

4.1 NETWORK, FILTERS AND TRANSMISSION LINES

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RATIONALE

The study of network, filters and transmission lines leads to understanding of line communication, audio and video communication and micro wave communication. Particularly the study of network from principles of AC theory, introduces the students to parameters and characteristics of various networks, including filters. Also the study of transmission lines becomes important as its analogy is used in study of transmission of plane electromagnetic waves in bounded media.

DETAILED CONTENT

1. **Networks** (12 hrs)
 - a) Two Port (Four Terminal) Network
 - Two port parameters (impedance, admittance, transmission, hybrid parameters)
 - Interconnection of two ports (series connection, parallel connection, cascade connection)
 - Equivalent networks
 - T-network, Pi-networks, ladder networks
 - Symmetrical and asymmetrical networks
 - b) Symmetrical Network
 - Concept and significance of characteristic impedance, propagation constant, attenuation constant (with expression in terms of Z_o , Z_{oc} for T-network, Pi-network)
 - c) Asymmetrical Network
 - Concept and significance of iterative impedance, image impedance, image transfer constant and insertion loss
 - Half section (L-section), symmetrical T and Pi section into half section
2. **Network Theorem** (08 hrs)

A brief study of following:

 - Tellegen's Theorem
 - Superposition theorem
 - Substitution theorem
 - Thevenin and norton theorem
 - Reciprocity – maximum power transfer theorem
 - Attenuators: brief idea about attenuators and its types

3. **Filters** (16 hrs)

- a) - Applications of filters in communication system
 - Concept of low pass, high pass, band pass, band stop, butter worth filter, constant filters, m-derived filters, K-filters
- b) Proto-type Filter Section
 - Reactance vs attenuation constant and characteristic of a low pass filter and its impedance
 - Attenuation vs frequency, phase shift vs frequency characteristics Impedance vs frequency of T and Pi curve and their significance
- c) M-derrived Filter Section
 - Need of M-derived filters
 - Expression for m in terms of f_c (cut off frequency) f_w (Frequency at which attenuation is infinity) for low pass and high pass filter
- d) Active Filters
 - Basic concept and comparison with passive filters
 - Simple problems on low pass and high pass filters (first and second order)

4. **Transmission Lines** (26 hrs)

- a) Transmission lines and their implications, shapes of different types of transmission lines, (including 300 ohms antenna feeder cable, 75 ohm co-axial cable)
- b) Distributed (or primary) constant of a transmission line, equivalent circuit of an infinite line, T and Pi type representation of a section of transmission line
- c) Definition of characteristics impedance line: concept of short line termination in Z_0 ; currents and voltage along at infinite line, propagation constant attenuation and phase shift constant of the line
- d) Relationship of characteristics impedance, propagation constant attenuation constant and phase constant in terms of distributed constants of the lines.
- e) Conditions for minimum distortion and minimum attenuation signal on the line; necessity and different methods of loading the communication lines (no derivation)
- f) Concept of reflection and standing waves on a transmission lines; definition of reflection coefficient in terms of characteristic impedance and load impedance, definition of standing wave ratio (SWR). Relation between VSWR and voltage reflection coefficient maximum impedance and VSWR
- g) Transmission line equation; expressions for voltage current and impedance at a point on the line for lines with and without losses
- h) Input impedance of an open and short circuited line and its graphical representation
- i) Transmission Line. at high frequency, effect of high frequencies on the

losses of a transmission line; application of Transmission Line as a reactive component and impedance transformer (e.f. quarter wave transformer)

- j) Principle of impedance matching using single stub; comparison of open and short circuited stubs

Note: No derivation of any formula

LIST OF PRACTICALS

1. Measurement of characteristics impedance of a symmetrical Pi and T networks
2. Image impedance of a given asymmetrical Pi and T networks
3. Determine experimently the characteristics impedance of a prototype
 - Low pass filters
 - High pass filter and plot attenuation characteristics
4. To design and measure the attenuation of a symmetrical T/Pi type attenuation
5. To plot the impedance characteristics of a prototype band-pass filter and also plot the attenuation characteristics of band pass filter
6.
 - To plot the impedance characteristics of m-derived low pass filter
 - To plot the attenuation characteristics of a m-derived high pass filter
7. To assemble test the following butter worths active filter:
 - First order low pass and high pass
 - Second order low pass and high pass
8. Measurement of characteristics impedance propagation constant, VSWR for a given T.L. (transmission line)

