

5.1 CONSUMER ELECTRONICS

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RATIONALE

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, VCR and other items like digital clocks, calculators microwave ovens, photostat machines etc. Which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

DETAILED CONTENTS

1. **Audio System** (09 hrs)
 - 1.1 Microphones: construction, working principles and applications of microphones, their types viz: a) Carbon b) moving coil, c) velocity, d) crystal, e) condenser, e) cordless etc.
 - 1.2 Loud Speaker: Direct radiating, horn loaded woofer, tweeter, mid range, multi-speaker system, baffles and enclosures.
 - 1.3 Sound recording on magnetic tape, its principles, block diagram, and tape transport mechanism
 - 1.4 Digital sound recording on tape and disc
 - 1.5 CD system
Hi-Fi system, pre-amplifier, amplifier and equalizer system, stereo amplifiers

2. **Television** (12 hrs)
 - 2.1 Monochrome TV Communication:
 - Elements of TV communication system.
 - Scanning- its need for picture transmission.
 - Need for synchronizing and blanking pulses.
 - Progressive scanning- Gross structure filters, interlaced scanning, resolution and band width requirement, tonal gradation.
 - Composite Video signal (CVS) at the end of even and odd fields. equalizing pulses and their need
 - Monochrome picture tube – construction and working, comparison of magnetic and electric deflection of beam

- Construction and working of camera tube: vidicon and plumbicon, Block diagram of TV camera and the transmitter chain.
- Block diagram of a TV receiver: function of each block and waveform at the input and output of each block.
- Frequency range of various VHF bands and channels used in India. Major specification of the CCIR.

2.2 Concept of positive and negative modulation VSB Transmission Turner

- Typical circuits of scanning and EHT stages of TV receiver, keyed AGC, function and location of brightness contrast V-hold, H-hold of centering control.
- Identification of faulty stage by analyzing the symptoms and basic idea of a few important faults and their remedies

2.3 Colour Schemes

- Introduction to PAL, NTSC, SECAM systems, advantages and disadvantages block diagram of video camera and its explanation
- Construction and working principles of trinitron and PIL types of colour picture tubes.
- Concept of convergence, purity of beam shifting
- Block diagram of PAL TV receiver, explanation and working

3. Colour TV

(12 hrs)

- Primary colours, tristimulus values, trichromatic coefficients, concepts of additive and subtractive mixing of colours, concepts of luminance, Hue and Saturation, Representation of a colour in colour triangle, non spectral colour, visibility curve
- Compatibility of colour TV system with monochrome system. Block diagram of colour TV camera, Basic colour TV system-NTSC, SECAM, and PAL their advantages and disadvantages.
- Construction and working principles of trinitron and PIL types of colour picture tubes. Concept of convergence, purity, beam shifting
- Need for luminance signal and band sharing by colour signals, sub-carriers frequency, colour difference signal and its need, synchronous quadratic modulation and representation of a colour by a vector, burst signal and its need, chrominance signal.
- Block diagram of PAL TV receiver, explanation and working

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| 4. | Cable Television | (03 hrs) |
| | Block diagram and principles of working of cable TV and DTH, cable TV using internet | |
| 5. | VCR, VCD and DVD | (06 hrs) |
| | Principle of video recording on magnetic tapes, block diagram of VCR, VHS tape transport mechanism. | |
| 6. | Video Camera | |
| | Study of VCD and DVD | |

LIST OF PRACTICALS

1. To plot the frequency response of a microphone
2. To plot the frequency response of a loud speaker
3. Demonstration of a tape-transport mechanism
4. Trouble shooting of tape-recorder system
5. To observe the wave forms and voltage B/W and colour T.V receiver.
6. Fault finding of colour T.V
7. Trouble shooting of C.D. Player
8. Demonstration of DVD Player.
9. Demonstration and study to VCD especially its transport mechanism.
10. Study of a TV cable network system through internet

