Fifth Semester

CONSUMER ELECTRONICS AND TROUBLESHOOTING (DEC-501)

Discipline core (DC): Credit 4(3-0-2)

Objective:

The objective of teaching this subject is to give students an in depth knowledge of various electronic audio and video devices and systems. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices like audio-systems, CD systems. TV and other items like microwave ovens, Photostat machines etc. Which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

COURSE OUTLINE:

1. Audio Systems:

1.1. Microphones and Loudspeakers

a) Carbon, moving coil, cordless microphone

b) Direct radiating and horn loudspeaker

c) Multi-speaker system

1.2 Sound Recording

a) Magnetic Recording

b) Digital Recording c) Optical Recording (CD system and DVD)

1.3 Study of VCD and DVD Player systems.

2. Television

2.1. Monochrome TV

a) Scanning and its need b) Need of synchronizing and blanking pulses, VSB

c) Composite Video Signal d) Picture Tube

e) Camera Tube : Vidicon and Plumbicon

f) TV Receiver: Block diagram, function of each block, waveform at input and output of each block.

2.2. Colour Television:

a) Primary, secondary colours

b) Concept of Colour Mixing, Colour Triangle

c) Camera tube d) PAL TV Receiver

e) Concept of Compatibility with Monochrome Receiver

f) NTSC, PAL, SECAM system (brief comparison)

3. LCD and LED Television: Basic principle and working of LCD & LED TV

4. Cable Television: Concept and Working of Cable TV, DTH, HDTV

5. Consumer Appliances- Principle, Working and troubleshooting with special emphasis on control panel

a) Microwave Oven b) Washing Machine c) Photostat Machine d) DTH System.

LIST OF PRACTICALS

1. To plot the directivity pattern and frequency response of a microphone.
2. To plot the directivity pattern and frequency response of a loudspeaker.
3. Demonstration of VCD/DVD player and study of its transport mechanism.
4. Familiarization with the different sections of B/W TV Receiver.
5. To observe the wave forms and voltage of B/W and colour TV Receiver.
6. Fault finding of colour T.V Receiver.
7. Familiarization with different section of LCD& LEDTV
8. Study of cable TV network system.
9. Demonstration and Operation of Control Panel

(a) Microwave Oven
(b) DTH System
(c) Photostat Machine
(d) Washing Machine

RECOMMENDED BOOKS

1. Audio and Video Systems by RG Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Colour Television-Principles & Practice by R.R Gulati , Wiley Eastern Limited, New Delhi

MICROWAVE COMMUNICATION (DEC-502)

Discipline core (DC) : Credit 4(3-0-2)

Objective: 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.

COURSE OUTLINE:

1. Introduction to Microwaves
   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)

   Microwave Devices
   Basic concepts of thermionic emission and vacuum tubes, Effects of interelectrode capacitance, Lead Inductance and Transit time on the high frequency performance of conventional vacuum tubes, and steps to extend their high frequency operations.
2. 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
- Impatt diode

3. Wave guides

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.

Microwave Components

Constructional features, characteristics and application of tees, bends, matched termination, twists, detector, mount, slotted section, directional

4. **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.

RECOMMENDED BOOKS

1. Microwave Devices and Components by Samuel Y. Liao, Prentice Hall of India, New Delhi
2. Electronics Communication by Roddy and Coleen.

ADVANCED MICROPROCESSORS (DEC-503)

Open Elective (OE): Credit 4(3-0-2)

Objective: The complex systems require high through put that at times is not met with 8-bit microprocessor system. So, 16 bit up based system become suitable. They provide better facilities to personal computers and other automatic process control systems.

COURSE OUTLINE:

1. The 8086 Microprocessor
- Internal Architecture of 8086.
- Memory organisation: Memory segmentation & physical address generation.
- 8086 Flags

2. 8086 Signal
- Pins and Signals description.
- CLK circuitry.
- 8086 Address and Data bus Concept

- Maximum & Minimum mode.
- Memory and I/O Interface block diagram
- Types of interrupts and interrupt priority. (Brief Idea)

3. 8086 Instruction set
- Instruction Format : Example on Mov instruction only.
- Instruction : Data transfer, Arithmetic, Bit & Logical manipulation, String, Program transfer and processor control instructions.
- Addressing mode & its types.
- Macros , Procedure.

4. Directives and Programming.
- Editor, Assembler, Emulators, Directives.
- Programs: Addition, Subtraction, Multiplication, Division, Shifting of data right / Left, Increment, Decrement, Complement, Block movement of data.

