

## **SYLLABUS: ELECTRONICS AND TELECOMMUNICATION ENGINEERING (SCTE, ASSAM)**

### **Et-501: COMMUNICATION ENGINEERING – II**

- 1.0 **DEMODULATION** (5 Hrs.): AM detectors – envelope detection, practical diode detector. FM discriminators – Foster Seeley discriminator, Radio Detector. VSB Demodulator. Demodulation of DSB/SSB waves – synchronous detector. Demodulation of PM waves.
- 2.0 **TRANSMITTING SYSTEMS** (13 Hrs.): Introduction to radio transmission systems, low level and high level transmitters. AM broadcast transmitters – block diagram and functions of each stage, MO circuits, buffer amplifier, harmonic generator, power amplifiers, Neutralization, power supply, cooling of transmitter tubes. FM transmitter – block diagram and functions of each stage. SSB transmitter – block diagram and working principle of each stage. Noise and its effects on transmission of AM and FM signals. Pre-emphasis and de-emphasis circuits. Comparison between AM and FM systems.
- 3.0 **RECEIVING SYSTEMS** (13 Hrs.): Types of receivers – TRF, Super heterodyne, communication receivers, etc. Block diagram and function of each stage of super heterodyne receivers. Extension of the super heterodyne principle. Special features of communication receivers. AM broadcast receivers – RF amplifier, frequency changers, IF amplifier, detector, AGC tone control. Communication receivers – variable selectivity, noise limiter, squelch, AFC, tuning indicator, volume expander. FM receivers – Block diagram and function of each stage of FM receivers. SSB receivers – block diagram and function of each stage of SSB receivers. Comparison between AM and FM receivers. Diversity reception – Space and frequency diversity reception.
- 4.0 **DIGITAL COMMUNICATION** (11 Hrs.): Concepts and fundamentals of digital communication. Data Communication fundamentals, characteristics of data transmission circuits, data transmission speeds, noise, digital codes, binary and ASCII codes. Pulse modulation: PAM, PWM, PPM, PCM. Advantages of digital transmission, sampling, encoding. Pulse modulation schemes: ASK, FSK, PSK. Multiplexing: Frequency and time division multiplexing, advantages of FDM and TDM systems.

#### **Suggested Books:**

1. Electronic Communication System – Kennedy
2. Communication Systems – Taub & Schilling.
3. Principles of Communication Systems – Anokh Singh.
4. Electronic Communication – Terman.

## **COMMUNICATION ENGINEERING LAB – II**

1. Study of AM detector
2. Study of DSB – SC Detector
3. Study of SSB detector
4. Study of FM detector
5. Study of Pulse Amplitude Modulation
6. Study of Pulse Width Modulation
7. Study of Pulse Position Modulation
8. Study of Pulse Code Modulation
9. Study of AM receiver
10. Study of FM receiver

## **Et-502: MICROPROCESSORS**

- 1.0 **INTRODUCTION** (2 Hrs.): An overview of Micro-computer System, Block diagram of digital computer. Organization of Micro-computer, Computer languages – machine language, assembly language, high-level language.
- 2.0 **MICROPROCESSOR ARCHITECTURE** (6 Hrs.): Architecture of a typical 8-bit microprocessor, Intel 8085 microprocessors, study of functional units, functions of various control signals. Memory – Memory organization, memory map, buffer, timing diagram.
- 3.0 **INTERFACING I/O DEVICES** (5 Hrs.): Basic interfacing concepts, interfacing input/ output devices. I/O addressing schemes – I/O mapped I/O and memory mapped I/O techniques.
- 4.0 **PROGRAMMING 8085 MICROPROCESSOR** (18 Hrs.): Programming model, instruction classification, instruction format, how to write, assemble and execute a program. Instructions – Data transfer, Arithmetic, logical branching and machine control instructions. Writing Assembly Language Programmes. Addition, Subtraction, Multiplication, Division using internal registers & memory. Sub-routine, delay sub-routine.
- 5.0 **INTERFACING PERIPHERAL I/Os** (6 Hrs.): Interfacing of peripheral chips with 8085: Programmable Peripheral Interface (Intel 8255), Programmable Communication Interface (Intel 8251), Programmable Interval Timer (Intel 8253 and 8254), Programmable Keyboard / Display Controller (Intel 8279), Direct Memory Access (Intel 8257).
- 6.0 **MICROPROCESSOR APPLICATION** (6 Hrs.): Stepper motor interface, A/D and D/A converter chips and their interface, Concepts of interfacing microprocessor to high power devices. Serial and parallel bus standards – RS 232 C, IEEE 488 Centronics parallel interface standards.

