CURRICULUM

for

Three Years Diploma Programme

in

Electronics & Instrumentation Engineering

(36)

For the State of Haryana

Prepared by:

State Board of Technical Education, Haryana

Chandigarh

DIPLOMA PROGRAMME IN
ELECTRONICS AND INSTURMENTATION ENGINEERING
(FOR THE STATE OF HARYANA)

SALIENT FEATURES OF THE PROGRAMME

1.	Name of the Programme	:	Diploma Programme in **Electronics and Instrumentation Engineering**
2.	Duration of the Programme	:	Three Years (6 semester)
3.	Entry Qualification	:	Matriculation or equivalent as prescribed by State Board of Technical Education, Haryana
4.	Intake	:	60
5.	Pattern of the Programme	:	Semester Pattern
6.	Ratio between theory and Practical	:	50 : 50(Approx)

2. EMPLOYMENT OPPORTUNITES AND ACTIVITY PROFILE OF DIPLOMA HOLDERS IN ELECRONICS AND INSTRUMENTS ENGINEERING

An exercise to have first hand information about employment opportunities and activity profile of diploma engineers in the field of Electronics & Instrumentation, was done by Electronics & Instrumentation Department of Seth Jai Parkash Polytechnic, Damla, Yamuna Nagar. The feedback from Passed out Student, industries and other organization has revealed that diploma holders in Electronics and Instrumentation Engineering and employment in the following organizations

Employment Opportunities

Various Departments/organizations/boards and corporations

1) Tele-Communication Engineering and related Departments
2) AIR, Doordarshan,
3) Overseas Communication
4) Mine Communication,
5) Radar and Wireless,
6) Railways,
7) Defence Services,
8) Electricity Boards and Corporations etc.

Industry

9) Communication Industry Including Paramilitary Services
10) PCB Design and Fabrication Industry
11) Process Control Industry
12) Consumer Electronics Industry
13) Electronic Components and Devices Manufacturing and Installation Organizations
14) Computer Assembling and Computer Peripheral Industry;
15) Computer Software Areas for Electronic Design and Semi Conductor Manufacturing Industry
16) Automobile Industry

17) Medical Electronics Industry

18) Instrumentation and Control Industries

Development/Testing Laboratories/Organizations

19) Electronics Services Centers

20) Opto Electronics

21) Computer Networking

22) Hospitals

23) Educational Institutions

24) Sales and Services of Electronic Gadgets from Small Scale Industries

Self Employment

- Marketing and Sales (Distributors – whole sale and retailers)
- Service Sector (repair and Maintenance; job work)
- Cable laying and jointing DBs etc.
- Preparing Simulated Models

Activity Profile

The diploma holders in Electronics and Instrumentation Engineering (EIE) generally get employed in manufacturing, assembly industries of consumer electronics, process control and instrumentation, Doordashan and All India Radio (AIR), defence organizations, marketing and servicing organizations. The activities they perform are listed below.

1) Reading, interpreting and preparing drawings and circuits in electronics and related fields

2) Preparing estimates of men and material required for different jobs of installation and maintenance

3) Making/preparing and interpreting layout of printed circuit boards and chassis

4) Selecting instrument and devices for simple applications

5) Testing the materials used in assembly work.

6) Supervising the fabrication and assembly work at sub-assembly and final assembly

7) Assisting the engineer in quality control of the product being assembled or manufactured

8) Operating, recording and display equipment in AIR/Doordarshan stations and studios
9) Operating, testing and maintenance of the communication receiver and transmitter in AIR/Doordarshan/Overseas communication sections
10) Operation, testing and maintenance of the control room equipment in AIR/Doordarshan, power plant and process industry
11) Operates test and maintains the telephone exchanges in Tele-communication department
12) Installation of the PBX or PABX exchanges/telex for organizations including Telecommunication department and post and telegraph department
13) Supervision of the fabrication and assembly work of trans-receivers and walkie-talkie used for police wireless, mines communication and defence services
14) Operation, testing and maintenance of radar equipment used in defence service
15) Assistance to the engineers/scientist doing research/development work by fabricating and testing different electronic circuits
16) Operates, maintains and tests computer and computer peripheral equipment
17) Supervising the assembly and testing work in computer industry
18) Maintenance and repairing of medical electronic equipment in hospitals and supervises fabrication and production of medical electronics equipment like ECG, EEG, blood production of medical electronics
19) As a self employed person he has to use multifarious activities such as designing PCBs, procuring raw material and components, assemble, manufacture, repair and maintenance, testing and fault diagnosis, sale and service, marketing etc.