5. Interrupts
- Interrupt Vector table, Vector & Non Vector Interrupt.
- Predefined Interrupts (0 – 4)
- User defined Software/Hardware Interrupts.

6. Latest Microprocessor

Introduction to 32 bit Microprocessor, Features and advantages of Pentium processor/ Dual core processor and RISC processor

LIST OF PRACTICALS

1. To Study the Architecture of 8086 microprocessor.
2. Familiarization of different keys of 8086-microprocessor kit and its memory map.
3. Steps to enter, check /modify data or program and to execute a program on 8086Microprocessor kit.
4. Addition of two 8 bit numbers.
5. Addition of two 16 bit numbers
6. Subtraction of two 8 bit numbers.
7. Subtraction of two 16 bit numbers
8. Multiplication of two 8 bit numbers
9. Division of two 8 bit numbers
10. Program for And, OR, X-OR & its complement.
11. Determine the Hex code of Mov instruction for various addressing mode.
12. Determine the Physical address for different segments.

RECOMMENDED BOOKS

1. Microprocessor and Application by D.V. Hall.
2. Microprocessor 8086/88 by B.B. Bray

OPTICAL FIBRE COMMUNICATION (DEC-503)

Open Elective (OE): Credit 4(3-0-2)

Objective:

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 expa0nded 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.

COURSE:

1. Introduction
   - Historical perspective, basic communication systems, optical frequency range, advantages of optical fibre communication, application of fibre optic communication
   - Electromagnetic spectrum used, Advantages and disadvantages of optical communication.
2. Optical Fibers and Cables
   - Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle, Types of optical fiber cable.
3. Losses in Optical Fiber Cable
   - Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending losses.
   - Dispersion: Types and its effect on data rate.
4. Optical Sources

   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.
5. Opticalll Optical Detectors

   Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), Noise in detectors

LIST OF PRACTICALS

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

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

Digital Electronics II (DEC-503)
Open Elective (OE): Credit 4(3-0-2)

Objective: Digital design is a vital area in electronics with a lot of scope in industry and research. This subject involves conventional and sequential circuit designs both of which are very important fields. This subject forms the basis for research and development of digital systems. This subject will enable the students to learn concept of

DETAILED CONTENTS

1. Logic Families

a) Logic family classification. TTL, ECL, MOS, CMOS. Types of integration SSI,MSI, LSI, VLSI

b) Characteristics of TTL and CMOS and the comparison. Propagation delay. Speed, noise margin. Logic levels., power dissipation, fan-in, fan-out, power supply requirements

c) Open collector and totem pole output circuits, operation of a standard TTL, CMOS, NAND, NOR gates

d) CMOS to TTL interfacing and TTL to CMOS interfacing LAMP/LED interfacting

e) Introduction to tri-state devices tri-state buffer and invertor circuits. Examples of unidirectional and bi-directional bus with tri-state interfacing.

2. A/D and D/A Converters

a) DA Converters : Performance characteristics of D/A converters, binary resister network and resistance ladder network methods of D/A converters and applications

b) A/D Converters : Performance characteristics of A/D converters, single slope, dual slope, successive approximation and parallel A/D converters

3. Memories

Memory organisation, classification of semi conductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM, expansion of memory. CCD memories, content addressable memory, programmable logic devices, PROM at PLD, programmable logic array (PLA) programmable array logic (PAL), field programmable gate array (FPGA), familiarization with common ICs.

4. Combinational Circuits

Minimisation of Boolean expressions using K-map method, tabular
method of function minimization, Quine Mcclaaskey method

5. Sequential Circuits

Essential components of sequential circuit, synchronous and asynchronous sequential circuits, classification of sequential circuits (Meely and Moore Machine), design of counters using J-K and R-S flip- flops.

6. Arithmetic and Logic Unit

Basic idea about arithmetic logic unit w.r.t. IC 74181 and applications, implementation of binary multiplication, division, subtraction and addition

LIST OF PRACTICALS

1. Verify the operation of D/A converter
2. Verify the operation of A/D converter
3. Verify the writing and reading operation of RAM IC
4. Design J-K Flip-flop counter and verify its truth table
5. Familiarity with the use of EPROM programmes and UV index
6. Exercise on programming of EPROM
7. Using PLA design and implement a combinational circuit like full adder
8. Design and implement full adder and full subtractor
9. Verify the logical operation, arithmetic operation of binary numbers using IC741981
10. Design of combination circuit using ROM