### **Suggested Books:**

1. Microprocessors Architecture Programming and Applications – Gaonkar
2. Intel Peripheral Users manual – INTEL
3. Microprocessors & Interfacing to 8085 Introduction to – Douglas V hall
4. Introduction to Microprocessors – Lance A Leventhal
5. Introduction to Microprocessors – A.P. Mathur.

## **MICROPROCESSOR LAB**

1. Study of a typical microprocessor trainer kit and its operation
2. Simple programming examples using 8085 instruction set. To understand the use of various instructions and addressing modes – Monitor routines – at least 20 examples to be completed.
3. Analog to Digital converter interface.
4. Interfacing to different types of EPROM & SRAM.
5. Keyboard interface.
6. Serial interface using 8251
7. Parallel interface using 8255
8. Seven segment display interface
9. Interfacing 8255 port to high power devices

## **Et-503: POWER ELECTRONICS**

- 1.0 **POWER SEMICONDUCTOR DEVICES** (5 Hrs.): Desirable characteristics in switches Power diodes, Thyristors – SCR, DIAC, TRIAC, BJT, MOSFET, GTO, IGBTs – their power rating, characteristics and comparison.
- 2.0 **PROTECTION OF POWER SEMICONDUCTOR DEVICES** (4 Hrs.): Selection of devices, overload protection, Fuse protection, Circuit breakers, Transient protection. RC networks, Zener, Metal Oxide resistors, Turn ON and OFF snubbers, transient voltage suppressors.
- 3.0 **CONTROLLED RECTIFIERS** (5 Hrs.): Controlled rectifiers – half wave, full wave half controlled, full wave full controlled rectifiers, firing angle, load voltage, different types of load, free wheel diode, circuits for controlling firing angle.
- 4.0 **INVERTERS** (5 Hrs.): Basic concept of inverter, single phase and three phase inverter, voltage driven and current driven inverter. Driver circuits, voltage controlled schemes.
- 5.0 **SWITCHING DC POWER SUPPLIES** (4 Hrs.): Principle of operation of switching power supplies, buck regulator, boost regulator, buck-boost regulator. Controlled schemes of SMPS, Electrical isolation in the feedback loop, comparison of linear & switching power supply.
- 6.0 **UNINTERRUPTIBLE POWER SUPPLY** (4 Hrs.): Basic principle, types of UPS – Off-line On-line, Line Interactive, their comparison. Other features of UPS – Cold Start, Static Switch etc.
- 7.0 **MOTOR CONTROL** (8 Hrs.): DC motor characteristics, types of speed control, armature voltage control, field current control, PWM drives, reversible drives, 4-quadrant drives, dual converters. AC motor controls – Introduction to induction motor, types of speed variations, frequency variation, stator voltage variation, closed loop control. Stepper motor control – open loop operation of stepper motor, closed loop control of stepper motor.
- 8.0 **AC REGULATED POWER SUPPLIES** (7 Hrs.): Manually controller regulators, Tap changing, Auto – Transformer. BBT – concept automatic regulators, step regulators. Solid state tap – changes, Servo – Regulators, DC motor, AC motor, AC motor control circuit, Constant voltage transformers.