RECOMMENDED BOOKS

1. Colour Television-principles & practice R.R Gulati by Wiley Eastern Limited, New Delhi
2. Complete Satellite & cable Television R.R Gulati New age International Publisher
3. Colour Television Servicing by RC Vijay BPB Publication, New Delhi
4. Colour Television & Video Technology by A.K. Maini CSB Publishers
5. VCR-principles, maintenance & repair by S.P. Sharma, Tata Mc Graw Hill, New Delhi
6. Colour TV by A.Dhake
7. Service Manuals, BPB Publication, New Delhi

5.2 MAINTENANCE OF COMPUTER SYSTEM (MOCS)

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RATIONALE

PCs have become a necessity in Industry, offices & becoming popular in homes too. This course gives organization structure and principles of working of various other components like visual display, keyboard drives & printers etc. Diploma holders will find employment in computer industry, Repair & maintenance field.

DETAILED CONTENTS

1. **CRT Display Device** (06 hrs)
Block Diagram, Principle of operation of Computer Monitor, Difference between TV & Computer Monitor. Video Display Adapters (Monochrome & Colour Graphic Adapter)
2. **Printers** (06 hrs)
Printing Mechanism, Construction and working principles and Dot Matrix Printer, Inkjet Printer, Laser Printer, Printer Controller, Centric Interface, Signals from PC to Printer & Printer to PC.
3. **Keyboard & Mouse** (06 hrs)
Block Diagram of keyboard Controller, keyboard switches, keyboard faults, mouse, common faults with mouse. Introduction to scanner, digitizer.
4. **Buses & Ports** (06 hrs)
Different type of Buses PCI, ISA, SCSI & Ports COM 1, COM 2, LPT1, USB.
5. **Secondary Memory** (08 hrs)
Principle & Construction of Floppy Disk Drive & hard disk device (HDD). Floppy disk Controller & Hard disk controller. Pen Drives, common faults with hard disk drive & floppy disk drive.
6. **Mother Board** (06 hrs)
Introduction to different type of mother boards
Single Board Based System, Block diagram of motherboard. Installation of Computer System.

7. Network Devices

(05 hrs)

Brief Introduction & working of following
HUBS, Routers, Bridges, Switches, LANS, WANS

LIST OF PRACTICALS

Operation, Maintenance, Installation & Testing of the following devices:

- 1 Keyboard
- 2 Mouse
- 3 Monitors
- 4 FDD
- 5 HDD
- 6 DOT Matrix Printer
- 7 Laser Printer
- 8 Mother board
- 9 CD-ROM
- 10 Connectors & Cables

RECOMMENDED BOOKS

1. PC Organisation by S. Chowdhury, Dhanpat Rai & Sons, Delhi
2. IBM PC Colours by Govinda Rajalu, Tata McGraw Hill Publishers, New Delhi
3. Text Book by Mark Mirasi

5.3 TROUBLE SHOOTING OF ELECTRONIC EQUIPMENT

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RATIONALE

The stress should be laid on tracing the circuits and its trouble shooting. Students should do fault removal. As well as fault analysis. it is assumed here that students knows the operation of electronic instruments such as multi-meter, logic pulsar, logic prob, soldering and desoldering station, CRO, digital IC tester etc.

Here is a sample list of electronic equipment whose repair can be carried out by students. at least eight exercises should be carried out by each students.

1. Stereo Amplifier/CD Player
2. Tape recorder
3. Telephone hand set
4. Fax machine
5. B/W and colour TV
6. VCR/VCD player
7. Regulated power supply
8. Analog and digital voltmeter
9. Function generator
10. CRO
11. Automatic Stabilizer
12. Inverter, UPS.
13. Cordless phone
14. EPABX
15. Video Games
16. Security devices
17. Computer and Peripherals
18. Mobile phone
19. Fan regulator
20. Temp. controller
21. Power supplies
22. Digital multimeters.

5.4 COMMUNICATION ENGINEERING -II

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RATIONALE

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. Fibre optics is the latest thrust area in communication with vast opportunities in the private sector.