3. COMPETENCY PROFILE OF DIPLOMA HOLDERS IN ELECTRONICS AND INSTRUMENTATION ENGINEERING

Keeping in view the job opportunities, activity profile and various domains of learning, the diploma holders in Electronics and Instrumentation Engineering should have following competency profile in terms of knowledge and skills in the students:

1) Skills in reading and interpreting drawings pertaining to electronics circuits, instruments, and equipment
2) Understanding of basic principles of electrical and electronics engineering
3) Understanding of electrical machines and equipment
4) Understanding of basic principles of digital electronics; communication engineering and systems; audio video systems and industrial electronics
5) Knowledge of different electronics devices, components, materials and I instruments used in manufacturing and testing of electronic products
6) Skills in fabrication and testing of different types of electronic circuits and devices by making use of testing and measuring instruments
7) Skills in fabrication of PCBs and designing the layout of various instruments, chassis and equipment for wiring/circuit development
8) Knowledge of installation and maintenance of
   - Electronic telephone exchanges
   - Communication systems
   - Computer Systems
9) Competency in solving simple problems related to various functional areas of electronics engineering may it be prototype development, diagnostic and fault finding or repair and maintenance of plant and equipment pertaining to:
   - Electronic measuring instruments
   - Electronic consumer goods
   - Entertainment equipment (Audio/video system)
   - Communication systems

10) Knowledge and skills pertaining to installation and maintenance of industrial electronics equipment and system and process control instrumentation
11) Knowledge and skills in using information technology tools for information storage retrieval and dissemination, and making use of computer application software
12) Knowledge of programming for software development
13) Knowledge of microprocessors and their applications in electronic system
14) Understanding of various relevant standards for testing and quality control in electronics
15) Knowledge of basic principles of management and entrepreneurship to manage men, material and machines optimally and efficiently, awareness about the environment, use of non-conventional energy sources, external financial and technical support system, adopting energy conservation techniques
16) Knowledge of applied and engineering sciences for better comprehension of technologies used in electronics and related industry and service sector and to develop scientific temper, analytical skills and to facilitate continuing education
17) Proficiency in oral and written communication, technical report writing, managing relationship with juniors, pears and seniors for effective functioning in the world of work

ABSTRACT OF CURRICULUM AREAS/SUBJECTS

The subjects have been divided in four different categories:

1. Basic Sciences

(1) Communication Skills – 1& II

(2) Entrepreneurship Development and Management

2. Applied Sciences

(3) Applied Physics – I & II

(4) Applied Chemistry – I & II

(5) Applied Mathematics – I & II

3. Basic Courses in Engineering Technology

(6) Engineering Drawing

(7) General Workshop Practice – I & II

(8) Basics of Information Technology

4. Area Specific Engineering/ Technology Subjects

(9) Basic Electrical Engineering

(10) Analog Electronics

(11) Electronic Components and Materials

(12) Digital Electronics

(13) Principles of Instrumentation

(14) Electrical Machines

(15) Transducers

(16) Computer Programming and Applications

(17) Microprocessors and Applications

(18) Basic of Control Systems

(19) Electronic Instruments and Measurement

(20) Power Electronic

(21) Biomedical Instrumentation

(22) Data Communication Networks

(23) Linear Integrated Circuits

(24) Fundamentals of Telemetry

(25) Computer Aided Instrumentation

(26) Electronic & Instrumentation Workshop

(27) Process Instrumentation

(28) Microcontrollers & PLC

(29) Minor Project

(30) Major Project Work

Specialized Courses in Engineering/ Technology

(32) Elective-I, to choose any one from the following:

(a) Intelligent Instrumentation
(b) Advanced Measurement Techniques

(33) Elective-II, to choose any one from the following:

(a) Optical Fibre Communication

(b) Computer Organisation and

(c) Trouble Shooting of Electronic Equipment Architecture

In addition, Ecology and Environmental Awareness Camp will be organized in First Year and Entrepreneurial Awareness Camp will be organized in Second Year

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HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution of Hours in Various Semesters					
		I	II	III	IV	V	VI
1.	Communication Skills	5	5	-	-	-	-
2.	Applied Mathematics	5	5	-	-	-	-
3	Applied Physics	6	5	-	-	-	-
4.	Applied Chemistry	4	4	-	-	-	-
5.	Basic Electrical Engineering	-	5	-	-	-	-
6.	Basic of Information Technology	4	-	-	-	-	-
7.	Engineering Drawing	6	-	-	-	-	-
8.	General Workshop Practice	6	6	-	-	-	-
9.	Analog Electronics	-	6	-	-	-	-
10.	Transducers	-	-	6	-	-	-
11.	Electronic Components and Materials	-	-	4	-	-	-
12.	Principles of Instrumentation	-	-	6	-	-	-
13.	Digital Electronics	-	-	7	-	-	-
14.	Electrical Machines	-	-	6	-	-	-
15.	Electronic Instruments and Measurements	-	-	7	-	-	-
16.	Basics of Control Systems	-	-	-	6	-	-
17.	Microprocessors & Applications	-	-	-	6	-	-
18.	Computer Programming & Applications	-	-	-	6	-	-
19.	Linear Integrated Circuits	-	-	-	6	-	-
20.	Fundamentals of Telemetry	-	-	-	6	-	-
21.	Electronic & Instrumentation Workshop	-	-	-	6	-	-
22.	Power Electronics	-	-	-	-	6	-
23.	Biomedical Instrumentation	-	-	-	-	6	-
24.	Elective I	-	-	-	-	3	-
25.	Industrial Process Control	-	-	-	-	6	-
26.	Process Instrumentation	-	-	-	-	6	-
27.	Minor Project	-	-	-	-	9	-
28.	Micrcontollers & PLC	-	-	-	-	-	6
29.	Entrepreneurship Development and Management	-	-	-	-	-	3
30.	Elective II	-	-	-	-	-	3
31.	Computer Aided Instrumentation	-	-	-	-	-	6
32.	Data Communication Networks	-	-	-	-	-	6
33.	Major Project	-	-	-	-	-	12
34	# Student Centered Activities	4	4	4	4	4	4
	Total	**40**	**40**	**40**	**40**	**40**	**40**

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN ELECTRONICS AND INSTRUMENTATION ENGINEERING

(For the State of Haryana)

FIRST SEMESTER (Electronics & Instrumentation)

Sr. No.	Subject	Study Scheme Hrs/Week			EVALUATION SCHEME						Total Marks
					Internal Assessment		External Assessment				
					Theory	Practical	Written Paper		Practicals		
		L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
1.1*	Communication Skills-I	3	0	2	25	25	100	3	50	2	200
1.2*	Applied Mathematics-I	4	1	0	50	-	100	3	-	-	150
1.3*	Applied Physics-I	4	0	2	25	25	100	3	50	3	200
1.4*	Applied Chemistry-I	2	0		25	25	100	3	50	3	200
1.5*	Basics of information Technology	0	0	4	-	50	-	-	100	3	150
1.6*	Engineering Drawing-I	0	0	6	-	50	100	3	25	2	175
1.7*	General Workshop Practice - I	0	0	6	-	50	-	-	$\wedge$ 100	3	150
# Student Centered Activities		0	0	4	-	25	-	-	-	-	25
Total		13	1	26	125	250	500	-	375	-	1250

* Common with other diploma programmes

$\wedge$ Including 25 marks for Viva-voce

\# Student Centred Activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, field visits, NCC, NSS and cultural activities etc.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN ELECTRONICS AND INSTRUMENTATION ENGINEERING

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SECOND SEMESTER (Electronics & Instrumentation)

Sr. No.	Subject	Study Scheme Hrs/Week			EVALUATION SCHEME						Total Marks
					Internal Assessment		External Assessment				
					Theory	Practical	Written Paper		Practicals		
		L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
2.1*	Communication Skills-II	3	0	2	25	25	100	3	50	2	200
2.2*	Applied Mathematics-II	4	1	0	50	-	100	3	-	-	150
2.3*	Applied Physics-II	3	0	2	25	25	100	3	50	3	200
2.4*	Applied Chemistry-II	2	0	2	25	25	100	3	50	3	200
2.5+	Basics Electrical Engineering	3	0	2	25	25	100	3	50	3	200
2.6+	Analog Electronics	4	0	2	25	25	100	3	50	3	200
2.7*	General Workshop Practice - II	0	0	6	-	250	-	-	100**	3	150
# Student Centered Activities		0	0	4	-	25	-	-	-	-	25
Total		19	1	20	175	200	600	-	350	-	1325

* Common with other diploma programmes

** Including 25 marks for Viva-voce

\+ Common with that of Diploma Programmes in Computer Engineering, IT, Instrumentation and Control, Electronic & communication

\# Student Centred Activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, field visits, NCC, NSS and cultural activities etc.

THIRD SEMESTER (Electronics & Instrumentation)

Sr. No.	Subject	Study Scheme Hrs/Week			EVALUATION SCHEME						Total Marks
					Internal Assessment		External Assessment				
					Theory	Practical	Written Paper		Practicals		
		L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
3.1	(073631) Transducers	3	0	3	25	25	100	3	50	3	200
3.2+	Electronics Components and Materials	4	0	0	50	-	100	3	-	-	150
3.3∧	(073633) Principles of Instrumentation	3	0	3	25	25	100	3	50	3	200
3.4∧	Digital Electronics	4	0	3	25	25	100	3	50	3	200
3.5∧	Electrical Machines	3	0	3	25	25	100	3	50	3	200
3.6∧	Electronic Instruments and Measurements	4	0	3	25	25	100	3	50	3	200
# Student Centered Activities		0	0	4	-	25	-	-	-	-	25
Total		21	0	19	175	150	600	-	250	-	1175

* Common with other diploma programmes

∧ Common with that of Diploma Programmes in Electronic & communication

\+ Common with that of Diploma Programmes in Computer Engineering, IT, Instrumentation and Control, Electronic & communication

\# Student Centred Activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, field visits, NCC, NSS and cultural activities etc.

FOURTH SEMESTER (Electronics & Instrumentation)

Sr. No.	Subject	Study Scheme Hrs/Week			EVALUATION SCHEME						Total Marks
					Internal Assessment		External Assessment				
					Theory	Practical	Written Paper		Practicals		
		L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
4.1	(073641) Basics of Control Systems	3	0	3	25	25	100	3	50	3	200
4.2∧	(31541) Microprocessors & Applications	3	0	3	25	25	100	3	50	3	200
4.3+	(31043) Computer Programming & Applications	3	0	3	25	25	100	3	50	3	200
4.4	(73644) Linear Integrated Circuits	3	0	3	25	25	100	3	50	3	200
4.5	(73645) Fundamentals of Telemetry	3	0	3	25	25	100	3	50	3	200
4.6	Electronics & Instrumentation Workshop	0	0	6		50	-	-	50	3	100
# Student Centered Activities		0	0	4	-	25	-	-	-	-	25
Total		15	0	25	125	200	500	-	300	-	1125

* Common with other diploma programmes

∧ Common with that of Diploma Programmes in Instrumentation & control

\+ Common with that of Diploma Programmes in Computer Engineering, IT, Instrumentation and Control, Electronic & communication

\# Student Centered Activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, field visits, NCC, NSS and cultural activities etc.

FIFTH SEMESTER (Electronics & Instrumentation)

Sr. No.	Subject	Study Scheme Hrs/Week			EVALUATION SCHEME						Total Marks
					Internal Assessment		External Assessment				
					Theory	Practical	Written Paper		Practicals		
		L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
5.1∧	(73651) Power Electronics	3	0	3	25	25	100	3	50	3	200
5.2+	(31551) Biomedical Instrumentation	3	0	3	25	25	100	3	50	3	200
5.3	Elective I	3	0	0	50		100	3	-	-	150
5.4	(31553) Industrial Process Control	3	0	3	25	25	100	3	50	3	200
5.5+	(31554) Process Instrumentation	3	0	3	25	25	100	3	50	3	200
5.6	Minor Project	0	0	9	0	100	-	-	100	3	200
# Student Centered Activities		0	0	4	-	25	-	-	-	-	25
Total		15	0	25	150	225	500	-	300	-	1175

Elective I (a) Intelligent Instrumentation (b) Advanced Measurement Techniques

* Common with that of other diploma programmes

∧ Common with that of Diploma Programmes in Electronics & Communication

\+ Common with that of Diploma Programmes in Instrumentation & control

\# Student Centered Activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, field visits, NCC, NSS and cultural activities etc.

SIXTH SEMESTER (Electronics & Instrumentation)

Sr. No.	Subject	Study Scheme Hrs/Week			EVALUATION SCHEME						Total Marks
					Internal Assessment		External Assessment				
					Theory	Practical	Written Paper		Practicals		
		L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
6.1∧	(31562) Micrcontollers & PLC	3	0	3	25	25	100	3	50	3	200
6.2*	(30364) Entrepreneurship Development and Management	3	0	0	50	-	100	3	-	-	150
6.3	Elective II	3	0	0	50	-	100	3	-	-	150
6.4∧	(031561)Computer Aided Instrumentation	3	0	3	25	25	100	3	50	3	200
6.5	(073665) Data Communication Networks	3	0	3	25	25	100	3	0	3	150
6.6	Major Project	0	0	12	0	100	-	-	100	3	200
# Student Centered Activities		0	0	4	-	25	-	-	-	-	25
Total		15	0	25	200	175	500	-	200	-	1075

Elective II (a) Optical Fibre Communication (b) Computer Architecture & Organization (c) Troubleshooting of Electronic Equipments

* Common with that of other diploma programmes

∧ Common with that of Diploma Programmes in Instrumentation & control

\# Student Centered Activities will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, field visits, NCC, NSS and cultural activities etc.

ELECTRONICS AND INSTRUMENTATION

CONTENTS

COMMUNICATION SKILLS – I 030011

L	T	P
3	-	2

Rationale

Interpersonal communication is a natural and necessary part of organizational life. Yet, communicating effectively can be challenging because of our inherent nature to assume, overreact to and misperceive what actually is happening. Poor communication or lack of communication is often cited as the cause of conflict and poor teamwork. In today's team-oriented workplace, managing communication and developing strategies for creating shared meaning are crucial to achieving results and creating successful organizations. The goal of the ***Communicating Effectively in English*** course is to produce civic-minded, competent communicators. To that end, students must demonstrate oral as well as written communication proficiency. These include organizational and interpersonal communication, public address and performance.

Objectives of Course in Communicating Effectively in English for the First Year (I & II Semesters) are: * *Understanding how communication works * Gaining active listening and responding skills * Understanding the importance of body language * Acquiring different strategies of reading texts * Increasing confidence by providing opportunities for oral and written expressions*

DETAILED CONTENTS FOR FIRST SEMESTER 48 Hrs

1. COMMUNICATION SKILLS 6 hrs
1.1 Verbal and Non-verbal Communication
1.2 Process of Communication
1.3 Barriers to Communication; Overcoming Strategies
1.4 Listening and Speaking Skills and Sub-Skills
2. Spoken English-Introduction, Features of Spoken English
(Note: This module is only for practice. This should not be included in the final examination)

2. DEVELOPING ORAL COMMUNICATION SKILLS 8 hrs
2.1 Greeting, Starting a Conversation
2.3 Introducing Oneself
2.4 Introducing Others
2.5 Leave Taking
2.6 Thanking, Wishing Well
2.7 Talking about Oneself
2.8 Talking about Likes and Dislikes

3. GRAMMAR AND USAGE 12 hrs
3.1 Punctuation
3.2 Articles-a, an, the
3.3 Framing Questions
3.4 Verbs-Classification: Main Verb, Auxiliary Verb, Transitive & Intransitive Verbs, Phrasal Verbs
3.5 Word Formation

4. WRITING SKILLS 10 hrs
4.1 Writing Paragraphs
4.2 Picture Composition

5. READING SKILLS 12 hrs
5.1 Vocabulary Enhancement
5.2 Techniques of Reading: Skimming, Scanning, Intensive and Extensive Reading

NOTE: The Reading Skills of the learners (along with vocabulary enhancement) will be through reading thematic articles/essays and/or stories.

1.2 APPLIED MATHEMATICS – I

RATIONALE

Applied Mathematics forms the backbone of engineering discipline, Basic elements of permutations and combinations, trigonometry, vector, complex number and statistics have been included in the curriculum as foundation course and to provide base for continuing education to the students.

DETAILED CONTENTS

1. **Algebra** (20 hrs)

1.1 Permutations and Combinations, Value of "pr and "cr , its properties and simple problems

1.2 Binomial theorem (without proof) for positive integral index (expansion and general term); Binomial theorem for any index (expansion only) first and second binomial approximation with application to engineering problems

1.3 Partial fractions (linear factors, repeated linear factors, non reducible quadratic factors)

1.4 Determinants and Matrices – expansion of determinants (upto third order) using sarrus rule, expansion method and pivotal's condensation method. Properties of determinants, solution of equations (upto 3 unknowns) by Cramer's rule. Definition of matrix, addition, subtraction and multiplication of matrices (upto third order). Inverse of a matrix by

adjoint method and elementary row transformations. Solution of equations (up to 3 unknowns) by Matrix method

1.5 Logarithm: general properties of logarithms, calculations of engineering problems using log tables

2. Trigonometry (11 hrs)

2.1 Addition and Subtraction formulae, Product formulae and their application in engineering problems. Transformation from product to sum or difference of two angles or vice versa, multiple and sub-multiple angles

2.2 Conditional identities, solution of triangles (excluding ambiguous cases).

2.3 Graphs of sin x, cos x, and tan x, ex

3. **Vectors** (11 hrs)

Definition of vector and scalar quantities, Addition and subtraction of vectors. Dot product and cross product of two vectors. Thumb rule. Angle between two vectors, application of dot and cross product in engineering problems, scalar triple product and vector triple product

4. **Complex Numbers** (9 hrs)

Definition, Real and Imaginary parts of a complex number, Polar and Cartesian representation of a complex number and conversion from one form to the other, conjugate of complex number, modulus and argument of a complex number, addition, subtraction, multiplication and division of a complex number.

5. **Statistics and Probability** (13 hrs)

Evaluation of standard deviation and process capabilities Rank, Rank correlation, probability: definition and laws on probability, concept of random variable, probability distribution (Binomial, Poisson and Normal) and their applications. Drawing control charts for average (x) and range (R)

RECOMMENDED BOOKS

1. Applied Mathematics Vol. I by SS Sabharwal and Others by Eagle Prakashan, Jalandhar

2. Applied Mathematics Vol. II by SS Sabharwal and Others by Eagle Prakashan, Jalandhar

3. Engineering Mathematics Vol. I by Ishan Publishing House

4. Engineering Mathematics Vol. I by S Kohli and Others; IPH, Jalandhar

5. Applied Mathematics Vol. I by RD Sharma

6. Engineering Mathematics by Dass Gupta

7. Advanced Engineering Mathematics by AB Mathur and VP Jagi; Khanna Publishers, Delhi

8. Higher Engineering Mathematics by BS Grewal; Khanna Publishers, Delhi

9. Engineering Mathematics by C Dass Chawla; Asian Publishers, New Delhi

1.3 APPLIED PHYSICS – I

RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects will behave. Concrete uses of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

DETAILED CONTENTS

1. Units and Dimensions (6 hrs)

   1.1 Physical quantities

   1.2 Fundamental and derived units

   1.3 Systems of units (FPS,CGS,MKS and SI units)

   1.4 Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain

   1.5 Principle of homogeneity

   1.6 Dimensional equations and their applications, conversion from one unit to another unit for density, force, pressure, work, power, energy, velocity, acceleration

1.7 Limitations of dimensional analysis

2. Force and Motion (8 hrs)

2.1 Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors

2.2 Force, resolution and composition of forces – resultant, parallelogram law of forces

2.3 Equilibrium of forces, Lami's theorem

2.4 Newton's Laws of motion – concept of momentum, Newton's laws of motion and their applications, determination of force equation from Newton's second law of motion; Newton's third law of motion conversion of momentum, impulse and impulsive forces, simple numerical problems based on third law.

2.5 Projectile, horizontal and oblique projections and equation of trajectory

2.6 Derivation of time of flight, maximum height and horizontal range

2.7 Circular motion

2.8 Relation between linear and angular velocity and linear acceleration and angular acceleration

2.9 Centripetal force (derivation) and centrifugal force

2.10 Banking of roads

3. Work, Power and Energy (8 hrs)

3.1 Work: definitions and its SI units

3.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces)

3.3 Power: definitions and its SI units, calculation of power in simple cases

3.4 Energy: Definitions and its SI units: Types: Kinetic energy and Potential energy, with examples and their derivation

3.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another

4. Properties of Matter (8 hrs)

4.1 Elasticity, definition of stress and strain

4.2 Different types of modulus of elasticity

4.3 Explanation of stress – strain diagram

4.4 Pressure – its units, gauge pressure, absolute, atmospheric pressure, Bourdon's pressure, manometers and barometer gauges

4.5 Surface tension – its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension

4.6 Fluid motion, stream line and turbulent flow, Reynolds number

4.7 Viscosity and coefficient of viscosity; derivation of terminal velocity; effect of temperature on viscosity

5. Waves and vibrations (8 hrs)

5.1 Generation of waves by vibrating particles

5.2 Wave motion with examples

5.3 Types of wave motion, transverse and longitudinal wave motion with examples

5.4 Velocity, frequency and wave length of a wave (relationship $v = \eta\lambda$)

5.5 Sound and Light waves

5.6 Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.

5.7 Vibration of cantilever and beam, determination of time period of a cantilever

5.8 Free, forced and resonant vibrations with examples

6. Rotational Motion (5 hrs)

6.1 Definitions of torque, moment of inertia, radius of gyration

6.2 Derivation of rotational kinetic energy and angular momentum

6.3 Conservation of angular momentum (qualitative)

6.4 Theorems of parallel and perpendicular axes

7. Gravitation and satellites (8 hrs)

7.1 Kepler's law of planetary motion

7.2 Newton's law of gravitation

7.3 Escape velocity (derivation)

7.4 Satellites, Geo-stationary satellite

8. Temperature and its measurement (5 hrs)

8.1 Principles of measurement of temperature and different scales of temperature

8.2 Difference between heat and temperature on the basis of K.E. of molecules

8.3 Bimetallic and Platinum resistance thermometer: their merits and demerits

8.4 Pyrometers – Disappearing filament optical pyrometer

9. Transfer of Heat (8 hrs)

9.1 Modes of transfer of heat (conduction, convection and radiation with examples)

9.2 Coefficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method)

9.3 Properties of heat radiation

9.4 Stefan's law, Kirchhoff's law, Wien's law, Planck's back radiation law

9.5 Prevost's theory of heat exchange

LIST OF PRACTICALS

1. To find the thickness of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier caliper
3. To determine the thickness of glass strip and radius of curvature of a concave surface using a spherometer
4. To find the surface tension of a liquid by capillary rise method
5. To determine and verity the time period of cantilever by drawing graph between load (w)
6. To determine the atmospheric pressure at a place using Fortin's Barometer
7. To determine the coefficient of linear expansion of a metal rod
8. To find the coefficient of thermal conductivity of copper using Searle's conductivity apparatus

9. To find the coefficient of thermal conductivity of Bakelite sheet (bad conductor) by Lee's Disc Method

RECOMMENDED BOOKS

1. Applied Physics Vol. I, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics – Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics – Volume I and II by RS Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics – Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Holiday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi

1.4 APPLIED CHEMISTRY – I

L	T	P
2	-	2

RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. Language of Chemistry (6 hrs)

    1.1 Definition of symbol, formula, valency and chemical equation.
    1.2 Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of chemical compound

1.3 Essentials of a chemical equation, balancing of a chemical equation by Hit and Trial method

2. Chemical Bonding (4 hrs)

2.1 Electronic concept of valency

2.2 Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency with the help of suitable examples to each

3. Water (10 hrs)

3.1 Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) boilers for steam generation.

3.2 Methods to remove hardness of water (i) Clark's Process (ii) Permutit Process (iii) Soda Lime process (iv) Ion-Exchange process. Simple numerical problems related to soda time process.