RECOMMENDED BOOKS

1. Network Lines and Fields by John D Ryder; PHI, New Delhi
2. Network Filters and Transmission Lines by AK Chakarvorty; Dhanpat Rai & Co. Publication
3. Network Analysis by Van Valkenbury; PHI, New Delhi
4. Network Analysis by Soni and Gupta; Dhanpat Rai & Co. Publication
5. Network Theory and Filter Design by Vasudev K. Aatre

4.2 COMMUNICATION ENGINEERING - I

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RATIONALE

Study of principles of communication systems leads to further study of audio and video systems, line communication and microwave communication systems. Thus the diploma holders shall find employment in areas of R&D, production, servicing and maintenance of various communication systems.

DETAILED CONTENT

1. **AM/FM Transmitters** (08 hrs)
 - a) Classification of transmitters on the basis of power and frequency
 - b) Concept of low level and high level modulation, Block diagram of low and high level modulation, AM Transmitters and working of each stage.
 - c) Block diagram and working principles of reactance transmitter and Armstrong FM transmitters.

2. **AM / FM Radio Receivers** (16 hrs)
 - a) Brief description of crystal and TRF receiver
 - b) Block diagram and working principle of super heterodyne AM receiver, function of each block and typical wave at I/P and O/P of each block Advantages of super heterodyne reception.
 - c) Performance characteristics of a radio receiver - sensitivity, selectivity, fidelity, S/N ratio, image rejection ration and their measurement procedure.
 - d) Selection criteria for intermediate frequency (IF), Concepts of simple and delayed AGC.
 - e) Block diagram of an FM receiver, function of each block and wave forms at input and output of different blocks. Need for limiting and de-emphasis in FM reception.
 - f) Block diagram of communication receivers, differences with respect to broadcast receivers.

3. **Antennas** (16 hrs)
 - a) Physical concept of radiation of electromagnetic energy from a dipole, Concept of polarization of EM waves, electromagnetic spectrum and its various ranges: VLF, LF, HF, VHF, UHF, Micro-wave

- b) Definition and physical concepts of the terms used with antennas like point source, gain, directivity, aperture, effective area, radiation pattern, beam angle, beam width and radiation resistance.
- c) Types of antennas : brief description, characteristics and typical applications of
 - half wave dipole
 - medium wave (mast) antenna
 - yagi and ferrite rod antenna
- d) Brief description of broadside and end fire arrays, their radiation pattern and applications (without analysis); brief idea about rhombic antenna and disc antenna.

4. Propagation

(16 hrs)

- a) Basic idea about different modes of radio wave propagation, ground wave propagation, space wave communication and sky wave propagation and troposcatter (duct propagation their characteristics and typical areas of applications (e.g. medium wave, short wave, radio and TV communication etc.)
- b) Basic idea of field strength in case of ground wave propagation and space wave propagation
- c) Explanation of terms – critical frequency, maximum usable frequency (MUF) and skip distance
- d) Noise in Radio communication, signal fading

LIST OF PRACTICALS

1. To plot the sensitivity characteristics of a radio receiver and determine the frequency of maximum sensitivity
2. To plot the selectivity characteristics of a radio receiver
3. To align AM broadcast radio receiver
4. To study the faults in radio receiver
5. To measure the DC/AC voltage at different points of a radio receiver
6. Installation of directional antenna for best reception
7. Installation of dish antenna for best reception

RECOMMENDED BOOKS

1. Electronic Communication by Kennedy, Tata McGraw Hill Publishers, New Delhi
2. Electronic Communication System by Reddy & Coolen, Prentice Hall of India
3. Electronic Communication System by KS Jamwal, Dhanpat Rai & Sons, Delhi

4.3 COMPUTER PROGRAMMING AND APPLICATIONS

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RATIONALE

Computers play a very vital role in present day life, more so, in the professional life of diploma engineers. With the extensive use of Information Technology in large number of areas, the diploma engineers should be well conversed with these environments. In order to enable the students to use the computers effectively in problem solving, this course offers the modern programming languages like C along with exposition to various engineering applications of computers.