### **Suggested Books:**

1. Power Electronics / Modern Power Electronics – P.C. Sen
2. Power Electronics: Converters, Application & Design – Mohan, Undeland, Robbins
3. Industrial Electronics – S.N. Biswas
4. Power Electronics: Devices, Drivers, applications & Passive Components – B.W. Williams
5. Power & Industrial Electronics – R.K. Khadse, S.Chand & Co.
6. Power Electronics – Dr. P.S. Bimbhra, Khanna Publishers
7. Power Electronics – M.S. Jamil Asgar, PHI
8. Power Electronics – B.R. Gupta, V. Singhal, S.K. Kataria & sons
9. Power Electronics – Muhammad H. Rashid, PHI
10. A Text Book of Power Electronics – S.N. Singh, Dhanpat
11. Fundamentals of Power Electronics & Devices – A. K. Chakravarty

## **POWER ELECTRONICS LAB:**

1. Study of DIAC characteristics.
2. Study of TRIAC characteristics.
3. Study of protection circuits.
4. Study of switching characteristics of transistor.
5. Study of single phase SCR controlled rectifier.
6. Study of inverter circuits.
7. Study of UPS.
8. Study of Switched Mode Power Supply (SMPS).
9. Study of DC/AC motor speed control characteristics.
10. Study of servo controlled AC voltage stabilizer.

## **Et-504: PC SYSTEM TECHNOLOGY**

- 1.0 **PC ARCHITECTURE** (10 Hrs.): Block Diagram of Computer, Personal Computer history; the IBM PC, PC, PC-XT, PC-AT. Microprocessor types & specification used in IBM PCs, processor sockets & slots. Different supporting chips & their functions; concepts of DMA & Interrupts, Chipset. Motherboard: architecture of PC-XT & PC-AT systems, motherboard form factors; peripheral interfacing, concept of bus system & types. Different types of memory used in a computer: SRAM, DRAM, FPRAM, EDORAM, SIMM, DIMM, RIMM, DDR etc.
- 2.0 **OPERATING SYSTEMS** (6 Hrs.): Booting procedure, concept of BIOS & POST; CMOS setup. Introduction to Operating Systems: DOS, Windows '9X, their differences. Memory management in DOS, Windows '9X. Description of the system and configuration files. Optimization of operating system.
- 3.0 **STORAGE DEVICES** (12 Hrs.): General concept of storage device; different types, their comparisons & interfacing. Floppy Disk Drive construction, types and operation. CD-ROM Drive construction & operation, different types; Concepts of cylinders, sectors, seek time etc., disk hardware & software limitations. Other types of storage devices like DVD, Tape Drive, MO Drive etc. Hard disk partitioning, concept of FAT, MBR, DBR etc. Types of file systems, their comparison.
- 4.0 **I/O INTERFACING** (2 Hrs.): Serial & Parallel communication ports, their standards, use & configuration. New generation communication ports like USB, Fire-Wire etc.
- 5.0 **INPUT DEVICES** (4 Hrs.): Keyboard: technology, types, specifications & interfacing. Pointing devices: Mouse types & specifications, Joystick, Light Pen, Trackballs etc.
- 6.0 **OUTPUT DEVICES** (6 Hrs.): Video Display: Basic concepts of monitors like pixel, resolution, H/V Frequency etc. Display types: CRT Display, LCD Display etc. Display interfacing: MDA to VGA, AGP and 3D graphic accelerator. Printers: Different technologies & interfacing.
- 7.0 **POWER SUPPLY** (2 Hrs.): general power supply issues, overview of PC-SMPS & their types. Power Line Disturbances, Power conditioners & UPS.

### **Suggested Books:**

1. IBM PC & Clones – Govindarajalu
2. Upgrading & Repairing PCs – Scott Muller
3. Maintenance & Repairing PCs – Mark Minasi
4. Troubleshooting, Maintenance & Repairing PC – Bigelow
5. Complete Guide to Upgrading & Repairing PC – Peter Norton

## **PC SYSTEM TECHNOLOGY LAB**

1. Study of various parts, connections & ports of a Personal Computer
2. Familiarization with DOS & Windows '9X operating systems
3. Assembling/ Disassembling & familiarization with different parts of PC-XT & PC-AT systems
4. Study of different types of motherboards
5. Installation & configuration of FDDs, HDDs & CD-ROM Drives.
6. Hard disk partitioning & formatting
7. Installation of DOS & Windows '9X
8. Hardware & Software troubleshooting
9. Study of various output voltage levels and signals of SMPS & UPS
10. Up-gradation/ Installation & Configuration of a new peripheral in an existing system.