DETAILED CONTENTS

1. Introduction to Microwaves (03 hrs)

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)

2. Microwave Devices (09 hrs)

Basic concepts of thermionic emission and vacuum tubes, Effects of inter-electrode capacitance, Inductance and Transit time on the high frequency performance of conventional vacuum tubes, and steps to extend their high frequency operations.

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 and
- Impatt diode

3. Wave guides (04 hrs)

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. Field configuration of TE_{10} , TE_{20} and TM_{11} modes.

4. **Microwave Components** (04 hrs)
- Constructional features, characteristics and application of tees, bends, matched termination, twists, detector, mount, slotted section, directional coupler, fixed and variable attenuator, isolator, circulator and duplex, coaxial to wave guide adapter.
5. **Microwave antennas** (03 hrs)
- Structure characteristics and typical applications of Horn and Dish antennas
6. **Microwave Communication systems** (03 hrs)
- a) Block diagram and working principles of microwave communication link.
 b) Troposcatter Communication: Troposphere and its properties, Tropospheric duct formation and propagation, troposcatter propagation.
7. **Radar Systems** (06 hrs)
- Introduction to radar, its various applications, radar range equation (no derivation) and its applications.
- a) Block diagram and operating principles of basic pulse radar. Concepts of ambiguous range, radar area of cross-section and its dependence on frequency.
 b) Block diagram and operating principles of CW (Doppler) and FMCW radars, and their applications.
 c) Block diagram and operating principles of MTI radar.
 d) Radar display- PPI
8. **Satellite Communications** (06 hrs)
- (a) Basic idea of passive and active satellites. Meaning of the terms orbit , apogee, perigee
 b) Geostationary satellite and its need. Block diagram and explanation of a satellite communication link. Link losses etc.
 c) Transponders multiple access techniques, VSAT & its features

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.
6. To verify the properties of magic tee.
7. To carry out installation of a dish antenna.

NOTE:

Visit to the appropriate sites of microwave industries, radar installations and communication stations should be made to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

RECOMMENDED BOOKS

1. Microwave Devices and Components by Sylio, Prentice Hall of India, New Delhi
2. Electronics Communication by Reddy and Coolen
3. Electronics Communication System by KS Jamwal, Dhanpat Rai & Sons, Delhi

(Elective-I)
5.5(a) OPTICAL FIBER COMMUNICATION

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RATIONALE

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 expanded 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.

DETAILED CONTENTS

1. **Introduction** (08 hrs)
 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.
 Principle of light penetration, reflection, critical angle.
2. **Optical Fibers and Cables** (08 hrs)
 Fiber types construction, multimedia and monomode fibers, step index and graded index fibers, acceptance angle and acceptance types of optical fiber cables.
3. **Losses in optical fiber cable:** (08 hrs)
 - a) Absorption Losses, Scattering Losses, Radiation losses, Compelling losses, Bending loses.
 - b) Dispersion, Material dispersion, wave guide dispersion, modal dispersion total dispersion and bit rate.
4. **Light sources and Detectors** (08 hrs)
 - a) Characteristics of light source used in optical communication, principle of operation of LED, different type of LED structures used and their brief description, LED driving circuitry, Injection Laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD, non semiconductor laser.

- b) Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), their brief description.

5. **Connectors, Splicing and coupling** (06 hrs)

Fiber alignment and joint losses, splicing, types of splices, types of connectors used, couplers, three and four port coupler, star coupler, fiber optic switch.

6. **Optical Fiber System** (08 hrs)

Optical transmitter circuit, optical receiver circuit, optical power budgeting, multiplexing methods used. Modulation methods used.

LIST OF PRACTICALS

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

RECOMMENDED BOOKS

1. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi
2. Optical fiber Communication by J. Gower, Prentice Hall of India, New Delhi
3. Optical fiber Communication by ' Gerd Keiser, McGraw Hill International Editions
4. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi
5. Optical fiber Communication Systems by GP Agrawal, John Wiley & Sons, New Delhi
6. Optical fiber Communication and its Applications by S C Gupta, Prentice Hall of India, New Delhi

(Elective-I)
5.5 (b) ADVANCED MICROPROCESSORS

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RATIONALE

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. Micro controller based system design provides facilities for economical & less complicated small process control system.