DETAILED CONTENTS

1. Information Storage and Retrieval
 - 1.1 Need for information storage and retrieval
 - 1.2 Creating data base file
 - 1.3 Querying database file on single and multiple keys
 - 1.4 Ordering the data on a selected key
 - 1.5 Programming a very simple application
2. Programming in C
 - 2.1 Basic structure of C programs
 - 2.2 Executing a C program
 - 2.3 Constants, variables, and data types
 - 2.4 Operators and expressions
 - 2.5 Managing Input-Output operations like reading a character, writing a character, formatted input, formatted output through print, scan, getch, putch statements etc.
 - 2.6 Decision making and branching using IF else, switch, go to statements
 - 2.7 Decision making and looping using do-while, and for statements
 - 2.8 Arrays - one dimensional and two dimensional
 - 2.9 File

3. Computers Application Overview
 - 3.1 Commercial and business data processing application
 - 3.2 Engineering computation
 - 3.3 CAD, CAM, CAE, CAI

4. Typical Applications:

Students will be required to make a small programme for analysis of circuits design in the area of Electronics and Communication Engineering.

Use of various software available in the field of Electronics and Communication Engineering.

LIST OF PRACTICALS

1. Creating database.
2. Querying the database.
3. Report generation.
4. Programming in dbase
5. Use of spread sheets/Matlan/Mathematica/Eureka (or any other package) for engineering computers.
5. Use of design packages (appropriate design packages may be selected depending upon the availability) on Estimating and Costing, Analysis of rates and other areas
7. Use of and electrical engineering related CAI packages.
8. Programming for DAS and control.
9. Exercises on data acquisition.
10. Exercises on control - on/off switch, and proportional control.
11. Programming exercise on executing C program
12. Programming exercise on editing C program

13. Programming exercise on defining variables and assigning values to variables.
14. Programming exercise on arithmetic and relational operators.
15. Programming exercise on arithmetic expressions and their evaluation.
16. Programming exercise on reading a character.
17. Programming exercise on writing a character.
18. Programming exercise on formatting input using print.
19. Programming exercise on formatting output using scan.
20. Programming exercise on simple if statement.
21. Programming exercise on IF else statement.
22. Programming exercise on switch statement.
23. Programming exercise on go to statement.
24. Programming exercise on do-while statement.
25. Programming exercise on for statement.
26. Programming exercise on one-dimensional arrays.
27. Programming exercise on two-dimensional arrays.
28. Exercises on
 - Internet use/application
 - Typical application on Electrical Engineering

RECOMMENDED BOOKS

1. Programming in C by Sachaum Series, McGraw Hills
2. Programming in C by Kerning Lan and Riechie Prentice Hall of India, New Delhi
3. Programming in C by Balaguru Swamy, Tata McGraw Hill, New Delhi
4. Let us C – Yashwant Kanetkar, BPB Publications, New Delhi
5. Vijay Mukhi Series for C and C++
6. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi
6. Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
7. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
8. Elements of C by MH Lewin, Khanna Publishers, New Delhi

4.4 DIGITAL ELECTRONICS - II

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RATIONALE

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 (08 hrs)

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

2. A/D and D/A Converters (08 hrs)

- a) DA Converters : Performance characteristics of D/A converters, binary resistor 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 (12 hrs)

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.

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| 4. | Combinational Circuits | (08 hrs) |
| | Minimisation of Boolean expressions using K-map method, tabular method of function minimization, Quine Mcclaaskey method | |
| 5. | Sequential Circuits | (08 hrs) |
| | 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 | (04 hrs) |
| | 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

4.4 MICROPROCESSORS AND APPLICATIONS

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RATIONALE

The study of microprocessor in terms of architecture, software, and interfacing techniques lead to the understanding of working of CPU in a computer. Also study of peripherals like PPT, PIT, PIC etc. enables understanding and designing of small process control systems.

DETAILED CONTENTS

1. **Introduction** (04 hrs)
Microprocessors – evolution, importance and Application
2. **Architecture of a Microprocessor – 8085** (16 hrs)
 - a) Concept of bus and bus organisation
 - b) Functional block diagram and function of each block
 - c) Pin details of 8085 and related signals
 - d) Demultiplexing of address/data bus and memory/IO read/write control signals
3. **Introduction Set for Intel 8085** (16 hrs)
 - a) Instruction and data format – opcode and operand and its word size
 - b) Instruction cycle, machine cycle, T-states, fetch cycle, and execute cycle
 - c) Different addressing modes
 - d) Status flags and their importance
 - e) Data transfer, arithmetic and logical operation, branching, and machine control instructions
 - f) Use of stacks and subroutines
 - g) Assembly language programming
4. **Interfacing and Data Transfer Schemes** (08 hrs)
 - a) Memory mapped I/O and I/O mapped I/O schemes
 - b) Interrupts of 8085
 - c) Programmable data transfer, DMA data transfer and interrupt driven data transfer schemes with their applications

