**CONSUMER ELECTRONIS**

**(ET-601)**

1. **MICROPHONE AND LOUD SPEAKERS: (6 Hrs.)**

1.1 Construction and working principles of carbon, condenser and crystal microphones and study of their technical parameters

1.2 Constructional features of PMMC and EMMC loud speakers, rating of loud speakers, function of woofers, tweeter.

1.3 Impedance matching of loudspeakers, series& parallel connections of loudspeakers and impedance calculations, matching transformers, multi-way speaker systems, passive & active crossover network.

1.4 Methods of testing, common faults remedies of microphone & loud speakers

**2.0 AUDIO CASSETTE SYSTEM: (7 Hrs.)**

2.1 Basic principle of magnetic tape recording and replay systems, tape drives systems & deck mechanism

2.2 Replay and erasing methods with basic circuits.

2.3 Block diagram of complete tape recorder & reply system; common faults & remedies.

2.4 Noise reduction techniques, Dolby noise limiting systems.

2.5 Stereo systems: study of different blocks, their electronic circuits, function of balance, bass & treble control, noise filter circuits, common faults & remedies.

**3.0 RADIO RECEIVERS: (5 Hrs.)**

3.1 AM and FM receivers: study of building blocks, study of their remedies.

3.2 Alignment of super heterodyne receivers.

3.3 Common faults and their rectifications.

**4.0 T.V RECEIVERS: (10 Hrs.)**

4.1 Study of T.V Antenna, T.V boosters, Balun transformers and installation

4.2 B/W T.V systems – fundamentals, picture tubes & their constructions

4.3 Reception of colour signals in PAL system

4.4 Commonly used ICs & their pin details and applications

4.5 Alignment of TV Receiver with oscilloscope & tuning of important stages

**5.0 VCR: (6Hrs.)**

5.1 Principle of video recording on magnetic tapes

5.2 working principle of VCR with block diagram description

5.3 Study of common faults and their rectifications

**6.0 CD PLAYERS: (4 Hrs.)**

6.1 Working principle of audio CD player & their common faults

6.2 Working principle of video CD player & their common faults

**7.0 HOME APPLIANCES: (4 Hrs.)**

7.1 Working principle of washing machines, vacuum cleaners, microwave ovens, dish-washer, electric heaters etc.

7.2 Common faults & their rectifications.

**SUGGESTED BOOKS:-**

1. Normal H, Crowhurst, “ABC’s of tape recording”
2. Murry P, Rosenthal, “how to select and use HI-FI and stereo equipments
3. R C Vijay, “Servicing cassette recorders and two in ones”, BPB Publishers
4. Charls Oppenheim, Butterworth, “CD ROM Fundamentals to applications”
5. Television Engineering – Grobb
6. Television Engineering – Gulhati
7. A Text book of Radio & Television – N. C. Goyal and S.K Mukherjee Khanna Publishers
8. Consumer Electronics - B.R. Gupta, S.K. Katania And sons
9. Radio & T.V Theory – A.K. Mittal, Asioan Publishers
10. Fundamentals of Audio and Video system and consumer electronics – M.L Anand, Khanna Publishers
11. Audio And Video systems – R.G. Gupta, \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*
12. Audio Video\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

**CONSUMER ELECTRONICS LAB**

1. Stud and testing of microphones
2. Study of testing of loud speakers
3. Study of operating mechanism of audio cassette recording and replay system
4. Assembling and testing of audio Pre-Amplifier
5. Assembling and testing of Audio power Amplifier
6. Troubleshooting audio cassette system
7. Assembling, testing & alignment of radio receivers
8. Study of operation & alignment of TV receivers
9. Study of Audio/ Video CD players
10. Study of operation of home appliances

