

**Scheme of Teaching and Examination for  
6th Semester of 3 Years Diploma in E.C.E.**

Duration of Semester : **14 Weeks**

Student Contact Hours : **36 Hrs**

Total Marks : **800**

Effective from: 2017 -18 Session

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Industrial Engineering & Management	601	Theory	3		-	3	100	80	20	26	40
2.	Optical Fiber Communication	ECE 604	Theory	3	-	-	3	100	80	20	26	40
3.	Wireless/Mobile Communication	ECE 605	Theory	3	-	-	3	100	80	20	26	40
4.	Elective III	ECE 606/607/CSE611	Theory	3	-	-	3	100	80	20	26	40
5.	Elective IV	ECE 608/609/610/CSE606	Theory	3	-	-	3	100	80	20	26	40
6.	Optical Fiber Communication Lab	ECE 611	Sessional	-	-	2	-	50	30	20	-	25
7.	Wireless/Mobile Communication Lab	ECE 612	Sessional	-	-	2	-	50	30	20	-	25
8.	Elective III Lab	ECE 613/614/CSE614	Sessional	-		2	-	50	30	20	-	25
9.	Elective IV Lab	ECE 615/616/617/CSE619	Sessional	-		2	-	50	30	20	-	25
10	Project Work	603	Sessional	-	-	4	-	50	30	20	-	25
11	Professional Practices	602	Sessional	-	-	4	-	50	30	20	-	25
<b>Total Hours of Teaching per week :</b>				<b>15</b>		<b>16</b>						

Elective III (Sensors & Actuators- ECE-606/ Biomedical Instrumentation-ECE-607/IoT -CSE611)

Elective IV (Microwave- ECE608/Satellite Communication- ECE609/Fire & Safety –ECE610/Image Processing –CSE606)

Total Marks: Theory : Practical : Sessional :  
L : Lecture, T : Tutorial P : Practical

- Note:
1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
  2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.
  3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
  4. Board will depute examiner for Practical examination.
  5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

**Subject : Industrial Engineering & Management (Common Paper)**

**Subject Code : 601**

**Full Marks : 80+20= 100**

**L T P**  
**3 0 0**

**Rationale:**

After completion of three years of technical training, Polytechnic students are expected to enter in to the World of Work. The business environment is altogether different and new to the students. A proper introduction and understanding of Business Processes is therefore essential for all Polytechnic students. Management is a subject which deals with basics of Management science required to understand the processes the in Industrial & Commercial environment. This will enable the students of Polytechnic to become familiar and to understand various Business Organizational structures, their functioning and the Role these technicians will have to play in these setups with responsibilities.

Industrial Engineering is concerned with the design, improvement and installation of integrated systems of people, materials, equipment and energy. Polytechnic students must be able to analyze the use and cost of the resources of the organization in order to achieve the objective, i.e. to increase productivity, profits etc. and carryout the policies efficiently and effectively.

**Objective:**

The students will able to:

1. Familiarize environment in the world of work.
2. Explain the importance of management process in Business.
3. Identify various components of management.
4. Describe Role & Responsibilities of a Technician in an Organizational Structure.
5. Apply various rules and regulations concerned with Business & Social responsibilities of the technician.

**Detailed Syllabus**

1. **Productivity :** **02 Hrs**  
Production and productivity, importance of productivity, factors affecting productivity, means of increasing productivity.

2. **Plant Layout and Material Handling :** **02 Hrs**  
Definition of plant layout, objectives of good plant layout, principles of plant layout, types of plant layout, flow pattern, steps in planning the layout for a new enterprise, definition of material handling, functions and principles of material handling, material handling devices.
3. **Work Study :** **04 Hrs**  
Definition, concept and need for work study, objectives of method study and work measurement, basic procedure/steps in method study, recording technique, critical examination, principles of motion economy, stop watch procedure for collecting time study data, including performance rating and allowances, work sampling.
4. **Production Planning and Control (PPC) :** **04 Hrs**  
Definition and objectives of PPC, functions of PPC, routing, scheduling, loading, dispatching, production control definition and objectives, principle of sound production control system.
5. **Material, Purchase and Stores Management :** **04 Hrs**  
Definition, functions& objectives of materials management, inventory control, economic order quantity (EOQ), ABC analysis. Objectives of purchasing department, buying techniques, purchasing procedure (steps involved in one complete purchasing cycle); functions of stores department, location and layout of stores, receipt and issue of materials.
6. **Quality Control and TQM :** **04 Hrs**  
Meaning of quality and quality control, dimensions of quality, quality circle, concept and definition of TQM, elements of TQM, Kaizen, 5 'S' and six sigma.
7. **Management :** **04 Hrs**  
Various definition, concept of management, levels of management, administration and management, scientific management by F. W. Taylor. Principles of management (14 principles of Henry Fayol). Functions of management - planning, organizing, coordinating, directing, controlling, decision making.
8. **Organizational Management :** **04 Hrs**  
Organization - definition, steps in forming organization. Types of organization. Types of organization - line, line and staff, functions, project type. Departmentation- Organized and