5. **Peripheral Devices** (12 hrs)
Detailed study of the following
- a) 8255 PPI
 - b) 8253 PIT
 - c) 8257 DMA Controllers
 - d) 8259 PIC
 - e) 8279 Programmable KB/Display Interface
 - f) 8251 Communication Interface Adapter
6. **Introduction to other** 8-bit microprocessor like Z-80, 6800 and their comparison with 8085 (08 hrs)

LIST OF PRACTICALS

1. Familiarisation of different keys of 8085 microprocessor kit and its memory map
2. Steps to enter, modify data/program and to execute a programme on 8085 kit
3. Writing and execution of ALP for addition and subtraction of two 8 bit numbers
4. Writing and execution of ALP for multiplication and division of two 8 bit numbers
5. Writing and execution of ALP for arranging 10 numbers in ascending/descending order
6. Writing and execution of ALP for 0 to 9 BCD counters (up/down counter according to choice stored in memory)
7. Interfacing exercise on 8255 like LED display control
8. Interfacing exercise on 8253 programmable interval timer
9. Interfacing exercise on 8279 programmable KB/display interface like to display the hex code of key pressed on display
10. Study and use of interfacing 8 bit A/D card
11. Study and use of interfacing 8 bit D/A card
12. Use of 8085 emulator for hardware testing

RECOMMENDED BOOKS

1. Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar
2. Microprocessor and Applications by B Ram
3. Comprehensive Study of Microprocessor by Naresh Grover
4. Introduction to Microprocessor by Adithya P Mathur, Tata McGraw Hill Publishers, New Delhi
5. Microprocessor by SK Goel
6. 8051 by Mcakenzie, Prentice Hall of India, New Delhi

4.6 MINOR PROJECT WORK

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RATIONALE

The purpose of this subject is to give practice to the students in elementary design and fabrication of the PCB. The topics of assembly, soldering, testing, and documentation have been included to give overall picture of the process of manufacturing of electronic devices.

Minor project work aims at developing interest of the students about the, what is inside the electronics devices, what is happening and how it happens. The project may be small in size but should include only those components which he has studied in earlier classes, with a clear idea of signals processing. It would enable first hand experience of components, their purchase, assembly, testing and trouble shooting. It would boost up confidence of the students to repair and preparation of electronics gadgets. There should not be more than 2-3 students for each project. A report must be prepared with a hard and soft copy.

Some of the projects are listed below which is just a guideline for selecting the minor project. Students can also select any other project with the advice of his teacher.

1. Regulated power supply
2. Timers using 555 and other oscillators
3. Touch plate switches – transistorized or 555 based
4. Door bell/cordless bell
5. Clapping switch and IR switch
6. Blinkers
7. sirens and hooters
8. Single hand AM or FM
9. Electronic toy gun, walker, blinkers
10. Electronic dice
11. Cell charger, battery charger, mobile charger
12. Fire/smoke/intruder alarm
13. Liquid level controller
14. Counters
15. Combination locks
16. Electronics musical instruments
17. Telephone handset
18. Audio amplifiers
19. Tape recorders
20. Automatic stabilizer/CVT
21. Emergency light
22. Design and manufacture of transformer
23. Fan regulator

This practical training of 3-4 weeks duration will carry 100 marks. 50 marks will be given by industrial/field supervisors and 50 marks by the teacher supervising this training. The components and criteria of evaluation will include the following :

	Criteria	Weightage
a)	Punctuality and regularity	15%
b)	Initiative in learning new things	15%
c)	Relationship with people	15%
d)	Report writing and seminar	55%

ENTREPRENEURIAL AWARENESS CAMP

This is to be organized at a stretch for two to three days during second year. Lectures will be delivered on the following broad topics. There will be no examination for this subject

1. Who is an entrepreneur?
2. Need for entrepreneurship, entrepreneurial career and wage employment
3. Scenario of development of small scale industries in India
4. Entrepreneurial history in India, Indian values and entrepreneurship
5. Assistance from District Industries Centres, Commercial Banks. State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other financial and development corporations
6. Considerations for product selection
7. Opportunities for business, service and industrial ventures
8. Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)
9. Legal aspects of small business
10. Managerial aspects of small business