**DATA COMMUNICATION & NETWORKING**

**ET-602**

1. **INTRODUCTION TO DATA COMMUNICATION (4 Hrs.)**
	1. Fundamental communication system, communication links (Twisted wire pair, co-axial cable and fiber optics), character codes, digital data rates.
	2. Asynchronous and synchronous data, binary data signal formats
	3. Base band and broad band communication
2. **LOW SPEED DATA COMMUNICATION SYSTEM: (10 Hrs.)**
	1. Basic units of a low speed data link, universal asynchronous receiver transmitter
	2. Data character options performed by a UART, Intel’s 8251 A USART, Operational options of8251A,
	3. Synchronous data transfer, RS232-C, RS489/RS 422-A/RS 423 Interface.
	4. Data link Protocols.
3. **TELEPHONE SYSTEMS AND MODEMS: (4 Hrs.)**
	1. Basic Telephone system, dialing, telephone systems specifications and parameters
	2. The role of MODEMS, operating modes of low speed MODEM
4. **INTRODUCTION TO COMPUTER NETWORKS: (8 Hrs.)**
	1. What is Network? Network Topologies
	2. Basic Network Protocols
	3. Media, Modulation and access
	4. Types of Network
	5. The open system Interconnection (OSI) model
5. **LOCAL AREA NETWORK STANDARD: (6Hrs.)**
	1. Evolution of LAN Standards, IEEE 802 family of standards Ethernet LAN
	2. CSMA/CD protocol, Frame format
	3. Network operating system – features in common
6. **INTER NETWORKING: (5 Hrs.)**
	1. Inter connecting local area networks
	2. Network products like bridges, Repeaters, Gateways, Routers, Hubs etc.
	3. Structure of internet, goals of internet
	4. Internet services, E-mail, FTP and Telnet
	5. TCP/IP Protocols, Internet addressing schemes
7. **INTEGRATING SERVICES DIGITAL NETWORK (6 Hrs.)**
	1. Integrating services, ISDN connections and interface, ISDN application
	2. Broad band ISDN
	3. Introduction to ATM switching

**SUGGESTED BOOKS:-**

1. Introduction to digital and data communication – Michael A. Miller
2. Data Communication – William L. Schweber
3. Data communication Networks and Systems – Thomas C. Bartee
4. Computer Networks – Tanebam

**DATA COMMUNICATION NETWORKS**

1. Study & preparation of communication cables like
2. Twisted Pair
3. Coaxial Cable
4. Fiber Optics
5. RS – 232
6. Null Modem etc
7. Study of modems
8. Study of Network Interface Cards
9. Study of Hubs & Switches
10. Study and Configuration of LAN
11. Study and Configuration of WAN

**OPTICAL FIBER COMMUNICATION**

**ET603**

1. **RAY THEORY: (6 Hrs.)**
	1. Lenses, Imaging, numerical aperture, diffraction
	2. Review of Electromagnetic wave dispersion, polarization, reflection critical angle of diffraction
2. **OPTICAL FIBER WAVES GUIDES: (10 Hrs.)**
	1. Dielectric slab wave guide , modes in symmetric and asymmetric waveguide, coupling, step index Fiber, graded index fiber, attenuation, modes in fiber, pulse distortion
	2. Construction of fiber cable
3. **LIGHT SOURCE, LIGHT DETECTOR AND COUPLERS: (8 Hrs)**
	1. LEDs, and laser diode
	2. Principle of photo detection photo multiplier, PN photo diode avalanche photo diode
	3. Connectors, fiber and preparation source coupling, directional coupler, star coupler
4. **OPTICAL TRANSMITER CIRCUITS: (12 Hrs.)**
	1. Source limitation Modulation: analog and digital modulation, modulation formats
	2. Modulation circuits: LED, LASER optical
	3. Receivers: heterodyne receiver free computer form, automatic gain control
	4. Equalizers, Multiplexing
5. **APPLICATIONS: (6 Hrs.)**
	1. Public network application, Military application, civil and consumer application industrial application, computer application
	2. Future Development: Integrated optical devices

**SUGGESTED BOOKS:-**

1. John M.Senior, “Optical Fiber Communication – Principles and Practice”, Prentice Hall International.
2. Joshep C Ptios, “Fibre Optical Communications”, Prentice Hall International.
3. John Gowar, “Optical Communication System”, Prentice Hall International.
4. Sharma, “Fibre Optics in Telecommunication”, Tata Mc Graw Hill.
5. Subir Kumar Sarkar – Optical fibers and Fibre optic communications, S. Chand & co.
6. D.C Agarwal – Fiber optic communications, S. Chand & co.
7. C.K. Sarkar & D.C. Sarkar – opts electronics and fibre optics communication – New age International Publisher.
8. Fibre – Optic Communication – Technology – D. K. Myabaev & L.L. schenier, , rearson edition.
9. Optical Fibna communication – Gerd Keiser, Mc Graw Hill.
10. Fibne – optic communication systems – Govind P. Agarwal, Joha Willey & sons.