3.3 Definition of degree of hardness of water and the systems to express the degree of harness of water. Simple numerical problems related to finding the degree of harness on different scales.

3.4 Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply

4. Solutions (6 hrs)

4.1 Concept of homogenous solution, brief introduction of the terms (i) lionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable

4.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molarity as applied in relation to a solution.

4.3 Simple numerical problems related to volumetric analysis

4.4 Definition of pH, and different industrial applications of pH

5. Electrolysis (6 hrs)

5.1 Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples

5.2 Faraday's Laws of Electrolysis

5.3 Simple numerical problems based upon the laws of electrolysis

5.4 Different account of (i) lead acid battery and (ii) Ni-Cd battery with special reference to their reaction mechanisms.

LIST OF PRACTICALS

1. Volumetric analysis and study of apparatus used therein. Simple problems on volumetric analysis equation

2. Preparation of standard solution of oxalic acid or potassium dichromate

3. Determine the strength of a given solution of sodium hydroxide with the help of a standard solution of oxalic acid

4. Determine the strength of solution of HCI with the help of a solution of NaOH and an intermediate solution of standard oxalic ac

5. Find the amount of chlorides in mg per liter in a sample of H2O with the help of a solution of AgNO3

6. Determine the degree of temporary hardness of water by O' Hehner's method

7. Estimate the amount of Cu in a sample of CuSO4 using a standard solution of Na2S2O3

8. Estimate of amount of iron in hematite ore volumetrically

9. Estimate of total alkalinity of water volumetrically

10. Determine conductance, pH of water sample using conductance bridge and pH meter

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi

2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K.Mishra; Kumar and Kumar Publishers (P) Ltd. Bangalore-40

3. "A Text Book of Applied Chemistry-I" by SS Kumar, Tata McGraw Hill, Delhi

4. "A Text Book of Applied Chemistry-I" by Sharma and Other; Technical Bureau of India, Jalandhar

5. Engineering Chemistry by Jain PC and Jain M

6. Chemistry of Engineering by Aggarwal CV

7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi

8. Progressive Applied Chemistry – I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

1.5 BASICS OF INFORMATION TECHNOLOGY

L	T	P
-	-	4

RATIONALE

Information technology has great influence on all aspects of life, Almost all work places and living environment are being computerized. In order to prepare diploma holders to work in these environment, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

1. Teaching of theory should be dovetailed with practical work

2. The following topics may be taught in the laboratory along with the practical exercises.

DETAILED CONTENTS

1. Information Technology – its concept and scope

2. Computers for information storage, information seeking, information processing and information transmission

3. Elements of computer system, computer hardware and software; data – numeric data, alpha numeric data; contents of a program, processing

4. Computer organization, block diagram of a computer, CPU, memory

5. Input devices; keyboard, mouse etc; output devices; VDU and Printer, Scanner, Plotter

6. Electrical requirements, inter-connections between units, connectors and cables

7. Secondary storage; magnetic disk – tracks and sectors, optical disk (CD and DVD Memory), primary and secondary memory: RAM, ROM, PROM etc., Capacity; device controllers, serial port, parallel port, system bus

8. Exercises on file opening and closing; memory management; device management and input - output (I/O) management with respect of windows

9. Installation concept and precautions to be observed while installing the system and software

10. Introduction about Operating Systems such as MS-DOS and Windows

11. Special features, various commands of MS word and MS-Excel

12. About the internet – server types, connectivity (TCP/IP, shell); applications of internet like: e-mail and browsing

13. Various Browsers like WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol)

14. Basics of Networking – LAN, WAN, Topologies

LIST OF PRACTICALS

1. Given a PC, name its various components and list their functions

2. Identification of various parts of a computer and peripherals

3. Practice in installing a computer system by giving connection and loading the system software and application software

4. Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands

5. Exercises on entering text and data (Typing Practice)

6. Installation of Windows 98 or 2000 etc.
   (1) Features of Windows as an operating system
   - Start
   - Shutdown and restore
   - Creating and operating on the icons
   - Opening Closing and sizing the windows
   - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
   - Creating and operating on a folder
   - Changing setting like, date, time color (back ground and fore ground)
   - Using short cuts
   - Using on line help

7. MS-WORD

- File Management:
  Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
- Page Set up:
  Setting margins, tab setting, ruler, indenting

- Editing a document:
  Entering text, Cut, copy, paste using tool-bars

- Formatting a document:
  Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods

- Aligning of text in a document, justification of document, Inserting bullets and numbering

- Formatting Paragraph, inserting footnote, end note, use of comments

- Use of headers, footers: Inserting footnote, end note, use of comments

- Inserting date, time, special symbols, importing graphic images, drawing tools

- Tables and Borders:

Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table

- Print preview, zoom, page set up, printing options

- Using Find, Replace options

- Using Tools like:
  Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and lables