decentralized, authority and responsibility, span of control (management). Forms of ownership - proprietorship, partnership, joint stock company, co-operative society, govt. sector.

9. **Human Resource Management :**

**06 Hrs**

Personnel Management – Introduction, definition, function. Staffing – Introduction to HR, Introduction to HR Planning, Recruitment procedure. Personnel- Training & Development – Types of training, Induction, Skill enhancement. Leadership & Motivation – Leadership- Styles & types, Motivation- Definition, Intrinsic, & Extrinsic, Maslow's theory of Motivation and its significance. Safety Management – Causes of accident, Safety Procedures. Introduction, Objectives & feature of Industrial Legislation such as – Factory act, ESI act, Workman compensation act, Industrial dispute act and salary & wages.

10. **Financial Management :**

**04 Hrs**

Financial Management- Objectives & Functions. Capital Generation & Management- Types of capitals, Sources of finance. Budgets and accounts- Types of budgets, Production budget (including variance report), Labour budget, Introduction to Profit & Loss Accounts (Only concept), Balance sheet etc.

11. **Entrepreneurship :**

**04 Hrs**

Concept and definition of entrepreneur and entrepreneurship, factors influencing entrepreneurship, entrepreneurial characteristics, need for promotion of entrepreneurship and small scale industries, steps in setting up a small scale industrial enterprise.

**References Books :**

1. Industrial Engineering and Management by O. P. Khanna
2. Industrial Engineering and Production Management by M. Mahajan.  
Publisher :Dhanpat Rai Publication (P) Ltd. New Delhi
3. Business Administration and Management by Dr. S. C. Saksena  
Publisher :Sahitya Bhawan, Agra.

**Subject** : Optical Fiber Communication  
**Subject Code** : ECE604  
**Total Hours** : 42  
**Full Marks** : 80 + 20 = 100

Unit-I Introduction 6 hrs

Need of Fiber Optic Communications, Evolution of Light wave Systems, Basic Concepts; Analog & Digital Signals, Channel Multiplexing, Modulation Formats, Optical Communication Systems, Light wave System Components; Optical Fibers as a Communication Channel, Optical Transmitters, Optical Receivers.

Unit-II Optical Fibers Geometrical 10 hrs

Optics Description; Step-Index Fibers, Graded Index Fibers, Wave Propagation; Maxwell's Equations, Fiber Modes, Single-Mode-Fibers, Dispersion in Single-Mode Fibers; Group Velocity Dispersion, Material Dispersion, Wave guide Dispersion, Higher-order Dispersion, Polarization-Mode Dispersion, Dispersion-Induced Limitations; Basic Propagation Equation, Chirped Gaussian Pulses, Limitations on the Bit Rate, Fiber Bandwidth, Fiber Losses; Attenuation Coefficient, Material Absorption, Rayleigh Scattering, wave guide Imperfections, Nonlinear Optical effects; Stimulated Light Scattering, Nonlinear Phase Modulation, Four Wave Mixing, Fiber Manufacturing; Design Issues, Fabrication Methods, Cables and Connectors

Unit-III Optical Transmitters Basic Concepts; 8 hrs

Emission and Absorption Rates, p-n Junctions, Non radiative Recombination, Semi conductor Materials, Light Emitting Diodes; Power-current Characteristics, LED spectrum, Modulation Response, LED Structures, Semi Conductor Lasers; DFB Lasers, Coupled Cavity semiconductor Lasers, Tunable Semiconductor Lasers, Vertical Cavity Semiconductor Lasers, Laser Characteristics, Small & Large Signal Modulation, Spectral Line width, Source Fiber Coupling.

Unit-IV Optical Receivers 8 hrs

Basic concepts, p-n Photo Diodes, p-i-n Photo Diodes, Avalanche Photo Diode, MSM Photo detector, Receiver Design, Receiver Noise; Noise mechanism, Receiver sensitivity; Bit error rate, Minimum Receiver Power, Sensitivity Degradation, Receiver Performance.

Unit-V Light Wave Systems 5 hrs

System Architecture, Loss limited Light wave systems, Dispersion limited Light wave systems, Power Budget, Long Haul systems, Sources of Power Penalty; Model Noise, Dispersive Pulse Broadening, Mode Partition Noise, Frequency Chirping, Reflection Feedback Noise

Unit-VI Multi channel Systems 5 hrs

WDM Light wave systems, Optical TDM Systems, Subscriber Multiplexing, Code Division Multiplexing.

**Subject : Optical Fiber Communication Lab**  
**Subject Code : ECE611**

### **LIST OF EXPERIMENTS**

1. DC Characteristics of LED
2. DC Characteristics of PIN
3. DC Characteristics of Photo diode
4. Mode Characteristics of Fibers
5. Measurement of connector and bending losses
6. Fiber optic Analog and Digital Link- frequency response(analog)
7. Fiber optic Analog and Digital Link- frequency response eye diagram (digital)
8. Numerical Aperture determination for Fibers
9. Attenuation Measurement in Fibers
10. Attenuation losses in bending of fibers.

### **Reference Books:**

1. Senior J. Optical Fiber Communications, Principles & Practice, PHI.
2. Keiser G., Optical Fiber Communication Mc graw-hill.
3. Govind P. Agrawal, Fiber Optics Communication Systems John Wiley & Sons (Asia) Pvt. Ltd.
4. Djafar K. Mynbeav, —Fiber-Optics Communications Technology| Pearson.

**Subject** : **Mobile Communication System (Wireless)**  
**Subject Code** : **ECE605**  
**Total Hours** : **42**  
**Full Marks** : **80 + 20 = 100**

1. Introduction: 8 hrs  
A basic cellular system, performance criteria, operation of cellular systems, planning a cellular system, analog & digital cellular systems. Examples of Wireless Communication Systems: Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems. Blue tooth and Zig Bee.
2. Elements of Cellular Radio Systems Design: 8 hrs  
General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems.
3. Digital Communication through fading multipath channels: 8 hrs  
Fading channel and their characteristics- Channel modeling, Digital signaling over a frequency non selective slowly fading channel. Concept of diversity branches and signal paths. Combining methods: Selective diversity combining, Switched combining, maximal ratio combining, Equal gain combining.
4. Multiple Access Techniques for Wireless Communications: 8 hrs  
Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access, Packet Radio Protocols; Pure ALOHA, Slotted ALLOHA.
5. Wireless Systems & Standards: 6 hrs  
AMPS and ETACS, United states digital cellular (IS- 54 & IS 136), Global system for Mobile (GSM): Services, Features, System Architecture, and Channel Types, Frame Structure for GSM, Speech Processing in GSM, GPRS/EDGE specifications and features. 3G systems: UMTS & CDMA 2000 standards and specifications. CDMA Digital standard (IS 95): Frequency and Channel specifications, Forward CDMA Channel, Reverse CDMA Channel, Wireless Cable Television.
6. Future trends: 4 hrs  
4G , 5 G and other higher G mobile techniques, LTE-Advance systems

**Subject : Mobile Communication System Lab (Wireless)**  
**Subject Code : ECE612**

### **List of Experiments**

1. Baseband communication
2. Adaptive Linear equalizer
3. CDMA multi path
4. CDMA Multiuser
5. Global System for Mobile Communication
6. GSM Wireless digital communication on digital SDR platform
7. GSM spread spectrum DSSS Modulation and demodulation
8. Free space propagation using path loss model
9. Link budget equation for sat communication
10. Carrier to noise ratio of wireless signal
11. Outdoor propagation Okumura model
12. Outdoor propagation Hata model