**MEDICAL ELECTRONICS**

**ET-604**

1. **INTRODUCTION TO BIOMEDICAL INSTRUMENTATION: (2 Hrs.)**
	1. The age of biomedical engineering, development of biomedical instrumentation, biometrics.
	2. Introduction to the man, components of the man, instrument system, physiological systems.
	3. Some conclusions, body, problem encouraged in measuring a living system.
2. **BASIC TRANSDUCER PRINCIPLES: (3 Hrs.)**
	1. Transducer and Transduction principles
	2. Transducer classification - active Transducers, Passive Transducers, transducers use in biomedical applications
3. **SOURCES OF BIOELCTRIC POTENTIALS: (8 Hrs.)**
	1. Introduction to Bioelectricity – Resting membrane potential, transmission of impulsers.
	2. Electrical activity of the heart, Pace maker potential, electro cardiograph.
	3. Biological Transducers – receptor potentials, electrical activity of the brain.
	4. Resting and action potentials, Propagation of action potentials.
4. **ELECTRODES: (3 Hrs)**
	1. Electrode theory, bio-potential electrodes.
	2. Bio-chemical Transducers.
5. **THE CARDIOVASCULAR SYSTEM: (3 Hrs )**
	1. The heart and cardiovascular system, the heart, heart sounds.
	2. Blood pressure, characteristics of blood flow.
6. **CARDIOVASCULAR MEASUREMENTS: (6 Hrs.)**
	1. Electro Cardio Graphy (ECG).
	2. Measurement of blood pressure.
	3. Measurement of blood flow and cardiac output.
7. **PATIENT CARE AND MONITORING: (6Hrs.)**
	1. The elements of intensive – care monitoring.
	2. Diagnosis calibration and reparability of patient.
	3. Monitoring equipment.
	4. Pacemakers, defibrillator.
8. **MEASUREMENTS IN THE RESPIRATORY SYSTEM: (5Hrs.)**
	1. The physiology of the respiratory system.
	2. Tests and instrumentation for the mechanism of breathing.
	3. Gas exchange and distribution.
	4. Respiratory therapy Equipment.
9. **THE NERVOUS SYSTEM: (6Hrs.)**
	1. The anatomy of the nervous system, neuronal communication, the organization of brain.
	2. Neuronal receptors – the somatic nervous system and signal reflexes, the autonomic nervous system.
	3. Measurements from the nervous system.

**SUGGESTED BOOKS:-**

1. Massey and Maredeth ,” Medical Physics”.
2. Joseph Bronzino ,”Biomedical Instrumentation”.
3. Khandpur R S ,”Handbook of Medical Instrumentation”, Tata McGraw Hill.
4. David Cooney ,”Principles of Biomedical Engineering”.
5. Ruch and Patton ,”Bio Physics and Medical Physiology”.

**MODERN COMMUNICATION SYSTEMS**

**ET-605**

1. **SATELLITE COMMUNICATION: (8Hrs.)**
	1. Orbit of communication satellite, angle of elevation, propagation delay, orbit sparing,
	2. Satellite links, transponders, earth station, antenna in space, multiple spot beam, satellite construction.
	3. Transmission losses, multiple access system for satellite communication.

