

## 5.1 EMPLOYABILITY SKILLS – I

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### RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. Our diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market and survive in cut throat competition among professionals.

### DETAILED CONTENTS

- |    |  |          |
|----|--|----------|
| 1. | Writing skills                                   | (08 hrs) |
|    | i) Official and business correspondence          |          |
|    | ii) Job application - covering letter and resume |          |
|    | iii) Report writing - key features and kinds     |          |
| 2. | Oral Communication Skills                        | (20 hrs) |
|    | i) Giving advice                                 |          |
|    | ii) Making comparisons                           |          |
|    | iii) Agreeing and disagreeing                    |          |
|    | iv) Taking turns in conversation                 |          |
|    | v) Fixing and cancelling appointments            |          |
| 3. | Generic Skills                                   | (04 hrs) |
|    | i) Stress management                             |          |
|    | ii) Time management                              |          |
|    | iii) Negotiations and conflict resolution        |          |
|    | iv) Team work and leadership qualities           |          |

## 5.2 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 and other items like digital clocks, calculator's 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 Systems: (08 hrs)
  - 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)
2. Television (24 hrs)
  - 2.1. Monochrome TV
    - a) Elements of TV communication system
    - b) Scanning and its need
    - c) Need of synchronizing and blanking pulses, VSB
    - d) Composite Video Signal
    - e) Picture Tube
    - f) Camera Tube : Vidicon and Plumbicon
    - g) 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 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 and LED TV (04 hrs)
  4. Cable Television: Working of Cable TV, DTH, HDTV (04 hrs)
  5. Electronics Gadgets: Principle, Working and troubleshooting with special emphasis on control panel (08 hrs)
    - a) Scanner
    - b) Digital Camera
    - c) VCD/DVD

### LIST OF PRACTICALS

1. To plot the frequency response of a Microphone
2. To plot the frequency response of a Loud Speaker
3. Trouble shooting of CD/DVD Player
4. To observe the wave forms and measure voltage of B/W TV Receiver at different points.
5. To observe the waveforms and measure voltages of colour TV Receiver at different points.
6. Fault finding of colour T.V
7. Demonstration and Operation of following.
  - (a) DTH System
  - (c) Scanner

### INSTRUCTION STRATEGY

This subject gives the knowledge of the various day-to-day life electronic products. So, the teacher is required to show and demonstrate the gadgets and impart practical knowledge to the students. For that one should give home assignment and frequent industrial visit should be there. Visit to TV studio and TV transmitter station should be arranged to give a practical exposure to the students

### RECOMMENDED BOOKS

1. Audio and Video Systems by RG Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Colour Television-Principles and Practice by R.R Gulati , Wiley Eastern Limited, New Delhi
3. Complete Satellite and cable Television R.R Gulati New age International Publisher, New Delhi

4. Colour Television Servicing by RC Vijay BPB Publication, New Delhi
5. Colour Television and Video Technology by A.K. Maini CSB Publishers
6. Consumer Electronics Yagnik & Jain by Ishan Publication, Ambala.
7. Colour TV by A.Dhake
8. Service Manuals, BPB Publication, New Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER**

<b>Sr. No</b>	<b>Topic</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allocation%</b>
1	Audio System	08	15
2	Television	24	50
3	LCD and LED TV	04	10
5	Cable Television	04	10
6	Electronics Gadgets	08	15
<b>Total</b>		<b>48</b>	<b>100</b>

## 5.3 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 (08 hrs)
 

Fiber alignment and joint losses, splicing, types of splices, types of connectors used, couplers, three and four port coupler, stare 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.. Introduction to SDH, SONET

### 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 defector
8. To Connectorise a fiber with connector at both ends
9. Introduction to various components and tools used in optical fiber communication
10. A visit to nearby Telephone Exchange

### 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 fiber Communication by Yashpal & Sanjeev Kumar, North Publication, Ambala
5. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi
6. Optical fiber Communication Systems by GP Agrawal, John Wiley and Sons, New Delhi
7. Optical fiber Communication and its Applications by S C Gupta, Prentice Hall of India, New Delhi
8. Optical fiber communication by R.K. Gautam, King India Published Ltd. New Delhi

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr. No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Introduction	08	18
2	Optical Fibers and Cables	08	16
3	Losses in optical fiber cable	08	16
4	Light sources and Detectors	08	16
5	Connectors, Splicing and coupling	08	16
6	Optical Fiber System	08	18
<b>Total</b>		<b>48</b>	<b>100</b>

## 5.4 TROUBLE SHOOTING OF ELECTRONIC EQUIPMENT

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### RATIONALE

The course provides the students with necessary knowledge and competency to diagnose the faults for trouble shooting and for systematic repair and maintenance of electronic equipment and testing of components.

**NOTE:** Students are to be given the awareness about the following topics during the Laboratory Work. There will not be any theory examination.

### TOPICS TO BE DISCUSSED

1. Repair, Servicing and Maintenance Concepts
 

Introduction, Modern electronic equipment, Mean time between failures (MTBF), Mean time to repair (MTR), Maintenance policy, potential problems, preventive maintenance, corrective maintenance.