## **Et-505: ELECTRONIC CIRCUIT TROUBLESHOOTING**

- 1.0 **STUDY OF CHARACTERISTICS OF TEST EQUIPMENTS** (7 Hrs.): Characteristics such as input impedance, equipment loading, sensitivity and resolution. AC and DC coupling of Analog Multimeter, Digital Multimeter, CRO. Function generator, Universal Counter, Scope 10: 1 probe, Logic probe, Logic pulser.
- 2.0 **SUBSYSTEMS** (4 Hrs): Overview of Amplifier, Oscillator, Power Supplies, Digital Systems.
- 3.0 **DIGITAL TROUBLESHOOTING** (7 Hrs.): Use of logic probe and pulser to test a digital circuit for faulty gates and flip-flops. Use of logic probe with word triggering to find bus faults. Use of logic probe to catch glitches using memory.
- 4.0 **PRINTED CIRCUIT BOARD** (4 Hrs.): Introduction, Classification; PCBs for different applications. Repairing techniques of PCB assemblies.
- 5.0 **FAULT CORRECTION** (2 Hrs.): Soldering and de-soldering, soldering for electrostatic sensitive devices. Soldering problems, protective coating after soldering.
- 6.0 **EQUIPMENTS AND SYSTEMS TESTING** (6 Hrs.): Testing of power supplies, CROs, Functions Generators. Computer testing – Hardware, Software.

### **Suggested Books:**

1. Electronic Devices & Circuits by Allen Mottershead
2. Modern Electronic Instrumentation & Measurement by Cooper
3. Arts of Electronics by Horowitz Winfield Hill
4. Electronic Devices & Circuits by Mathur & Chadha
5. Operational Amplifiers and Integrated Circuits by Denton Daily
6. Electronic Devices & Circuits by Millman & Halkias

## **ELECTRONIC CIRCUIT TROUBLESHOOTING LAB**

1. Testing of components – micro-switches, relays, electrolytic capacitors, transformer, BJT, FET, MOSFET, SCR, TRIAC, TTL IC and CMOS IC etc.
2. Design, fabrication & testing of PCBs using simple circuits.
3. Construction & Testing of RC phase-shift & Crystal Oscillators.
4. Plotting of frequency response of amplifiers with different couplings.
5. Square-Wave test of amplifiers.
6. Comparison of estimated and measured values of DC voltages in DC regulated power supplies & hence the adjustments to obtain the nominal output.
7. Comparison of estimated and measured values of DC voltages and AC waveforms in signal/ function generators & hence the adjustments to obtain the nominal output.
8. Performance testing of CRO.
9. Troubleshooting Digital Circuits.
10. Troubleshooting Analog Circuits.

## **Et-506: COMPUTER AIDED ELECTRONIC DESIGN (Elective)**

- 1.0 **INTRODUCTION TO COMPUTER AIDED DESIGN** (5 Hrs.): Computer as design medium – Hardware / Software requirements. Representation of images – Scan conversion of primitive objects – text in graphics. Transformation – Viewing and modelling transformation in 2D and 3D-Matrix representation. Segmentation, Geometric modelling, data base management for CAD.
- 2.0 **COMPUTER SIMULATION OF ELECTRONIC NETWORKS** (15 Hrs.): Mathematical review – Solution of simultaneous linear equations – exploiting the sparsity in matrices. DC analysis of linear networks – review of Nodal and loop analysis. DC analysis of non-linear networks. Transient analysis of linear and non-linear circuits.
- 3.0 **SEMICONDUCTOR DEVICE MODEL** (6 Hrs.): Low frequency models for semiconductor devices – models for pn-junction diodes, AC Ebers Moll model, AC and DC transport model for BJT, Noise Modelling. Introduction to SPICE models.
- 4.0 **LOGIC SIMULATION** (6 Hrs.): Introduction to Hardware Description, Testing for design and manufacturing, Oscillations and other problems-fault simulation. Mixed-mode simulation: Relaxation method for transient analysis – waveform relaxation.
- 5.0 **COMPUTER AIDED PCB DESIGN** (10 Hrs.): Computer aided setup- Input Packages, setup – Libraries, Schematics Capture, Interface techniques Layout and component placement – general consideration – manual, assisted and automatic placement. Conductor routing – the routing problem – surface organization. Documentation.