**2.0 ENTROPY ENCODING AND DATA COMPRESSION: (12 Hrs.)**

2.1 Noise in channel: effect of noise, capacity of noisy channel, Shannon’s theorem, Shannon Hartley theorem

2.2 Modem operation: Compare the operation of a modem to a code, terms and definitions,: bit, bit rate, baud, bandwidth, S/N, bit error rate, use Shannon’s Law to analyze the capacity of a channel

2.3 Types of modem modulation schemes used in modems, compression schemes used in modems

2.4 Modem standard such as V.22, V.34, V.42, etc

2.5 Understand the operating modes of the modem

**3.0 DATA ENCRYPTION: (4 Hrs.)**

3.1 Need for data encryption, description of conventional and public-key encryption algorithms, comparison of conventional and public-key encryption, use of the digital signatures and public key certificates

**4.0 DIGITAL SWITCHING: (8 Hrs)**

4.1 Switched systems – circuit switching, message switching, packet switching, virtual circuit packet switching; their comparison

4.2 Circuit switching network – digital switching networks, ping-pong protocol; digital private branch exchange – general architecture

4.3 packet switching – General principles of data gram packet switching and virtual packet switching

**5.0 INTIGRATED SERVICE DIGITAL NETWORK (ISDN): (6Hrs)**

5.1 Introduction, ISDN standards, transmission channels, signaling, numbering and addressing

5.2 Network access control: centralized, distributed and decentralized

5.3 Broadband ISDN: Architecture, user-network interface, B-ISDN protocols

**6.0 CELLULAR TELEPHONEY: (4 Hrs)**

6.1 Introduction, cellular concepts, system components frequency reuse, dynamic channel assignment, cell splitting, block diagram of handset, GSM architecture.

**SUGGESTED BOOKS:-**

1. William C Y Lee, “Mobile Cellular Telecommunication system”, McGraw Hill
2. Martin s Roden, “Analog and digital communication system”
3. Martin s Roden, “Digital communication system design”
4. Bruce Carlson, “Communication system”
5. Tanenbaum, “Computer Neyworks”
6. John Freer, “Computer Communication Networks.
7. Thiagarajan Viswanath, “Telecommunication switching system and networks”, Prentice hall Ed.
8. Dennin Roddy, “Satellite Communication”, PHI

**MICROWAVE TECHNIQUES: (4 Hrs.)**

**ET-606**

1. **INTRODUCTION TO MICROWAVES: (4Hrs)**
	1. Microwave frequency range, significance of microwave frequency range, properties of microwaves
	2. Microwave safety rules, application of microwaves
2. **MICROWAVE PASSIVE COMPONENTS: (12 Hrs)**
	1. Wave guides – Rectangular and circular, modes of propagation
	2. Cavity resonators – rectangular and circular cavities, Q of cavity resonator, re-entrant cavities
	3. Coupling two cavities, microwave junctions, Tee junctions, Magic Tee
	4. Rat race, Corners, bents and twists, directional couplers, two hole directional couplers
	5. Ferrites – important microwave properties and applications – microwave antennas
	6. Attenuators, phase shifters, E-plane, H-plane and magic –less, slotted line as standing wave detector
3. **MICROWAVE TUBES: (8Hrs)**
	1. Frequency limitation of conventional tubes, principles of operation, performance and application of linear space beam (0 Type) Tubes
	2. KLYSTRON – Reflex KLYSTRON and helix traveling, Wave tube
	3. Microwave crossed – field tubes (M Type)
	4. Principles of operation, performance and application of cavity Magnetron & Travelling wav Tube (TWT)
4. **SEMICONDUCTOR MICROWAVE DIVECES: (8Hrs.)**
	1. Operation, characteristic and applications of BJTs and FETs.
	2. Negative resistance amplifiers, Principles of tunnel diodes, Varactor and Step-Recovery diodes
	3. Principles and modes of operation of gun diodes
	4. Parametric devices – Principles of operation and applications of parametric amplifier
5. **OTHER DEVICES: (6Hrs)**
	1. Operation, performance and application of IMPATT and TRAPATT diodes,
	2. 1 ASER & MASERS, Transition process, population-inversion, solid state ruby laser
6. **PROPAGATION OF MICROWAVES: (4 Hrs)**
	1. Effect of earth and its curvature, Duct formation, Troposphere refraction and scattering
	2. Microwave links – Terrestrial line of sight communication links propagation
7. **SUGGESTED BOOKS:-**
8. Samuel Y Liao, “Microwave devices & Circuits” prentice Hall India
9. Reich, “Microwave Techniques” East West Press
10. K.C Gupta, “Microwaves” – Wiley Eastern
11. George Kenedy, “Electronic Communication Systems” Mc Graw Hill
12. R. Chatterjee, “Elements of Microwave Engineering” – East West Press