  - a) Study of basic procedure of service and maintenance
  - b) Circuit tracing techniques
  - c) Concepts of shielding, grounding and power supply considerations in instruments.
  
2. Fundamental Trouble Shooting Procedures
  - i) Fault location
  - ii) Fault finding aids
    - Service manuals
    - Test and measuring instruments
    - Special tools
  - iii) Trouble Shooting Techniques
    - Functional Areas Approach
    - Split half method
    - Divergent, convergent and feedback path circuit analysis
    - Measurement techniques
  
3. Mobile Phones
  - Identification of various parts of mobile phones
  - Repair and maintenance of mobile phones
  - Software installation in mobile phones
  - Common faults

4. Trouble shooting and maintenance of testing equipment like C.R.O , function generator, power supplies and other measuring devices, detailed discussion about trouble shooting of medical, electronic equipment like, ECG, EEG, Ultra sound. Repair and maintenance and exposure of medical electronics equipment through industrial visits.
5. Troubleshooting Digital Systems  
Typical faults in digital circuits. Use of logic dip, logic pulsar, IC tester
6. Demonstration and practicals to be performed on following groups of Electronic equipment, with compulsory visit to low service centre.

**Choice of one equipment from each group is compulsory.**

<b>Group-I Communication</b>	<b>Group-II Consumer</b>	<b>Group-III Audio-video</b>	<b>Group-IV Computer</b>
Telephone Handsets.	Inverters/UPS Emergency Lights	TV, CRT, LCD/HD	Monitor
Cordless Phones	Stabilizers	VCD, DVD Players	Printer (Laser)
Fax Machine	EPABX	CCTV	Printer (Inkjet)
Modem	Hub/Switches	Audio Systems	Scanner
Walkie / Talkie	Electronic Toys		Keyboard, Mouse
			Video Games

### **LIST OF PRACTICALS**

1. Demonstration and practice of fault finding and repair of:
  - (a) C.R.O
  - (b) Function Generator
  - (c) Power supplies
  - (d) Digital multimeter
2. Demonstration, practice of fault finding and repair of any one equipment from group-I i.e. Communication
3. Demonstration, practice of fault finding and repair of any one equipment from group-II i.e. Consumer
4. Demonstration, practice of fault finding and repair of any one equipment from group-III i.e. Audio/Video systems



5. Demonstration, practice of fault finding and repair of any one equipment from group IV i.e. Computer
6. Testing of Integrated Circuits (ICs)
7. Use of digital tools for troubleshooting digital equipments

#### **RECOMMENDED BOOKS**

1. Modern Electronic Equipment Trouble shooting, Repair and Maintenance by RS Khandpur, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Troubleshooting and maintenance of Electronics Equipment by Manoj Kumar, Satya Parkashan

## 5.5 MICROWAVE AND RADAR ENGINEERING

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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   | (02 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. | Wave guides  | (06 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. |          |
| 3. | Microwave Components   | (08 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.  |          |
| 4. | Microwave Devices  | (10 hrs) |
|    | Basic concepts of thermionic emission and vacuum tubes, Effects of inter-electrode capacitance, Lead 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
5. Microwave antennas (04 hrs)  
Structure characteristics and typical applications of Horn and Dish antennas
6. Microwave Communication systems (08 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 (08 hrs)
- Introduction to radar, its various applications, radar range equation (no derivation) and its applications.
  - Block diagram and operating principles of basic pulse radar. Concepts of ambiguous range, radar area of cross-section and its dependence on frequency.
  - Block diagram and operating principles of CW (Doppler) and FMCW radars, and their applications.
  - Block diagram and operating principles of MTI radar.
  - Radar display- PPI
8. Introduction to VSAT transponders multiple access techniques, VSAT and its features (02 hrs)

### 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.

### 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.

## INSTRUCTIONAL STRATEGY

Microwave and radar is a very important subject and requires both theoretical as well as practical exposure. The teaching should be supplemented by visits to the microwave stations and using suitable audio visual aids.

## RECOMMENDED BOOKS

1. Microwave Devices and Components by Sylio, Prentice Hall of India, New Delhi
2. Communication System by Sanjay Sharma
3. Microwave & Radar Engg. by Navneet Arora, Ishan publication, Ambala
4. Electronics Communication by Roddy and Coolen
5. Electronics Communication System by KS Jamwal, Dhanpat Rai and Sons, Delhi
6. Microwave Engineering by Das, Tata McGraw Hill Education Pvt Ltd , New Delhi

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction to Microwaves	02	5
2	Wave guides	06	10
3	Microwave Components	08	15
4	Microwave Devices	10	20
5	Microwave antennas	04	10
6	Microwave Communication systems	08	15
7	Radar Systems	08	15
8	Introduction to VSAT	02	10
	<b>Total</b>	<b>48</b>	<b>100</b>