RECOMMENDED BOOKS

1. Digital Systems and Applications by RJ Tocci, Prentice Hall of India, New Delhi
2. Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi
3. Digital Electronics by KS Jamwal, Dhanpat Rai & Co., New Delhi
4. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi

5. Digital Designs by CJ Roth, Jaico Publication
6. Digital Designs by Z Kohavi
7. Digital Electronics by Terry LM Bartlet
8. Digital Electronics by Rajaraman V, Prentice Hall of India, New Delhi
9. Digital Fundamentals by Malvino and Leachy, Tata McGraw Hill Publishers, New Delhi
10. Digital Systems by Sanjay K Bose, Wiley Eastern (P) Ltd., New Delhi

ELECTRONICS IN INDUSTRY (DEC-504)

Discipline core (DC): Credit 4(3-0-2)

Objective: This course deals with electronic devices and circuits used in industry. It involves the study of thyristors, rectifier circuits, communication circuits and also the application of electronics in industry.

COURSE OUTLINE:

1. Thyristors and Other Power Electronics Devices

1.1 Introduction
1.2 Applications
1.3 Symbolic Representations
1.4 Specifications

1.5 Principle of Operating of an SCR
1.6 Two-Transistor Analogy of SCR
1.7 DIAC
1.8 TRIAC
1.9 Basic Triggering circuits for Thyristors
1.10 Rectifier Circuits using SCR
1.11 Construction and working of Gate Turn Off (GTO) thyristor
1.12 Characteristics of Programmable Uni-junction Transistor (PUT), ASCR, LASCR, RCT, SCS
1.13 Construction and Working of IGBT
2. Power Electronics Circuits
2.1 Commutation Circuits
2.2 Inverters series and parallel
2.3 Choppers: Step up, Morgan's, Jones's
2.4 Single phase and Three Phase Converters.
3. Module 03- Application of Electronics in Industry/ Sector
a. Process Industry- i) Chemical Industry ii) Sugar iii) Paper iv) Paint v) Steel vi) Fertilizer vii) Glass viii) Textile ix) Rubber
b. Medical and Pharmaceutical Industry
c. Computer Manufacturing Industry
d. Consumer Goods Industry e. Service Sector
f. Power Generation and Transmission Industry
g. Communication Service providing Organisation as BSNL, Reliance, Airtel, Idea, Government Telecommunication Department etc
h. Defence Sector
i. Space Organisation j. Petroleum Industry

LIST OF PRACTICALS

1. Testing of components-SCR, DIAC, TRIAC
2. To plot and verify Characteristic of an SCR
3. To plot and verify Characteristic of an TRIAC
4. To plot V-I characteristics of UJT
5. To plot V-I characteristics of DIAC
6. Assembly and testing of Half-wave Gate-controlled Rectifier using One SCR
7. Assembly and testing of Single-phase Half-controlled Full-wave Rectifier using two SCRs and two Diodes
8. Assembly and testing of Illumination/ Fan Control circuit using SCR
9. Assembly and testing of Illumination Control circuit using Triac
10. Assembly and testing of SCR Controlled Emergency light
11. Study of Integrator and Differentiator circuit using OPAMP 741
12. Study of Adder and comparator circuit using OPAMP 741
13.To visit at least four industries mentioned at module 03and write the report.

RECOMMENDED BOOKS

1. Industrial Electronics: S.K. Bhattacharya / S Chatterjee, Tata McGraw-Hill Publishing Company Limited
2. Industrial Electronics: James Humphries, Leslie Sheets, 4e - Delmar Publications

DIGITAL SWITCHING AND CIRCUITS (DEC-505)
Discipline core (DC): Credit 4(3-0-2)

Objective: This course deals with the advanced digital and data communication techniques beyond the conventional communication. It involves the use of modems in synchronous and asynchronous data transmission. It encompasses the modern communication network and integrated services like FAX, electronic exchanges etc. so vital for present day communication.

COURSE OUTLINE:

1. Introduction:

Basic block diagram of digital and data communication systems. Their comparison with analog communication systems. Basic information theory.

