

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 ENVIRONMENTAL EDUCATION

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RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by 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

In addition, different activities pertaining to Environmental Education like expert lectures, seminar and awareness camps etc. may also be organized.

RECOMMENDED BOOKS

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

SUGGESTED DISTRIBUTION OF MARKS

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

5.3 CAD/CAM

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3 - 2

RATIONALE

CAD/CAM subject is very important these days and is extensively required in industry. This subject enables the students to learn about the applications of computer in design and manufacturing.

DETAILED CONTENTS

Section – I CAD

1. Fundamentals of CAD (04 hrs)

Introduction, Design Process, Application of Computers in Design. Creating Manufacturing, Database, Automation, Difference between CAD/CAM and Automation. Coordinate systems, User coordinates, Working Coordinate System (WCS), User Coordinate System (UCS). Benefits of CAD

2. CAD Hardware (06 hrs)

Input Devices: Keyboard, Touch Panel, Light pens, Graphic tables, Joysticks, Trackball, Mouse, Voice System.

Output Devices : Storage Tube, Graphics displays, Raster Refresh Graphic Displays, Plasma Panel Displays, Liquid Crystal Displays (LCD), Light Emitting Diodes (LED), Central Processing Unit (CPU)

3. CAD/CAM (08 hrs)

Geometrical Modelling, Data Structures, Database Management System (DBMS), Database coordinate System, Solid frame modelling and Wire frame modelling

4. Geometrical Transformation (08 hrs)

Introduction to transformation, scaling, rotation and translation in 2D. Concatenation

Section – II CAM

5. Fundamental of CAM (06 hrs)

Introduction, Manufacturing line, Application of computers in manufacturing

6. NC Machine Tools (08hrs)

Nomenclature NC Machine axis, Types of NC machine tools, Features of NC machine tools, NC Motion control System. Machine control Unit: Manual Control Panel, NC Actuation Systems, Part program to command signal, MCU organization, Transducer for NC machine tools

7. Computer Control in NC (08 hrs)

Problems with Conventional NC, Computer Numerical Control, Direct Numerical Control (DNC), Combined DNC/CNC Systems. ADAPTIVE CONTROL SYSTEM - their types, Advantages; Adaptive control for proper cutting speed, feed in turning operation

PRACTICAL EXERCISES

1. Introduction to AutoCAD: Setting up, practice on – how to create a new drawing file, setting drawing limits and saving a file, drawing lines in different ways using absolute coordinate system, user co-ordinates, WCS, UCS, drawing circles, drawing arcs, drawing ellipses. Drawing polygons, drawings splines. Drawing polylines, using window, zoom commands.
2. Practice on Edit commands such as erase, copy, mirror array, offset, rotate, oops, undo, redo, scale, stretch, trim, break, extend chamfer, fillet.
3. Practice on Text commands: editing text, text size, text styles, change properties commands.
4. Practice on Layer Commands: creating layer, freeze, layer on/off colour assigning, current layer, load line type, lock and unlock layer, move from one layer to other.
5. Practice on Hatching, Hatch pattern selection, practice on Dimensioning linear dimensioning, angular dimensioning radius/diameter dimensioning O-snap command, aligned dimensioning, editing of dimensioning, tolerance in dimensioning.
6. Practice on print /plot commands. Export/Import commands.
7. Practice on making complete drawings of components by doing following exercises:
 - a) Detail and assembly drawing of the following using AUTOCARD 2D (4 Sheets)
 - Plummer Block
 - Wall Bracket

- Stepped pulley, V-belt pulley
 - Flanged coupling
 - Machine tool Holder (Three views)
 - Screw jack or knuckle joint
- b) Isometric Drawing by CAD using Auto CAD (1 sheet)
- Drawings of following on computer
 - Cane
 - Cylinder
8. Modelling and Simulation of CAM Software
 9. Demonstration the CNC trainer.
 10. Practice on CNC trainer for various types of jobs.

INSTRUCTIONAL STRATEGY

Before teaching this subject, it would be very helpful if teacher knows and give the knowledge to the students about basics of computer and mathematics and their application in engineering and technology

RECOMMENDED BOOKS

1. CAD/CAM- Theory and practice by Zeiod libraham; Tata McGraw Hill
2. CAD/CAM by Groover And Zimmers; PHI
3. CNC Machine by Kundra Rao and Tiwari
4. CNC Machine by Pabla and Adithan; NITTTR, Chandigarh
5. Computer Graphics by Steven Harrington; Mc Graw Hill
6. Numerical Control of Machine Tools by Koren and Ben-Uri; Khanna Publisher

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	08
2	06	12
3	08	18
4	08	18
5	06	12
6	08	16
7	08	16
Total	48	100

5.4 ELECTRONIC INSTRUMENTS AND MEASUREMENT

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3 - 3

RATIONALE

In the real world of work the technician is required to handle wide variety of instruments while testing, trouble shooting, calibration etc. the study of this subject will help students to gain the knowledge of working principles and operation of different instruments. During practical sessions, he will acquire the requisite skills.

DETAILED CONTENTS

1. Basics of Measurements (04 hrs)
Measurement, method of measurement, types of instruments
Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors loading effect, requirements, importance and applications of standards, calibration
2. Multimeter (06 hrs)
Principles of measurement of DC voltage, DC current, AC voltage, AC current, moving coil and moving iron type instruments (voltmeter and Ammeter)
Block diagram of multimeter and measurement of voltage, current and resistance using multimeter
Specifications of multimeter and their applications
Limitations with regard to frequency and input impedance
3. Electronic Voltmeter (06 hrs)
Advantages over conventional multimeter for volt measurement with respect to input impedance and sensitivity
Principles of voltage, current and resistance measurement (block diagram only)
Specifications of electronics voltmeter

4. AC Milli Voltmeter (04 hrs)
- Types of AC milli voltmeters and their block diagram description
 Typical specifications and their significance
5. Cathode Ray Oscilloscope (04 hrs)
- Construction and working of different blocks used in CRT
 Time base operation and need for blanking during flyback, synchronization
 Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls
 Specifications of CRO and their explanation
 Measurement of current, voltage, frequency, time period and phase using CRO
 CRO probes, special features of dual beam, dual trace, delay sweep
 Digital storage oscilloscope: block diagram and working principle
6. Signal Generators and Analysis Instruments (06 hrs)
- Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
 Distortion factor meter; wave analyser and spectrum analyser
7. Impedance Bridges and Q Meters (10 hrs)
- Wheat stone bridge
 AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge, Schering bridge and Anderson bridge
 Block diagram description of laboratory type RLC bridge, specifications of RLC bridge
 Block diagram and working principle of Q meter
8. Digital Instruments (08 hrs)
- Comparison of analog and digital instruments
 Working principle of ramp, dual slope and integration type digital voltmeter
 Block diagram and working of a digital multimeter
 Measurement of time interval, time period and frequency using universal counter/frequency counter
 Working principle of logic probe, logic pulser, logic analyzer, logic comparator, signature analyzer and logic analyzer

LIST OF PRACTICALS

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance
2. To observe the limitations of a multimeter for measuring high frequency voltage
3. Measurement of voltage, frequency, time period and phase using CRO
4. Measurement of rise time and fall time using CRO
5. Measurement of Q of a coil and its dependence on frequency
6. Measurement of voltage, frequency, time and phase using DSO
7. Measurement of resistance and inductance of coil using RLC meter
8. Measurement of distortion of RF signal generator using distortion factor meter
9. Use of logic pulser and logic probe
10. Measurement of time period, frequency, average period using universal counter/
frequency counter
11. Study of operation and features of a logic analyser

RECOMMENDED BOOKS

1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai & Sons, Delhi
2. Electronics Instrumentation by Cooper, Prentice Hall of India
3. Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala
4. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	08
2	06	12
3	06	12
4	04	10
5	04	10
6	06	12
7	10	20
8	08	16
Total	48	100

5.5 DIGITAL ELECTRONICS AND MICROPROCESSORS

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RATIONALE

Digital electronics has made extremely rapid advances in the last five decades. It has important applications in communication entertainment, instrumentation, control, automation etc. Thus it appears that there is no end to its usefulness. In fact, the light and the new world belongs to it. So it is necessary to give the knowledge of digital electronics to the electrical students. Microprocessor is one of the most exciting technological advancement among the semiconductor devices in recent times. It has a tremendous impact on the Industrial processes due to its high reliability, flexibility and control capacity both at the design and the Implementation stages. The decreasing cost with increasing facilities act as catalysts in widening their scope of applications.

DETAILED CONTENTS

Note: Question paper will be set 70% from Part-A and 30% from Part-B.

(Part-A)

1. Number Systems (08 hrs)
 - 1.1 Decimal, binary, octal, hexa-decimal BCD and ASCII code number systems and their inter-conversion
 - 1.2 Binary and Hexadecimal addition, subtraction and multiplication
 - 1.3 1's and 2's complement methods of addition/subtraction
2. Gates (06 hrs)

Definition, symbol and truth tables for inverter, OR, AND, NAND, NOR and X-OR exclusive-AND gates
3. Boolean Algebra (08 hrs)
 - 3.1 Boolean Relations and their applications
 - 3.2 DeMorgan's Theorems
 - 3.3 K-Map upto four variables
4. Combinational Circuits (08 hrs)
 - 4.1 Half adder, Full adder
 - 4.2 Encoder, Decoder
 - 4.3 Multiplexer/Demultiplexer
 - 4.4 Display Devices (LED, LCD and 7-segment display)

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|-----------------|---|----------|
| 5. | Flip-Flops | (08 hrs) |
| | 5.1 J-K Flip-Flop | |
| | 5.2 R-S Flip-Flop | |
| | 5.3 D-Type Flip-Flop | |
| | 5.4 T-Type Flip-Flop | |
| | 5.5 Applications of Flip-Flops | |
| 6. | Introduction to Shift Registers and Counters | (06 hrs) |
| 7. | A/D and D/A Converters | (06 hrs) |
| | 7.1 A/D converter (Counter ramp, successive approximation method of A/D Conversion) | |
| | 7.2 D/A converters (Binary weighted, R-2R D/A Converter) | |
| 8. | Semi-conductor Memories
Types, merits, demerits, and applications | (06 hrs) |
| (PART-B) | | |
| 9. | Microprocessor | (24 hrs) |
| | 9.1 Study of 8085 microprocessor architecture, pin configuration, bus organisation, registers flags, interrupts | |
| | 9.2 Instruction set of 8085 microprocessor, addressing modes, instruction format. Writing some simple assembly language programmes including debugging. Use of stacks and sub-routines in programming | |
| | 9.3 Interfacing and data transfer between peripheral, I/O and microprocessor | |
| | 9.4 Study of peripheral chips – 8251, 8155, 8051, 8257, 8259 | |
| | 9.5 Introduction of 16-bit, 32-bit microprocessor, their advantages over 8-bit microprocessor | |

LIST OF PRACTICALS

1. Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, X-OR gates
2. Construction of Half Adder/Full Adder using gates
3. To verify the truth table for R-S and JK flipflop
4. Construction and testing of any counter
5. Verification of operation of a 8-bit D/A Converter
6. Writing assembly language programme using numemoanics and test them on μ P Kit (any three)
 - a) Addition of two 8-bit numbers
 - b) Subtraction of two 8-bit numbers
 - c) Multiplication of two 8-bit numbers

- d) Division of two 8-bit numbers
 - e) Finding average of N given integer
 - f) Finding maximum number out of three given numeric
7. Assembly language programming for different applications on 8051 microcontroller

INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing), A/D, D/A converters and other Topics. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. More emphasis while teaching this subject should be given on practical aspects along with the theory input. Lots of programming exercises may be given to the students. Mini projects based on microprocessor operations may be identified and given to students as assignments.