DETAILED CONTENTS

1. **The 8086 Microprocessor** (08 hrs)
 - Internal Architecture of 8086.
 - Concept of memory segmentation & physical address generation.
 - Memory and data addressing mode
 - Minimum and Maximum mode of 8086.

2. **System Design using 8086** (06 hrs)
 - Pins and Signals.
 - CLK circuitry
 - 8086 Address and Data bus Concept
 - Memory and I/o Interface block diagram
 - Math coprocessor 8087

3. **Programming of 8086** (10 hrs)
 - Instruction Format
 - Data transfer, Arithmetic, Bit & Logical manipulation, String, Program transfer and processor control instructions.
 - Programming using manual assembly on exercises like
 - (i) Addition & Subtraction of two 16 bit numbers.
 - (ii) Multiplication's & Division of two numbers
 - (iii) Moving a block of data (intra and inter segment)
 - (iv) To arrange a block of data in ascending/descending order.
 - Use of assembler and assembler directives.

4. **8086 Interrupt System** (4 hrs)

Concept

- Interrupt Vector table and Interrupt type code.
- Types of interrupts and interrupt priority.
- Predefined Interrupts (0 to 4).
- User defined software/hardware interrupts.

5. **Micro Controller** (08 hrs)

Introduction of Micro Controllers.

- Main features and architecture of 8051/8951
- Application of Micro controllers such as washing machines, photocopier, cars etc

6. **Application of Microprocessors-** (08 hrs)

Use of microprocessor (with block diagram, main devices used and operation) for applications like-

- (i) A microprocessor based weighing scale
- (ii) Temperature measurement and control system
- (iii) Data Acquisition system.
- (iv) Speed control of DC motor.

7. **Introduction to 32 bit Microprocessors** (04 hrs)

Main features of 80386, 80486, Pentium microprocessor.

LIST OF PRACTICALS

1. Familiarization of different keys of 8086-microprocessor kit and its memory map.
2. Steps to enter, check /modify data or program and to execute a program on 8086 microprocessor kit.
3. Writing and execution of ALP on 8086 for addition/subtraction of two 16 bit numbers (signed & unsigned).
4. Writing and execution of ALP on 8086 kit for Multiplication/Division of two signed/unsigned numbers.
5. Writing and execution of ALP on 8086 kit for arranging a block of data in

ascending/descending order.

6. Writing and execution of ALP on 8086 kit to generate nos of series like 1,1,2,3,5,8,13,21-----.
7. Writing and execution of ALP for stepper motor control using stepper motor interfacing card.
8. Study and use of Logic controller Interface card.
9. Study and use of opto coupler interface card.
10. Exercise on micro controller kit 8051.
11. Use of 8086 emulator for hardware testing.

RECOMMENDED BOOKS

1. Microprocessor and Application by D.V. Hall.
2. 8051 Micro Controller.
3. Microprocessor 8086/88 by B.B. Brey
4. Microprocessors & Micro controllers by Dr. B.P. Singh
5. Microprocessor by Rajiv Sapra, Ishan Publications, Ambala
6. Microprocessor by Naresh Grover
7. Microprocessors and Microcomputers and their Applications by AK Mukhopadhyay
8. Microprocessors and Applications by Uffenback
9. Introduction to Microprocessor by Adithya Mathur, Tata McGraw Hill Publishing Co, New Delhi
10. Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar, Wiley Eastern Ltd, New Delhi
11. Microprocessor and Applications by B Ram
12. Microprocessor by SK Goel
13. 8051 by Mcakenzie, Prentice Hall of India, New Delhi

5.6 POWER ELECTRONICS

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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** (12 hrs)
 - 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 relaxation 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 using choppers)
 - b) AC drive control
 - i) Phase control (Speed control of induction motor using variable 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