**DIGITAL SIGNAL PROCESSING**

**ET-607**

**1.0 INTRODUCTION TO DISCRET TIME SIGNAL AND SYSTEMS: (15 Hrs)**

* 1. Discrete time signals and systems, Properties of discrete systems: Linearity, time-invariance, causality, stability, convolution
	2. Difference equation representation of discrete systems
	3. The Laplace transform: Properties of Laplace Transform
	4. The Fourier Transform: Properties of Fourier Transform
	5. The Z-Transform: Properties of Z-Transform, The inverse Z-Transform, system function
1. **DISCRETE FOURER TRANSFORM AND FAST FOURER TRANSFORM: (15Hrs)**
	1. Discrete Fourier series – properties
	2. Discrete Fourier transform – properties
	3. Block convolution: Decimation-in-time FFT algorithms, decimation-in-frequency FFT algorithms

**3.0 FIR DIGITAL FILTER REALIZATIONS: (6Hrs)**

3.1 Direct, cascade, lattice forms, FIR filters design using Fourier series

 3.2 Use of window functions, frequency sampling design

**4.0 IIR DIGITAL FILTER REALIZATION: (4Hrs)**

 4.1 Direct, Cascade, Parallel forms

**5.0 DSP PROCESSORS: (2 Hrs)**

**6.0 ARCHITECTURE OF TYPICAL DSP PROCESSOR, TYPICAL DSP PROCESSOR AND THEIR COMPARISONS.**

**SUGGESTED BOOKS:-**

1. Introduction to digital signal processing – Roman Kuc
2. Digital signal processing – Oppenheim & Ronald W Schafer.
3. Theory of Application of Digital Signal Processing – R Rabiner & B. Gold
4. Digital Signal Processing – Andreas Antonio
5. The scientist and engineer’s guide to digital signal Processing – Steven W. Smith.

**ADVANCE MICROPROCESSORS**

**ET-609**

1. **16-BIT MOCROPROCESSORS: (8 Hrs)**
	1. Architecture of typical 16 bit microprocessors (Intel 8086), Memory address space and data organization, Segment registers and memory segmentation, I/O address space, Addressing Modes.
	2. Comparison of 8086 and 8088, basic 8086/8088 configurations, Minimum mode – Maximum mode.
2. **PROGRAMMING: (12 Hrs)**
	1. Instruction set of 8086/8088 microprocessors, programming examples, and assembly language program development on IBM PC, Study of DEBUG and LINK utility.
	2. Interrupts and interrupt priority management in 8086, architecture and functions of 8087 numeric processor, interfacing with 8086/8088
3. **32 –BIT MICROPROCESSORS: (8Hrs)**
	1. Intel 80386 – Architecture, modes – Real, protected and virtual 8086 mode.
	2. Memory Management – management of tasks, interrupts and exceptions, I/O privilege levels, initialization, advance instructions
	3. Intel 80486 – Architecture, implementation of paging and its hardware enhancement
4. **64 – BIT MICROPROCESSORS: (6Hrs)**
	1. Pentium processor – Functional unit and its working, Super scalar architecture, Addressing modes, Concepts like intelligent branch prediction and U-V pipelining, Burst mode of data transfer
	2. Pentium Pro – Introduction and its architecture
5. **MICROCONTROLLERS: (8Hrs)**
	1. Introduction, comparison with microprocessors.
	2. Study of microcontroller (MCS 51 family) – Architecture, instruction set, addressing modes and its programming

**SUGGESTED BOOKS:-**

1. YU-Cheng Liu & Glenn A Gibson, “Microprocessor System, Architecture programming & Design
2. Douglas V Hall, “Microprocessor and Interfacing
3. Avtar Singh, “IBM PC/8088 Assembly language Programming”
4. Scott Muller, “Upgrading and repairing IMB PCs”
5. James L Hardey, “Advance 80386 Programming Techniques
6. Intel User manuals for 8086, 80386 & 80486, Pentium & Pentium pro