2. Coding

a) Introduction to various common codes 5 bit Baudot code, 7 bit ASCII, EBCDIC

b) Code error detection and correction techniques - Redundancy, parity, block check character (BCC), Vertical Redundancy check (VRC), Cyclic Redundancy check (CRC), Hamming code

3. Digital Modulation Techniques: -

Basic block diagram and principle of working of the following:

- Amplitude shift keying (ASK): Interrupted continuous wave (ICW), two tone modulation
- Frequency Shift keying (FSK)
- Phase shift keying (PSK),
- Quadrature Amplitude modulation (QAM)

4. Characteristics/working of data transmission circuits; bandwidth requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers

5. UART, USART:

Their need and function in communication systems

6. Modems:

Need and function of modems, Mode of modems operation (low speed, medium speed and high speed modems). Modem interconnection, Modem data transmission speed, Modem modulation method, Modem interfacing (RS 232 Interface, other interfaces).

LIST OF PRACTICALS

1. Observe wave forms at input and output of ASK and FSK modulators
2. To transmit parallel data on a serial link using USART
3. Transmission of data using MODEM.
4. Observe wave forms at input and output of a PSK and QAM circuit
5. To study the working principle of a telephone handset
6. To study the working principle of a FAX machine.
7. To study the working principle of an EPABX.

RECOMMENDED BOOKS

1. Electronic Communication Systems By George Kennedy Tata McGraw Hill Education Pvt Ltd, New Delhi

2. Communication system By A.K. Gautam S.K. Kataria Sons, Delhi

Power Electronics (DEC-506)
Discipline core (DC): Credit 4(3-0-2)

RATIONALE

Diploma holders in Electronics and Instrumentation and Control are required to handle a wide variety of power electronic equipment used in process control Industry. This subject will provide the student basic understanding of the principles of their working. The practical training will further re-inforce the knowledge and skill of the students.

DETAILED CONTENTS

1. Introduction to thyristors and other power electronics devices

a) Construction, Working principles of SCR, two transistor analogy of SCR, VI characteristics of SCR.

b) SCR specifications & ratings.

c) Different methods of SCR triggering.

d) Different commutation circuit for SCR.

e) Series & parallel operation of SCR.

f) Construction & working principle of DIAC, TRIAC & their V-I characteristics.

g) Construction, working principle of UJT, VI characteristics of UJT.UJT as rrelaxation oscillator.

h) Brief introduction to Gate Turn off thyristor (GTO),Programmable uni-function transistor (PUT), MOSFET, IGBT.

i) Basic idea about the selection of Heat sink for thyristors.

j) Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.

2. Controlled Rectifiers (06 hrs)

a) Single phase half wave controlled rectifier with load (R, R-L)

b) Single phase half controlled full wave rectifier (R, R-L)

c) Fully controlled full wave bridge rectifier.

d) Single phase full wave centre tap rectifier.

3. Inverters, Choppers, Dual Converters and Cyclo converters. (12 hrs)
i) Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel. Inverters & their application.
ii) Choppers: Introduction, types of choppers (Class A, Class B,Class C and Class D). Step up and step down choppers.
iii) Dual Converters & cyclo converters:Introduction, types &basic working principle of dual converters & cyclo converters &their application.
4. Tyristorised Control of Electric drives (08 hrs)
a) DC drive control
i) Half wave drives.
ii) Full wave drives
iii) Chopper drives (Speed control of DC motor usingchoppers)
b) AC drive control
i)Phase control (Speed control of induction motor usingvariable frequency)
ii) Constant V/F operation
iii) Cycloconverter/Inverter drives.
iv) Slip power control of AC drives.
5. Uninterrupted Power supplies (04 hrs)
i) UPS, on-line, off line & its specifications
ii) Concept of high voltage DC transmission

LIST OF PRACTICALS

1. To plot VI characteristic of an SCR.
2. To plot VI characteristics of TRIAC.
3. To plot VI characteristics of UJT.
4. To plot VI characteristics of DIAC.
5. Study of UJT relaxation oscillator. And observe I/P and O/P wave forms
6. Observation of wave shape of voltage at relevant point of single-phase half wave controlled rectifier and effect of change of firing angle.
7. Observation of wave shapes of voltage at relevant point of single phase full wave controlled rectifier and effect of change of firing angle.
8. Observation of wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit for.
9. Varying lamp intensity of AC fan speed control.
10. Installation of UPS system and routine maintenance of batteries.
11. Speed control of motor using SCRs

RECOMMENDED BOOKS

1. Power Electronics by P.C. Sen Tata Mc Graw Hill. New Delhi
2. Power Electronics by P.S. Bhimbhrah, Khanna Publishers, New Delhi

3. Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.
4. Power Electronics by MH Rashid
5. Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi
6. Power Electronics by S Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
7. Power Electronics by Sugandhi and Sugandhi
8. Power Electronics – Principles and Applications by J Michael Jacob, Vikas Publishing House, New Delhi