RECOMMENDED BOOKS

1. Modern Digital Electronics by RP Jain, Tata McGraw Hill, Education Pvt. Ltd. New Delhi
2. Digital Principles and Electronics by Malvino and Leach, Tata McGraw Hill, New Delhi
3. Digital Electronics by SN Ali
4. Digital Electronics by Rajive Sapra, Eshan Publications, Ambala City
5. Digital Fundamentals by Floyd and Jain, Pearsons Education (Singapore) Pte Ltd Patparganj, Delhi 110092
6. Digital Electronics by Jamwal, Dhanpat Rai and Co. New Delhi
7. Microprocessors Architecture, Programming and Application with 8085/8080A, Ramesh S Gaonkar, Wiley Eastern Ltd. New Delhi
8. Introduction to Microprocessors by Aditya Mathur, TMH Publishing Co., New Delhi
9. Microprocessors and Microcontrollers by BP Singh, Galgotia Publications, New Delhi
10. Digital Systems by Sanjay K Bose, Wiley Eastern(P) Ltd. New Delhi
11. Digital Systems : principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
12. Digital Integrated Circuits by AK Gautam, SK Kataria and Sons, New Delhi
13. Microprocessors(The 8086 and 8088) by AK Gautam and A Jaiswal; SK Kataria and Sons, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (hrs)	Marks Allocation (%)
1	8	10
2	6	7
3	8	10
4	8	10
5	8	10
6	6	8
7	6	7
8	6	8
9	24	30
Total	80	100

5.6 BASICS OF REFRIGERATION AND AIR CONDITIONING

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RATIONALE

The diploma holders of General Engineering are responsible for supervising and maintenance of RAC system. Moreover, RAC industry is expanding and employment opportunities in this field are good. For this purpose, the knowledge and skill covering basic principles of refrigeration and air conditioning is required to be imparted to the students.

DETAILED CONTENTS

REFRIGERATION

1. Fundamentals of Refrigeration (04 hrs)
Introduction to refrigeration, and air conditioning, meaning of refrigerating effect, units of refrigeration, COP, methods of refrigeration. Introduction to air refrigerator working on reversed carnot cycle
2. Vapour Compression System (06 hrs)
Introduction, principle, function, parts and necessity of vapour compression system. Effect of sub cooling, super heating, mass flow rate, entropy, enthalpy, work done, Refrigerating effect and COP
3. Refrigerants (04 hrs)
Functions, classification of refrigerants, selection of refrigerant
4. Vapour Absorption System (04 hrs)
Introduction, principle and working of simple absorption system and domestic electrolux refrigeration systems. Solar power refrigeration system, advantages and disadvantages of solar power refrigeration system over vapour compression system.
5. Refrigeration Equipment (04 hrs)
 - 5.1 Compressor - Function
 - 5.2 Condenser - Function
 - 5.3 Evaporator - Function
 - 5.4 Expansion Valve - Function
 - 5.5 Safety Devices-Thermostat, overload protector LP, HP cut out switch

AIR CONDITIONING

6. Psychrometry (04 hrs)

Definition, importance, specific humidity, relative humidity, degree of saturation, DBT, WBT, DPT, sensible heat, latent heat

7. Air-Conditioner (06 hrs)

Study of window air-conditioning, split type air conditioning, concept of central air-condition and automobile air-conditioning

INSTRUCTIONAL STRATEGY

1. Teaches should take the students to industry and explain the details of refrigeration and air-conditioning systems and their components.
2. While imparting instructions, focus should be on conceptual understanding.
3. Training slides of “Carrier Fundamentals of Refrigeration Air Conditioning” to be shown to students.

RECOMMENDED BOOK

1. Refrigeration and Air Conditioning by Domkundwar; Dhanpat Rai and Sons, Delhi.
2. Refrigeration and Air Conditioning by CP Arora; Tata McGraw Hill, New Delhi.
3. Refrigeration and Air Conditioning by R.S Khurmi and J.K. Gupta; S Chand and Company Limited, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	12
2	06	20
3	04	12
5	04	14
6	04	12
7	04	12
8	06	18
Total	32	100

5.7 WORKSHOP PRACTICE – II

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PRACTICAL EXERCISES

Turning Shop

- Job 1. Grinding of single point turning tool.
- Job 2. Exercise of simple turning and step turning.
- Job 3. A composite job involving, turning, taper turning, external thread cutting and knurling.

Advance Fitting Shop

- Job 1. Exercise on drilling, reaming, counter boring, counter sinking and tapping
- Job 2. Dove tail fitting in mild steel
- Job 3. Radius fitting in mild steel
- Job 4. Pipe threading with die

Machine Shop

- Job 1. Prepare a V-Block up to ± 0.5 mm accuracy on shaper machine
- Job 2. Exercise on key way cutting and spline cutting on shaper machine.