### **Suggested Books:**

1. Computer Aided Design-Software and analytical tool – C.S. Krishnamoorthy and S Rajeev (Narosa Publishing House)
2. Computer Simulation of Electronic Circuits – R. Raghuram (Wiley Eastern)
3. Printed Circuit Design – Gerald L Ginsberg (McGraw Hills)
4. Design of Electronic Circuits and CAD – M.M. Shah (Wiley Eastern Books)

## **Et-507: ELECTRONIC INSTRUMENTATION (Elective)**

1.0 **INTRODUCTION** (4 Hrs.): Concept of instrumentation system – exploration with block diagram and examples. Transducer as a system component, input/output specification for a transducer, classification of transducer; factors affecting choice of transducers.

2.0 **MEASUREMENT OF PHYSICAL QUANTITIES** (30 Hrs):

- Displacement – potentiometric, strain gauge, LVDT, inductive transducer, capacitive gauge, Piezo electric, photoelectric transducer, synchros.
- Pressure-Elastic deformation elements, electrical transducers as secondary transducers; low pressure measurement – Pirani gauge, Ionization gauge.
- Velocity – Moving magnet type, Moving coil type, AC and DC tachometer, Drag – cup tachometer, Photoelectric tachometer, stroboscopic method, capacitive tachometer, tachogenerator.
- Acceleration – basic principle, potentiometric type, Piezo-electric type and seismic accelerometer.
- Temperature – Resistance thermometer, thermo couple, thermistor, semi conductor thermometer, non contact type temperature measurement – radiation pyrometer, optical pyrometer.
- Flow – Electromagnetic, Turbo magnetic, Hot-wire, anemometer and ultrasonic flow meter.
- Liquid level – Resistive, capacitive and crystal hygrometer, microwave refractometer.
- Humidity – Resistive, capacitive and crystal hygrometer, microwave refractometer.

3.0 **SIGNAL CONDITIONING** (8 Hrs.): Need for transducer signal conditioning; DC and AC signal conditioning system, DC and AC bridges as signal conditioning elements. Instrumentation Amplifiers, Chopper Amplifier, their specification and characteristics applications.

### **Suggested Books:**

1. Electrical and Electronic Measurements & Instrumentation – A.K. Sawhney
2. Electronic Instrumentation & Measurement Techniques – Helfrick & Cooper
3. Instrumentation Measurements & Analysis – Nakra & Choudhury
4. Electronic Instruments & Measurements – Larry Jones & A. Foster Chin

## **Et-509: CONTROL SYSTEM (Elective)**

- 1.0 **ELEMENTARY FORMS OF CONTROL SYSTEM** (10 Hrs): Elementary control devices, open and closed control system, position control system, on-off control system, continuous control system. Laplace transformation technique, system representation by equation, block diagram representation, block diagram reduction technique, single flow graph, Mason's gain.
- 2.0 **TRANSFER FUNCTION** (8 Hrs.): Transfer function of DC motor, generator, AC motor, servomotor, amplifiers & compensating networks, gear trains, AC tachometers.
- 3.0 **SERVO – ELEMENTS** (14 Hrs.): Error measuring system, synchros, potentiometers, null devices, motor and power amplifiers, magnetic amplifiers phase sensitive detectors. Steady state errors, constants and examples of error calculation, error co-efficient, types of mechanisms.
- 4.0 **STABILITY ANALYSIS** (10 Hrs.): Closed loop and open loop transfer function, characteristic equation, Routh stability criterion, Hurwitz stability criterion.

### **Suggested Books:**

1. Modern Control Engineering – K. Ogata, Prentice Hall
2. Automatic Control System – B.C. Kuo, Prentice Hall
3. Control System Engineering – Nagarath & Gopal, Wiley Eastern