audio, Video, Tone) simultaneously through satellite Link.
5. To study the Path Loss (effect of distance) between Transponder and Downlink Receiver.
6. To measure the Link Carrier to Noise Ratio (C/N)

**TEXT BOOK:**

1. Satellite Communication : D.C. Aggarwal ; Khanna.

**REFERENCE BOOK :**

1. Satellite Communication : D.C. Aggarwal ; Khanna.
2. Satellite Communication : Gagliardi ; CBS
3. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006.
4. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice Hall/Pearson, 2007.

**Suggested Distribution of Marks**

Unit	Time Allotted (Periods)	Marks Allocation %
I	08	15
II	08	20
III	12	15
IV	12	20
V	10	10
VI	08	10
VII	06	10
<b>TOTAL</b>	<b>64</b>	<b>100</b>



## 6.5 EMPLOYABILITY SKILLS

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<b>Unit I:</b>	<b>(06 periods)</b>
<ul style="list-style-type: none"><li>• Technical Education &amp; Industrial scenario.</li><li>• Competency required of an engineer.</li></ul>	
<b>Unit II:</b>	<b>(06 periods)</b>
<ul style="list-style-type: none"><li>• Professional Engineer desirable values and ethics and their development.</li><li>• Relation between engineering profession, society and environment</li></ul>	
<b>Unit III:</b>	<b>(12 periods)</b>
<b>Effective Communication</b>	
<ul style="list-style-type: none"><li>• Reading &amp; Active Listening Skills</li><li>• Speaking</li><li>• Writing</li><li>• Presentation Technique/Seminar</li><li>• Group discussion</li></ul>	
<b>Unit IV:</b>	<b>(12 periods)</b>
<b>Managing project</b>	
<ul style="list-style-type: none"><li>• Leadership</li><li>• Motivation</li><li>• Time management</li><li>• Resource management</li><li>• Interpersonal relationship</li></ul>	
<b>Unit V:</b>	<b>(10 periods)</b>
<b>Preparing for Employment</b>	
<ul style="list-style-type: none"><li>• Searching for job/job hunting</li><li>• Resume &amp; CV Writing</li><li>• Interview technique in personal interview telephonic interview, panel interview, group interview, video conferencing</li></ul>	
<b>Unit VI:</b>	<b>(08 periods)</b>
<b>Self Management</b>	
<ul style="list-style-type: none"><li>• Self awareness</li><li>• Stress Management</li><li>• Conflict resolution</li></ul>	
<b>Unit VII:</b>	<b>(06 periods)</b>
<ul style="list-style-type: none"><li>• Creativity, Innovation and Intellectual property right</li><li>• Concept and need in present time for an engineer</li></ul>	
<b>Unit VIII:</b>	<b>(04 periods)</b>
<b>Rules &amp; Ethics</b>	
<ul style="list-style-type: none"><li>• Basic rules, laws and norms to be adhered by engineers during their working</li></ul>	

### LIST OF PRACTICAS

- Steps how to effectively write different types of Letters.
- Steps to make a Presentation in Power Point.
- Steps to make a Resume more effective.
- Steps to conduct Telephonic/On-line Interview (Through skype/Google Hangout).
- Study of Different Techniques of Stress Management.
- Study of Rules & Ethical practices to be followed at Workplace.

### RECOMMENDED BOOKS

- Employability skills by Kapil Dev, Vishnu P. Singh Asian Pub. New Delhi
- Employability skills for Diploma students by Dr. S.K. Singh, Vayu Education, New Delhi

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted(%)
<b>1</b>	<b>06</b>	<b>10</b>
<b>2</b>	<b>06</b>	<b>10</b>
<b>3</b>	<b>12</b>	<b>18</b>
<b>4</b>	<b>12</b>	<b>18</b>
<b>5</b>	<b>10</b>	<b>16</b>
<b>6</b>	<b>08</b>	<b>12</b>
<b>7</b>	<b>06</b>	<b>10</b>
<b>8</b>	<b>04</b>	<b>6</b>
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.6 MAJOR PROJECT -II

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Each teacher is expected to supervise and guide 5-6 students. Some of the project activities are given below: one third part of Major Project is all ready Completed in 5<sup>th</sup> Sem.

- 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	08	06	04	02
2	Planning and execution of considerations	10%	10	08	06	04	02
3	Quality of performance	20%	20	16	12	08	04
4	Providing solution of the problems or production of final product	20%	20	16	12	08	04
5	Sense of responsibility	10%	10	08	06	04	02
6	Self expression/ communication skills	5%	05	04	03	02	01
7	Interpersonal skills/human relations	5%	05	04	03	02	01
8	Report writing skills	10%	10	08	06	04	02
9	Viva voce	10%	10	08	06	04	02
<b>Total Marks</b>		100	100	80	60	40	20

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 <math>\diamond</math> 65 Very good
- iii) 64 <math>\diamond</math> 50 Good
- iv) 49 <math>\diamond</math> 40 Fair
- v) Less than 40 Poor Important

SUGGESTION