### **Recommended Text Books:**

1. T.S.Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education Asia, 2010.
2. William C Y Lee, Mobile Cellular Telecommunications, 2nd Edition, MGH, 2004.
3. Raj Pandya, —Mobile and Personal Communication systems and services, Prentice Hall of India, 2001.
4. Wireless and Digital Communications; Dr. Kamilo Feher (PHI)



**Subject** : Sensors and Actuators (Elective-III)  
**Subject Code** : ECE606  
**Total Hours** : 42  
**Full Marks** : 80 + 20 = 100

1. Introduction to Sensor electronics and techniques - Overview of sensor measurements 3
2. Sensor linearization and characterization - Sensor classification 3
3. Pressure Sensors 3
4. Position sensors 3
5. Temperature Sensors 3
6. Humidity Sensors 3
7. Speed Sensors 3
8. Acceleration Sensors 3
9. Torque, light, distance and level Sensors 3
10. Fire sensors, smoke detectors and their types. 3
11. CO and CO2 sensors 3
12. Principles of stepper motors, Relays, solenoids, Hydraulic and pneumatic devices. 3
13. Sensor and actuator circuit interface for microcontrollers and their programming 3
14. Trends in Recent sensors and actuator development 3

**Subject** : Sensors and Actuators Lab  
**Subject Code** : ECE613

**List of Experiments:**

1. To study various types of Resistors, Inductors, Capacitors, Diodes, Transistors, LED.
2. To study CRO, Function generator, Power Supply.
3. To study various components of Induction Machine and Synchronous Machine
4. To study various components of DC Machines and Transformers.
5. To obtain output voltage waveforms of half wave and full wave uncontrolled rectifier with and without filter capacitor.
6. To design a voltage regulator using Zener Diode and analyze the performance of the regulator for various loads. Also compare the performance with a linear voltage regulator.
7. To verify truth-tables of various flip-flops (J-K, D, Toggle etc.)
8. To study the characteristics of LVDT using linear displacement trainer Kit & compare with ideal characteristics.
9. To measure the strain of the metal strip using strain gauge trainer kit & compare with ideal characteristics.
10. To measure the angular displacement of resistive & capacitive transducer using angular displacement trainer kit & compare with ideal characteristics.
11. To obtain the characteristics of RTD, Thermistor, thermocouple with hot and cold junction thermal trainer kit & compare with ideal characteristics.

**Subject** : **Bio Medical Instrumentation (Elective -III)**  
**Subject Code** : **ECE607**  
**Total Hours** : **42**  
**Full Marks** : **80 + 20 = 100**

**OBJECTIVES:**

- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters
- To understand the basic principles in imaging techniques
- To have a basic knowledge in life assisting and therapeutic devices

**UNIT I**

**FUNDAMENTALS OF BIOMEDICAL ENGINEERING** : 10 hrs

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues - Basic mechanics of spinal column and limbs - Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

**UNIT II**

**NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES:** 8 hrs

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO<sub>2</sub>, pO<sub>2</sub>, finger-tip oxymeter - ESR, GSR measurements .

**UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS** : 8 hrs

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments.

#### UNIT IV

##### IMAGING MODALITIES AND ANALYSIS :

8 hrs

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems - Analysis of digital images

#### UNIT V

##### LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES :

8 hrs

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery – Advanced 3D surgical techniques- Orthopedic prostheses fixation

**Subject : Bio Medical Instrumentation Lab**

**Subject Code : ECE614**

#### **List of Practical's**

1. Blood Pressure measurement
2. ECG Measurement
3. EEG Measurement
4. EMG Measurement
5. Pacemaker
6. Audiometry test using audiometer
7. Ultrasound blood flow measurement
8. Ultrasound of abdomen
9. Heart sound measurement using PCG
10. Respiratory system analysis using spirometer.
11. MRI scanning
12. CT Scanning
13. Doppler test
14. Blood test for its parameters
15. Urine test for its constituents

#### TEXT BOOKS:

1. Leslie Cromwell, Biomedical Instrumentation and Measurement, Prentice hall of India, New Delhi, 2007.
2. Ed. Joseph D. Bronzino, The Biomedical Engineering HandBook, Second Edition, Boca Raton, CRC Press LLC, 2000

#### REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 1997.
3. Joseph J.carr and John M. Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 1997.
4. Khandpur R S, Handbook of Medical Instrumentation, Tata Mc Graw Hill.
5. Duane Knudson, Fundamentals of Biomechanics, Springer, 2003.
6. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.