## 5.6 POWER ELECTRONICS

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### RATIONALE

Diploma holders play a vital role in the field of Electronics especially in industry and research organizations 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 (13 hrs)
  - a) Construction, Working principle of SCR, two transistor analogy of SCR, V-I characteristics of SCR.
  - b) SCR specifications and ratings.
  - c) Different methods of SCR triggering.
  - d) Different commutation circuits for SCR.
  - e) Series and parallel operation of SCR.
  - f) Construction and working principle of DIAC, TRIAC and their V-I characteristics.
  - g) Construction, working principle of UJT, V-I characteristics of UJT. UJT as relaxation oscillator.
  - h) Brief introduction to Gate Turn off thyristor (GTO), Programmable Uni-junction Transistor (PUT), MOSFET.
  - i) Basic idea about the selection of Heat sink for thyristors.
  - j) Applications such as light intensity control, speed control of universal motors, fan regulator, battery charger.
  
2. Controlled Rectifiers (07 hrs)
  - a) Single phase half wave controlled rectifier with load (R, R-L)
  - b) Single phase half controlled full wave rectifier with load (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)
  - a) Principle of operation of basic inverter circuits, concepts of duty cycle, series and parallel Inverters and their applications.

- b) Choppers: Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step down choppers.
  - c) Dual Converters and cyclo converters: Introduction, types and basic working principle of dual converters and cyclo converters and their applications.
4. Thyristorised Control of Electric drives (10 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
    - ii) Constant V/F operation
    - iii) Cycloconverter/Inverter drives.
5. Un interrupted Power Supply (UPS) (06 hrs)
- a) UPS: Block Diagram & specifications of on-line, off line and Smart UPS
  - b) Concept of high voltage DC transmission

### LIST OF PRACTICALS

- 1) To plot V-I characteristic of an SCR.
- 2) To plot V-I characteristics of TRIAC.
- 3) To plot V-I characteristics of UJT.
- 4) To plot V-I 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 Varying lamp intensity and AC fan speed control.
- 9) Installation of UPS system and routine maintenance of batteries.

## 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 – Principles and Applications by Vithayathi, Tata Mc Graw Hill Education Pvt Ltd. New Delhi
- 4) Power Electronics by Sanjay Puri & Chopra North Publication, Ambala
- 5) Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.
- 6) Power Electronics by MH Rashid
- 7) Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted%
1	Introduction to thyristors and other power electronics devices	13	30
2	Controlled Rectifiers	07	15
3	Inverters, Choppers, Dual Converters and Cyclo converters.	12	25
4	Thyristorised Control of Electric drives	10	20
5	UPS	06	10
	<b>Total</b>	<b>48</b>	<b>100</b>

## 5.7 ENVIRONMENTAL EDUCATION

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### RATIONALE

Education about environment protection is a must for all the citizens. In addition, a diploma holder must have knowledge of different types of pollution caused by industries and construction activities so that he may help in balancing the eco system and controlling pollution by adopting pollution control measures. He should also be aware of environmental laws related to the control of pollution.

### DETAILED CONTENTS

1. Definition, Scope and Importance of Environmental Education (02 hrs)
2. Basics of ecology, biodiversity, eco system and sustainable development (03 hrs)
3. Sources of pollution - natural and manmade, causes, effects and control measures of pollution (air, water, noise, soil, radioactive and nuclear) and their units of measurement (12 hrs)
4. Solid waste management – Causes, effects and control measures of urban and industrial waste (06 hrs)
5. Mining and deforestation – Causes, effects and control measures (04 hrs)
6. Environmental Legislation - Water (prevention and control of pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board, Environmental Impact Assessment (EIA) (10 hrs)
7. Role of Non-conventional Energy Resources (Solar Energy, Wind Energy, Bio Energy, Hydro Energy) (04 hrs)
8. Current Issues in Environmental Pollution – Global Warming, Green House Effect, Depletion of Ozone Layer, Recycling of Material, Environmental Ethics, Rain Water Harvesting, Maintenance of Groundwater, Acid Rain, Carbon Credits. (07 hrs)

### INSTRUCTIONAL STRATEGY

The contents will be covered through lecture cum discussion sessions. In addition, in order to have more appreciation of need for protection of environment, it is suggested that different activities pertaining to Environmental Education like video films, seminars, environmental awareness camps and expert lectures may also be organized.



**RECOMMENDED BOOKS**

1. Environmental Engineering and Management by Suresh K Dhameja; SK Kataria and Sons, New Delhi.
2. Environmental Science by Dr. Suresh K Dhameja; SK Kataria and Sons, New Delhi.
3. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
4. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
5. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
7. Environmental Studies by Erach Bharucha; UGC University Press.

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted for Lectures (Periods)</b>	<b>Marks Allotted (%)</b>
1	02	04
2	03	06
3	12	24
4	06	12
5	04	10
6	10	20
7	04	10
8	07	14
<b>Total</b>	<b>48</b>	<b>100</b>

## PERSONALITY DEVELOPMENT CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person interviews; telephonic interviews, panel interviews; group interviews and video conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene