4.1 NETWORK FILTERS AND TRANSMISSION LINES

L	T	P
3	-	3

RATIONALE

The study of networks, filters and transmission lines leads to understanding of line communication, audio and video communication, and microwave communication. Particularly the study of networks takes off from principles of A.C. theory and introduces the student 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.

LEARNING OUTCOMES

After completion of the course, the learner will be able to

- Describe the concept of symmetrical, asymmetrical, balanced, unbalanced, T, PI, ladder, lattice, L and Bridge T networks
- Demonstrate the operation of filters and attenuators.
- Demonstrate the operation of attenuators.
- Design and measure the attenuation of a symmetrical T/ ᒪI type attenuator
- Determine the characteristic impedance experimentally and Plot the attenuation characteristic of prototype low pass filter and prototype high pass filter
- Plot the Impedance characteristic and attenuation characteristics of prototype band-pass filter and m-derived filters
- Measure standing wave ratio and characteristic impedance of the line
- Draw the attenuation characteristics of a crystal filter

DETAILED CONTENTS

1. Networks (14 hrs)

   - Two port (four terminals) network: Basic concepts of the following terms:
     - Symmetrical and asymmetrical networks: Balanced and unbalanced network; T-network, ᒪI network, Ladder network; Lattice network; L-network and Bridge T-network
   - Symmetrical Network:
     - Concept and significance of the terms characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.
     - T-network and ᒪI Network (No Derivation)

- Asymmetrical Network
  - Concept and significance of iterative impedance, image impedance,
  - The half section (L-section); symmetrical T and ⊓ sections into half sections (No Derivation)

2. Attenuators (05 hrs)

- Units of attenuation (Decibels and Nepers): General characteristics of attenuators
- Analysis and design of simple attenuator of following types; Symmetrical T and ⊓ type, L type.

3. Filters (13 hrs)

- Brief idea of the use of filter networks in different communication systems, concept of low pass, high pass, band pass and band stop filters.
- Prototype Filter Section:
  - Impedance characteristics vs frequency characteristics of a low and high pass filter and their significance
  - Attenuation Vs frequency; Phase shift Vs frequency, characteristics impedance vs frequency of T and ⊓ filters and their significance
  - Simple design problems of prototype low pass section.
- M-Derived Filter Sections
  Limitation of prototype filters, need of m-derived filters
- Crystal Filters
  Crystal and its equivalent circuits, special properties of piezoelectric filters and their use
- Active Filters
  Basic concept of active filters and their comparison with passive filters.

4. Transmission Lines (16 hrs)

- Transmission Lines, their types and applications.
- Distributed constants, T and ⊓ representation of transmission line section.
- Concept of infinite line

- Condition for minimum distortion and minimum attenuation of signal on-the-line and introduction to loading methods.
- Concept of reflection and standing waves, definition of reflection coefficient, SWR & VSWR and their relation (no derivation).
- Concept of transmission lines at high frequencies.
- Introduction to stubs. (single, open and short stubs).

LIST OF PRACTICALS

1. To measure the characteristic impedance of symmetrical T and ꠖ networks
2. To measure the image impedance of a given asymmetrical T and ꠖ networks
3. For a prototype low pass filter:

   a) Determine the characteristic impedance experimentally
   b) Plot the attenuation characteristic

4. To design and measure the attenuation of a symmetrical T/ ꠖ type attenuator

5. For a prototype high pass filter:

   - Determine the characteristic impedance experimentally
   - To plot the attenuation characteristic

6. a) To plot the Impedance characteristic of a prototype band-pass filter
   b) To plot the attenuation characteristic of a prototype band pass filter

7. a) To plot the impedance characteristic of m- derived low pass filter
   b) To plot the attenuation characteristics of m-derived high pass filter

8. To observe the information of standing waves on a transmission line and measurement of SWR and characteristic impedance of the line

9. Draw the attenuation characteristics of a crystal filter

Class Project: Fabricate any filter circuit and measure its characteristic impedance.

INSTRUCTIONAL STRATEGY

Stress should be laid on problems in networks/ filler and transmission lines. Practical must be carried out after completion of topic to gain a good know how on the subject students should be given home assignments on various topics, stress on making own

circuit models to calculate input/output impedance, characteristic impedance, losses etc. should be carried out by the students.

RECOMMENDED BOOKS

1. Network Lines and Fields by John D Ryder; Prentice Hall of India, New Delhi
2. Network Filters and Transmission Lines by AK Chakarvorty; Dhanpat Rai and Co. Publication, New Delhi
3. Network Analysis by Van Valkenburg: Prentice Hall of India, New Delhi
4. Network Analysis by Soni and Gupta; Dhanpat Rai and Co. Publication, New Delhi
5. Network Theory and Filter Design by Vasudev K. Aatre
6. Network Filters and Transmission line by Umesh Sinha
7. Electrical and Electronics Measuring instrumentation , A.K Sawhney, Dhanpat Rai and Co. Publication, New Delhi
8. Network Analysis by G.K. Mithal
9. Network Filters and Transmission line by Nardeep Goyal, Rajneesh Kumari, Tech. Max Publication, Pune.

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	**Time Allotted (Hrs)**	**Marks Allocation (%)**
1	14	25
2	5	10
3	13	30
4	16	35
Total	**48**	**100**

4.2 COMMUNICATION SYSTEMS

L	T	P
4	-	3

RATIONALE

This course provides the basics of electronic communication systems including transmitters, receivers, antennas and various modes of propagation of signals. In addition to components and systems of fiber optic communication, the students will learn the basics of satellite communication. This course will provide the students with perspectives of different communication systems.

LEARNING OUTCOME

After completion of the course, the learner will be able to:

- Classify the transmitters on the basis of modulation, service, frequency and power
- Demonstrate the working of each stage of AM and FM transmitters
- Identify the waveforms at different stages of a Radio Receiver
- Tune AM broadcast radio receiver
- Measure the performance characteristics of a radio receiver(sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio).
- Determine the appropriate value of Intermediate Frequency IF.
- Identify the waveforms at different stages of a FM receiver
- Identify the various types of antennas used in different frequency ranges
- Plot the radiation pattern of directional and omni-directional antenna
- Explain various modes of propagation of waves i.e. Ground Wave, Sky Wave, Space Wave and Duct Propagation.
- Explain satellite communication link and terms related to satellite orbit.
- Plot the variation of field strength of a radiated wave, with distance from a transmitting antenna

DETAILED CONTENTS

1. AM/FM Transmitters (10 hrs)

   - Classification of transmitters on the basis of modulation, service, frequency and power
   - Block diagram of AM transmitters and working of each stage
   - Block diagram and working principles of reactance FET and armstrong FM transmitters

2. AM/FM Radio Receivers (16 hrs)

- Principle and working with block diagram of super heterodyne AM receiver. Function of each block and typical waveforms at input and output of each block
- Performance characteristics of a radio receiver: sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio and their measurement procedure. ISI standards on radio receivers (brief Idea)
- Selection criteria for intermediate frequency (IF). Concepts of simple and delayed AGC
- Block diagram of an FM receiver, function of each block and waveforms at input and output of different blocks. Need for limiting and de-emphasis in FM reception
- Block diagram of communication receivers, differences with respect to broadcast receivers.

3. Antennas: (16 hrs)

- Electromagnetic spectrum and its various ranges: VLF, LF, MF, HF, VHF, UHF, Microwave.
- Physical concept of radiation of electromagnetic energy from a dipole. Concept of polarization of EM Waves.
- Definition and physical concepts of the terms used with antennas like point source, gain directivity, aperture, effective area, radiation pattern, beam width and radiation resistance, loss resistance.
- Types of antennas-brief description, characteristics and typical applications of half wave dipole, medium wave (mast) antenna, folded dipole.
- Structure, Characteristics and typical applications of Horn antenna and dish antenna.

4. Propagation: (12 hrs)

- Basic idea about different modes of wave propagation and typical areas of application. Ground wave propagation and its characteristics, summer field equation for field strength.

- Space wave communication – line of sight propagation, standard atmosphere, concept of effective earth radius range of space wave propagation standard atmosphere

- Duct propagation : sky wave propagation - ionosphere and its layers. Explanation of terms - virtual height, critical frequency, skip distance, maximum usable frequency, multiple hop propagation.

5. Satellite Communications*:* (10 hrs)

- Basic idea, passive and active satellites, Meaning of the terms; orbit, apogee, perigee

- Geo-stationary satellite and its need. Block diagram and explanation of a satellite communication link.
- Introduction to VSAT and its features.

LIST OF PRACTICALS

1. To observe the waveforms at different stages of a AM transmitter
2. To observe the waveforms at different stages of a Radio Receiver
3. To align AM broadcast radio receiver
4. To identify and study the various types of antennas used in different frequency ranges.
5. To plot the radiation pattern of a directional and omni directional antenna
6. To plot the variation of field strength of a radiated wave, with distance from a transmitting antenna..

Class Project:

Fabricate wireless remote transmitter and receiver as is used in common toys and verify its operation.

NOTE:Visits to appropriate sites of digital/data communication networks, satellite communication, telemetry centres (like remote sensing) should be made with a view to understand their working. A comprehensive report must be prepared by all students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

1. Communication Systems by George Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Communication Systems by A.K. Gautam, SK Kataria and Sons, New Delhi.

3. Fundamentals of Communication System by Fitz, Tata McGraw Hill Education Pvt Ltd, New Delhi
4. Electronic Communication Sytesms by K.S. Jamwal, Dhanpat Rai and Sons, New Delhi.
5. Electronic Communication System by Roddy and Coolen, Prentice Hall of India, New Delhi.
6. Handbook of Experiments in Electronics and Communication Engineering by S. Poornachandra Rao, and B Sasikala, Vikas Publishing House Pvt Ltd, Jangpura, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	10
2	16	30
3	16	30
4	12	15
5	10	15
Total	**64**	**100**

4.3 POWER ELECTRONICS

L	T	P
4	-	3

RATIONALE

Diploma holders in Electronics and related fields 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 reinforce the knowledge and skill of the students.

LEARNING OUTCOME

After completion of the subject, the learner will be able to:

- Describe the construction, working principles of SCR, two transistor analogy of SCR, SCR specifications, methods of SCR triggering.
- Plot and explain V-I characteristics of SCR, TRIAC, UJT, DIAC
- Draw and demonstrate I/P and O/P wave forms of UJT relaxation oscillator
- Draw and demonstrate the wave shape of voltage at relevant point of single-phase controlled rectifiers(half wave, full wave) and effect of change of firing angle.
- Draw and demonstrate wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit
- Install UPS system and routine maintenance of batteries
- Demonstrate the concept and working of choppers, inverters, dual converters, and cyclo-conveters.
- Explain basic ideas about electric drives(AC and DC)

DETAILED CONTENTS

1. Introduction to thyristors and other Power Electronics Devices (18 hrs)

   - Construction, working principles of SCR, two transistor analogy of SCR, V-I characteristics of SCR.
   - SCR specifications & ratings.
   - Different methods of SCR triggering.
   - Different commutation circuits for SCR.
   - Construction & working principle of DIAC, TRIAC & their V-I characteristics.
   - Construction, working principle of UJT, V-I characteristics of UJT. UJT as relaxation oscillator.
   - Basic idea about the selection of Heat sink for thyristors.
   - Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.

2. Controlled Rectifiers (08 hrs)

- Single phase half wave controlled rectifier with load (R, R-L)
- Single phase half controlled full wave rectifier (R, R-L)
- Fully controlled full wave bridge rectifier.
- Single phase full wave centre tap rectifier.

3. Inverters, Choppers, Dual Converters and Cyclo converters. (16 hrs)

- Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel. Inverters & their applications.
- Choppers: Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step down choppers.
- Dual Converters and cyclo converters: Introduction, types & basic working principle of dual converters and cyclo converters & their applications.

4. Thyristorised Control of Electric drives (14 hrs)

a) DC drive control
- Half wave drives.
- Full wave drives
- Chopper drives (Speed control of DC motor using choppers)

b) AC drive control
- Phase control
- Constant V/F operation
- Cycloconverter/Inverter drives.

5. Uninterrupted Power supplies (08 hrs)

- UPS, on-line, off line & its specifications
- Concept of high voltage DC transmission
- Concept of SMPS

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) Demonstrate of wave shape of voltage at relevant point of single-phase half wave controlled rectifier and effect of change of firing angle.
7) Demonstrate of wave shapes of voltage at relevant point of single phase full wave controlled rectifier and effect of change of firing angle.

8) Demonstrate of wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit for .
9) Study of varying lamp intensity and AC fan speed control.
10) Installation of UPS system and routine maintenance of batteries.
11) Speed control of motor using SCRs

Class Project: Fabricate any SCR based rectifier circuit and verify its operation.

INSTRUCTIONAL STRATEGY

Power Electronics being very important for industrial controls requires a thorough know how about industrial devices. Teacher should take to the class various SCRs and other semiconductor devices to demonstrate these to the students. The teacher may encourage students to perform practical simultaneously for better understanding of the subject and verification of theoretical concepts. So industrial visit in between the course is a must.

RECOMMENDED BOOKS

1) Power Electronics by P.C. Sen, Tata Mc Graw Hill Education Pvt Ltd. New Delhi
2) Power Electronics by P.S. Bhimbhra, Khanna Publishers, New Delhi
3) Power Electronics – Pricilpes and Applications by Vithayathi, Tata Mc Graw Hill Education Pvt Ltd. New Delhi
4) Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.
5) Power Electronics by MH Rashid
6) Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi
7) Power Electronics by S Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
8) Power Electronics by Sugandhi and Sugandhi
9) Power Electronics – Principles and Applications by J Michael Jacob, Vikas Publishing House, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	18	30
2	08	15
3	16	25
4	14	20
5	08	10
Total	**64**	**100**

4.4 MICROPROCESSORS

L T P
4 - 3

RATIONALE

The study of microprocessors in terms of architecture, software and interfacing techniques leads to the understanding of working of CPU in a microcomputer. The development in microprocessors of 32 bit architecture brings them face-to-face with mainframe, finding employment in R&D, assembly, repair and maintenance of hardware of microprocessors and computers.

Microprocessors find application in process control industry. They also form a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessor is an area of specialization. Students of electronics and related engineering branches often use microprocessors to introduce programmable control in their projects, in industrial training.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Write, edit a machine language program using mnemonics
- Describe all the internal parts and pins of 8085 and 8086
- Write, execute and debug assembly language programs for simple applications.
- Interface various peripheral devices with microprocessor.
- Use various data transfer techniques used in microcomputers.

DETAILED CONTENTS

1. Evolution of Microprocessor (3 hrs)

   - Typical organization of a microcomputer and functions of its various blocks
   - Microprocessor, its evolution, function and impact on modern society

2. Architecture of a Microprocessor (With reference to 8085 microprocessor) (8 hrs)

   - Concept of Bus, bus organization of 8085
   - Functional block diagram of 8085 and function of each block
   - Pin details of 8085 and related signals
   - De-multiplexing of address/data bus of read/write control signals
   - Steps to execute a stored programme

3. Memories and I/O interfacing (8 hrs)

- Basic RAM Cell, N X M bit RAM, Expansion of word length and capacity, static and dynamic RAM, basic idea of ROM, PROM, EPROM and EEPROM
- Memory organization, Concept of memory mapping, partitioning of total memory space, Address decoding, concept of I/O, mapped I/O and memory mapped I/O, interfacing of memory mapped I/O devices
- Concept of stack and its function

4. Programming (with respect to 8085 microprocessor) (14 hrs)

- Brief idea of machine and assembly languages, Machines and Mnemonic codes
- Instruction format and addressing modes, identification of instructions as to which addressing mode these belong
- Concept of instruction set, Explanation of the instructions of the following groups of instruction set

  Data transfer groups, arithmetic group, logic group, stack, I/O and machine control group
- Programming exercises in assembly language. (Examples can be taken from the list of experiments)
- Serial data transfer using RIM and SIM instructions

5. Instruction Timing and Cycles (3 hrs)

- Instruction cycle, machine cycle and T-states
- Fetch and execute cycle

6. Interrupts (4 hrs)

- Concept of interrupt
- Maskable and non-maskable interrupts
- Edge triggered and level triggered interrupts
- Software interrupts
- Restart interrupts and its use
- Various hardware interrupts of 8085
- Servicing interrupts, extending interrupt system

7. Peripheral devices (8 hrs)

- 8255 PPI and 8253 PIT
- 8257 DMA controller
- 8279 Programmable KB/Display Interface

- 8251 Communication Interface Adapter
- 8155/8156

8. Architecture of 8086 Microprocessor (8 hrs)

- Internal Architecture of 8086.
- Concept of memory segmentation and physical address generation.
- Memory and date addressing mode
- Minimum and Maximum mode of 8086

9. Instruction sets of 8086 (8 hrs)

- Instruction Format.
- Data transfer.
- Arithmetic
- Bit and logical manipulation
- String
- Program transfer and processor control instructions
- Assembler and assembler directives

LIST OF PRACTICALS

1. Familiarization 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. Execution of ALP on 8085 kit for addition/subtraction of two 8 bit numbers.
4. Execution of ALP on 8085 kit for Multiplication/Division of two 8 bit numbers.
5. Execution of ALP on 8085 kit for arranging 10 numbers in ascending/descending order.
6. Execution of ALP on 8085 kit 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. Demonstration of different keys of 8086-microprocessor kit and its memory map.
9. Execution of steps to enter, check /modify data or program and to execute a program on 8086 microprocessor kit.
10. Execution of ALP on 8086 kit for addition/subtraction of two 16 bit numbers (signed and unsigned).
11. Execution of ALP on 8086 kit for Multiplication/Division of two signed/unsigned numbers.

RECOMMENDED BOOKS

1. Microprocessor Architecture, Programming and Applications with 8080/8085 by Ramesh S Goanker, Willey Eastern Ltd, New Delhi
2. Introduction to Microprocessor by Mathur, Tata McGraw Hill Education Pvt. Ltd. New Delhi
3. Advanced Microprocessor and Interfacing by Badri Ram, Tata McGraw Hill Education Pvt. Ltd. New Delhi
4. Microprocessor and Application by D.V. Hall; McGraw Hill Book Co. New Delhi
5. Microprocessor 8086/88 by B.B. Brey; Pearson Education, New Delhi
6. Microprocessor and Applications by B Ram; McGraw Hill Book Co. New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	03	05
2.	08	13
3.	08	13
4.	14	20
5.	03	05
6.	04	05
7.	08	13
8.	08	13
9.	08	13
Total	**64**	**100**

4.5 ELECTRONICS DESIGN AND SIMULATION TECHNIQUES

L	T	P
-	-	6

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.

LEARNING OUTCOMES

After completion of the course, the learner will be able to:

- Demonstrate skills in assembly of components, soldering, and desoldering techniques
- Prepare a PCB, mount the components and assemble in a cabinet
- Design of electric circuit using software ORCAD/ PSpice /EAGLE/ SEQUEL
- Demonstrate drilling, photo plating, explain concept of SMDs (Surface Mount Devices)
- Assemble circuits on PCB
- Design a mini project using basic techniques

PRACTICAL EXERCISES

1. Electronic Design

   - Selection and use of commonly used active and passive components
   - Testing of active and passive components
   - Develop skills in assembly of components, soldering, and soldering techniques
   - Procedure for Cabinet Making

2. Fabrication Techniques

   - Printed Circuit Boards (PCBs):
     - PCB board materials, their characteristics and plating, corrosion and its prevention.
     - Photo processing, screen printing, etching, high speed drilling, buffing, surface treatment and protection from harsh environments, plated through holes, double sided and multilayer PCBs.

- Standards of board sizes. Modular assemblies edge connectors, multi board racks, flexible boards.
- Assembly of circuits on PCB, soldering techniques, role of tinning, flow and wave soldering, solderability, composition of solder. Edge connector. Elements of wire shaping.

3. PSpice/ ORCAD/EDA Based Circuit Simulations

- Introduction to WinSpice
- DC analysis of resistor network
- Characteristics of p-n junction diode
- Half wave rectifier
- Clamper circuit
- I/O characteristics of BJT
- Transistor CE amplifier
- Input and output characteristics of JFET

4. Event Driven Circuit Simulation
(Using software like SEQUEL

- Introduction to Software
- Simulation of logic gates.
- Simulation of combinational circuit.

LIST OF PROJECTS (to be designed individually)

Some of the mini projects are listed below which is just a guideline for selecting the mini 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 band 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. Electronic Ballasts
19. Audio amplifiers
20. Automatic stabilizer/CVT
21. Emergency light
22. Fan regulator

INSTRUCTIONAL STRATEGY

More emphasis may be laid on practical Project. Small industrial problems may be taken as assignments. Practical training regarding fabrication techniques using CAD may be carried out.

RECOMMENDED BOOKS

2. Printed Circuit Board by Bosshart; McGraw Hill Education Pvt Ltd., New Delhi

3. Printed Circuit Board by RS Khandpur, Tata McGraw Hill Education Pvt Ltd., New Delhi

4. Electronics Techniques by Rajesh Kumar, NITTTR, Chandigarh

5. Modular CAD for PCBs using EAGLE Software by Rajesh Kumar, NITTTR, Chandigarh

6. Electronic Manufacturing Technology by KS Jamwal; Dhanpat Rai and Sons, New Delhi

4.6 GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

L	T	P
3	-	-

RATIONALE

Generic Skills and Entrepreneurship Development is one of the courses from "Human Science" subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aims at developing conceptual understanding for setting-up one's own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager. Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma pass-outs for enhancing their employability and self confidence.

LEARNING OUTCOME

After undergoing the subject, the student will be able to:

- Explain the importance of generic skills
- Demonstrate self development
- Manage himself/herself physically, intellectually and psychologically
- Work effectively as a team member
- Manage tasks effectively
- Apply knowledge to solve problems
- Develop an entrepreneurial mindset.
- Identify entrepreneurial support system for new ventures and small businesses.
- Recognize a business opportunity.
- Prepare project report
- Demonstrate how to launch an individual's entrepreneurial career

DETAILED CONTENTS

1. Introduction to Generic Skills (04 hrs)

    1.1 Importance of Generic Skill Development
    1.2 Global and Local Scenario of Generic Skill Development
    1.3 Life Long Learning and associated importance of Generic Skill Development

2. Managing Self (08 hrs)

2.1 Knowing Self for Self Development
- Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

2.2 Managing Self - Physical
- Personal grooming, Health, Hygiene, Time Management

2.3 Managing Self – Intellectual development
- Information Search: Sources of information
- Writing Skills – Official & business correspondence, Job application covering letter and resume
- Speaking Skills – Mock interview, Preparing for meeting, Group discussion

2.4 Managing Self – Psychological
- Stress, Emotions, Anxiety-concepts and significance
- Techniques to manage stress

3. Managing in Team (06 hrs)

3.1 Team - definition, team dynamics

3.2 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background

4 Task Management (03 hrs)

4.1 Task Initiation, planning, execution, close out

4.2 Exercises/case studies on task planning towards development of skills for task management

5. Problem Solving (05 hrs)

5.1 Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving

5.2 Different approaches for problem solving.

5.3 Steps followed in problem solving.

5.4 Exercises/case studies on problem solving.

6. Entrepreneurship (22 hrs)

6.1 Introduction
- Concept/Meaning and its need
- Qualities of an entrepreneur

- Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Market Survey and Opportunity Identification (Business Planning)

- How to start a small scale industry
- Procedures for registration of small-scale industry
- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity
- Considerations in product selection

6.3 Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Preparation of Detailed Project Report

INSTRUCTIONAL STRATEGY

This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting ones own business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.

RECOMMENDED BOOKS

1. Soft Skills for Interpersonal Communication by S. Balasubramanian Published by Orient Black Swan, New Delhi**.**
2. Generic skill Development Manual, MSBTE, Mumbai.
3. Lifelong learning, Policy Brief (www.oecd.orf)
4. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
5. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	04	05
2.	08	15
3.	06	10
4.	03	10
5.	05	10
6.	22	50
Total	**48**	**100**

ENTREPRENEURIAL AWARENESS CAMP

This is to be organized at a stretch for two to three days during fourth semester. Lectures will be delivered on the following broad topics by experts. 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