**Subject** : Internet of Things (Elective-III)  
**Subject Code** : CSE611  
**Total Hours** : 42  
**Full Marks** : 80 + 20 = 100

Concept of working of Internet	2
Sensors and actuators introduction	4
Networking of devices and systems and concept of multimedia	4
Introduction to IOT and low interoperability for the IPv6	4
A review of IOT working across	2
RFID technology introduction and mapping and localization of RFID technology	4
Concept of wave	2
Performance comparison of multi hop wireless Ad Hoc network routing protocols	4
Power assignment method for Multi Sink WSN with and without outage probability constraints	2
Routing in Vehicular Ad Hoc networks	2
LTE and IEEE802 protocol for vehicular networking	2
Investigation and optimization of IEEE 802 for industrial wireless networks	2
Performance analysis for slotted SCMA / CA in IEEE 802	2
Integration of wireless sensor network to IOT using different gateways	2
Communication Industrial wireless mesh network	2
Networks primitives in wireless sensor networks	2
Applications of IOT	2

**Subject : Internet of Things Lab**  
**Subject Code : CSE614**

**List of Experiments -**

1. Physical and virtual Networking
2. Multimedia operation using wireless modes
3. Development of systems based on IOT technique
4. Operation of sensors through networking in wired and wireless modes
5. Operation of actuators through networking in wired and wireless modes
6. Smart board handling through wireless networks
7. GSM based evaluation of road traffic system
8. Smart town features demonstration
9. Cloud based operation
10. Case study of IOT based system.

**Books**

IoT Inc, Bruce Sinclair

Building the Internet of Things by M Kranze

Race Against the Machine by Erik Brynjolfsson and Andrew McAfee

Internet of Things: Principles and Paradigms by Rajkumar Buyya (Editor), Amir Vahid Dastjerdi (Editor)

Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud by Cuno Pfister (Author)

Enterprise IoT: Strategies & Best Practices for Connected Products & Services by by Dirk Slama (Author), Frank Puhlmann (Author), Jim Morrish (Author), Rishi M Bhatnagar (Author)

The Ultimate Introduction to IoT by leverage

**Subject** : Microwave (Elective-III)  
**Subject Code** : ECE608  
**Total Hours** : 42  
**Full Marks** : 80 + 20 = 100

Unit 1 Microwave Tubes: 10 hrs

Limitations of conventional tubes, construction, operation and properties of Klystron Amplifier, reflex Klystron, Magnetron, Travelling Wave Tube (TWT), Backward Wave Oscillator (BWO), Crossed field amplifiers.

Unit 2 Microwave Solid State Devices: 11 hrs

Limitation of conventional solid state devices at Microwaves, Transistors (Bipolar, FET), Diodes (Tunnel, Varactor, PIN), Transferred Electron Devices (Gunn diode), Avalanche transit time effect (IMPATT, TRAPATT, SBD), Microwave Amplification by Stimulated Emission of Radiation (MASER).

Unit 3 Microwave Components: 11 hrs

Analysis of Microwave components using s-parameters, Junctions (E, H, Hybrid), Directional coupler, Bends and Corners, Microwave posts, S.S. tuners, Attenuators, Phase shifter, Ferrite devices (Isolator, Circulator, Gyator), Cavity resonator, Matched termination.

Unit 4 Microwave Measurements: 10 hrs

Power measurements using calorimeters and bolometers, Measurement of Standing Wave Ratio (SWR), Frequency and wavelength, Microwave bridges.

Text books: 1. Microwave devices and circuits: Samuel Liao; PHI

2. Microwave devices and Radar Engg: M. Kulkarni; Umesh Publications

Reference Books:

1. Foundation of Microwave Engg. : R.E. Collin; McGraw Hill

2. Microwave Engg: K.C Gupta

**Subject : Microwave Lab**  
**Subject Code : ECE615**

**List of Experiments:**

1. Study of microwave components and instruments.
2. Measurement of crystal characteristics and proof of the square law characteristics of the diode.
3. Measurement of klystron characteristics.
4. Measurement of VSWR and standing wave ratio.
5. Measurement of Dielectric constants.
6. Measurement of Directivity and coupling coefficient of a directional coupler.
7. Measurement of Q of a cavity.
8. Calibration of the attenuation constant of an attenuator.
9. Determination of the radiation characteristics and gain of an antenna.
10. Determination of the phase-shift of a phase shifter.
11. Determination of the standing wave pattern on a transmission line and finding the length and position of the short circuited stub.



**Subject : Satellite Communication (Elective-III)**  
**Subject Code : ECE609**  
**Total Hours : 42**  
**Full Marks : 80 + 20 = 100**

Unit-I

Introduction to Satellite Communication

8 hrs

Origin, Brief History, Current state and advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, Angle of Evaluation, Propagation Delay, Orbital Spacing, System Performance

Unit-II

Satellite Link Design

12 hrs

Link design equation, system noise temperature, C/N & G/T ratio, atmospheric & ionospheric effects on link design, complete link design, interference effects on complete link design, earth station parameters, Earth space propagation effects, Frequency window, Free space loss, Atmospheric absorption, Rainfall Attenuation, Ionospheric scintillation, Telemetry, Tracking and command of satellites.

Unit-III

Satellite Multiple Access System

12 hrs

FDMA techniques, SCPC & CSSB systems, TDMA frame structure, burst structure, frame efficiency, super-frame, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, satellite switched, Erlang call congestion formula, DA-FDMA, DA-TDMA.

Unit-IV

Satellite Services

10 hrs

INTELSAT, INSAT Series, VSAT, Weather forecasting, Remote sensing, LANDSAT, Satellite Navigation, Mobile satellite Service. Unit-V Laser & Satellite Communication Link analysis, optical satellite link Tx & Rx, Satellite, beam acquisition, tracking & pointing, cable channel frequency, head end equation, distribution of signal, n/w specifications and architecture, optical fibre CATV system.

**Subject : Satellite Communication Lab**  
**Subject Code : ECE616**

**List of Experiments:**

- 1 Measure the baseband analog signal parameters in a wireless link.
- 2 Study the phenomenon of linear and circular polarization of antennas.
- 3 Measure the C/N ratio and propagation delay of signal in a satcom link.
- 4 To estimate, calculate and design of satellite link budget.
- 5 To simulate satellite system using Qualnet
- 6 To study and analyze Digital modulation techniques in time and frequency domain and their constellation view.
- 7 To measure numerical aperture and various types of losses in fiber.
- 8 Measurement of insertion loss, directivity, back reflection /return loss for a series of fiber optic components (i.e coupler, WDM, isolator, circulator, DWDM Mux/ Demux devices)
- 9 Designing of optical communication systems and photonic devices as per the given Specifications using simulation softwares.
- 10 Do investigations in terms of BER, Eye diagram for systems and mode calculation for devices.

**Reference Books:**

1. Timothy Pratt, Charles W. Bostian, —Satellite Communications, John Wiley & Sons, 1986.
2. Dr. D.C. Aggarwal, —Satellite Communications, Khanna Publishers, 2001.
3. Dennis Roddy, —Satellite Communications, McGraw Hill, 1996.

**Subject** : Fire and Safety (Elective-III)  
**Subject Code** : ECE610  
**Total Hours** : 42  
**Full Marks** : 80 + 20 = 100

1. Fire, its classification and types of extinguishers	4
2. Fire protective devices , ladders, lifts etc and clothes	4
3. Safety measures in devices and construction	6
4. Industrial safety	4
5. Environmental safety	4
6. Safety of people and belongings	4
7. Fire risk assessment	4
8. Fire engineering science	4
9. Fire control Technology	4
10. Fire fighting drills and their importance	4

**Subject** : Fire and Safety Lab  
**Subject Code** : ECE617

#### **List of Experiments**

1. Study and analyze the different types of fire extinguishers
2. Study and demonstration of Fire protective devices , ladders, lifts etc and clothes
3. Study of Safety measures in devices and construction
4. Case study of Industrial safety
5. Demonstration of Environmental safety
6. Drill of Safety of people and belongings
7. Case study of Fire risk assessment
8. Fire control through liquid
9. Fire control through solid
10. Fire control through gas
11. Different types of Fire fighting drills demonstration.

#### **Books**

- 1 Principles of Fire Safety Engineering by A K Das
2. Fire Safety Engineering by J A Purkiss
- 3 An Introduction to Fire Dynamics by D Drysdale

**Subject** : Image Processing (Elective-III)  
**Subject Code** : CSE606  
**Total Hours** : 42  
**Full Marks** : 80 + 20 = 100

Unit-I Introduction to Image Processing 10 hrs

Historical background, visual perception, image formation, Elements of Storage, sampling & Quantization, Relationships between pixels-neighbors of pixel, connectivity labeling of connected components, Relations, equivalence and Transitive closure, Distance measures, Arithmetic/ Logic operation, Imaging Geometry Basic and perspective transformation stereo imaging, application of image Processing.

Unit-II Image Enhancement 10 hrs

Spatial and frequency domain methods point processing, intensity transformation, Histogram processing image subtraction and Averaging spatial filtering, LP, HP and homo-morphic filtering, generation of spatial marks, Color image processing.

Unit-III Image Compression 6 hrs

Redundancy models, error free compression, Lossy compression, Image compression standards.

Unit-IV Image Segmentation 6 hrs

Detection of Discontinuity, Edge detection, Boundary detection, Thresholding, Regional oriented segmentation, use of motion in segmentation.

Unit-V Speech Processing 10 hrs

Review of human speech and Acoustic theory, nature of sound, harmonics, resonance measurement, virtual display. Music theory, pitch, duration, intervals, rhythm. Human speech production, the vocal tract, the Larynx, the source filter. Speech signal processing-the phasor mode, Fourier transfer, DFT, FFT. The hardware use of FIR & IIR filters. Software, Elements of speech Synthesis speech Recognition-speech in the computer-human interface.

**Reference Books:**

1. Digital Image Processing - by Rafael Gonzalez and Richard E. Woods, Pearson Education Society.
2. Digital Image Processing - by Kenneth R Castleman, Pearson Education Society.
3. A. K. Jain, —Fundamental of Digital Image Processing, PHI
4. Speech and Audio Processing for multimedia PC's - by Iain Murray

**Subject : Image Processing Lab**  
**Subject Code : CSE619**

**List of Experiments**

1. Display of gray scale images
2. Histogram Equalisation
3. Design of non linear filter
4. Determination of edge detection using operators
5. 2-D DFT and DCT
6. Filtering in frequency domain
7. Display of colour images
8. Conversion between colour spaces
9. DWT of images
10. Segmentation using watershed transform

**Subject : Professional Practices (Common Paper)**  
**Subject Code : 602**

**Rationale:**

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

**Activities to be undertaken:**

Students are expected to undertake these activities:

1. Acquire information from different sources (Print and electronic) on the topics of specialization and related to the subjects of II nd and final year. The class is to be divided in groups of not more than five to six students in a group and all groups are to be allotted topic of their choice. The topic should not be repeated to other group for originality of work to be performed by the group. This activity will develop interdependence and leadership among the students.
2. Prepare notes for given topic at point no 1. The notes will be in form of a project report, having all the sections of report. The report should not be of 30 – 50 pages.
3. Prepare presentation and Present the learning and finding on given topic in a seminar. The presentation should be prepared in Power Point module having more than 25 slides. All students should be asked to deal with suitable parts decided by the group itself.
4. Interact with peers to share thoughts. After the final presentation the students should be encouraged to interact with the faculty members, students' fellows and other experts for suggestions and advanced and structured learning.
5. Undertake industrial visit of their area and choice. Prepare a report on industrial visit. Expert lectures on the topic selected may be invited for the students and these expert lectures also the students should be asked to prepare a report and present the same in seminar or have a group discussion before the expert and faculty members.
6. Develop entrepreneurial traits. Students group may be asked to have a field survey and product assessment and analysis for a product of their choice. Prepare a report for all the inputs of their requirement and submit it for evaluation.
7. To prepare for start ups. Expert lectures for exploring this option may be arranged as this is also a viable option and much talked about option for self employment and avail the encouragement by the government.

Based on the above rationales students will advised to develop traits under guidance of dedicated faculty members / mentors.