- Using shapes and drawing toolbar,

- Working with more than one window in MS Word,

- How to change the version of the document from one window OS to another

- Conversion between different text editors, software and MS word

8 MS-EXCEL

- Starting excel, open worksheet, enter, edit, data, formulas to calculate values, format data, create chart, printing chart, save worksheet, switching from another spread sheet
- Menu Commands:
  Create, format charts, organize, manage data, solving problem by analyzing data, exchange with other applications, programming with MS-Excel, getting information while working

- Work books:
  Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays

- Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet

- Creating a chart:
  Working with chart types, changing data in chart, formatting a chart, use chat to analyzes data
- Using a list to organize data, sorting and filtering data in list

- Retrieve data with MS – query: Create a pivot table, customizing a pivot table. Statistical analysis of data

- Customize MS-Excel:
  How to change view of worksheet, outlining a worksheet, customize workspace, using templates to create default workbooks, protecting work book

- Exchange data with other application: linking and embedding, embedding objects linking to other applications, import, export documents.

9. Internet and its Applications
   a) Log-in to internet
   b) Navigation for information seeking on internet
   c) Browsing and down loading of information from internet
   d) Sending and receiving e-mail

      - Creating a message
      - Creating a address Book
      - Attaching a file with e-mail message
      - Receiving a message
      - Deleting a message

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hal of India Pvt.Ltd., New Delhi

2. Computers Today by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi

3. MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi

4. Internet for Every One By Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

5. A First Course in Computer by Sanjay Saxena, Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

6. Mastering Windows 95, BPB Publication, New Delhi

7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi

8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

1.6 ENGINEERING DRAWING – I

L	T	P
-	-	6

RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

Note:
1. First angle projection is to be followed
2. Minimum of 15 sheets to be prepared by each student
3. SP46 – 1988 should be followed
4. Instruction relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

1. Drawing Office Practice

    1.1 Drawing instruments

1.2 Sizes and layout of standard drawing sheets

1.3 Sizes of drawing boards

1.4 Drafting table/board

2. Different types of Lines and Free Hand Sketching (1sheet)

2.1 Different types of lines in engineering drawing as per BIS specifications

2.2 Practice in free hand sketching of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, small and large circles, parabolas, curves and ellipses

3. Lettering Techniques and Practice (2sheets)

3.1 Instrumental single stroke (capital and inclined) lettering of 35 mm height in the rations of 7:4

3.2 Instrumental double stroke lettering of 35 mm height in the ratio of 7:4, vertical

3.3 Free hand lettering (alphabet and numerals) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5,3,5,7,10, and 15 mm heights in the ratio of 7:4

4. Dimensioning (1 sheet)

4.1 Necessity of dimensioning, terms and notations – methods and principles, dimensioning small components as in 4.2 below (mainly theoretical instructions)

4.2 Dimensioning of overall sizes, circles, thread holes, chamfered surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches – chain and parallel dimensioning

5. Scale (3 sheets)

5.1 Scales – their need and importance, Definition of representative fraction (RF); Find RF of a given scale

5.2 Types of scales

5.3 Construction of plain and diagonal scales

6. Principle of Projections (strictly in first angle projection)(8sheets)

6.1 Principle of orthographic projection

6.2 projection of points situated in different quadrants

6.3 Projection of lines, Lines inclined to one plane and parallel to the other and vice versa

6.4 Projection of planes: Planes perpendicular and parallel to either of the planes: planes perpendicular to one plane and parallel to the other or vice versa

6.5 Projection of solids, such as Prism, Cube, Cylinder and Cones with axis perpendicular to horizontal plane or Parallel to horizontal plane/vertical plane or both

6.6 Drawing 3 orthographic views of given objects (at least five objects)

6.7 Drawing 6 views of given objects (non-symmetrical one or two objects may be selected for this exercise)

6.8 Identification of surfaces on drawn orthographic views from isometric object drawn

6.9 Exercises on missing lines, surfaces and views

6.10 Sketching practice of pictorial views from isometric objects

7. Sectional views (2 sheets)

Need for sectional views – cutting planes methods of representing sections, conventional sections of various material, classification of sections, conventions in sectioning

Drawing of full section, half section, partial broken out sections, off-set sections, revolved sections and removed sections. Exercises on sectional views of different isometric views

Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections

8. Isometric Views (2 sheets)

8.1 Fundamentals of isometric projections (theoretical instructions)

8.2 Isometric views from 2 or 3 given orthographic views

9. Introduction to Third angle projection (1 sheet)

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House

2. A Text Book of Engineering Drawing by Surjit Singh, Published by Dhanpat Rai and Co., New Delhi

3. Engineering Drawing by PS Gill, Published by SK Kataria and Sons, Delhi

1.7 and 2.7 GENERAL WORKSHOP PRACTICE – I and II

	L	T	P
I	-	-	6
II	-	-	6

RATIONALE

Manual abilities to handle engineering materials with hand tools need to be developed in the students. They will be using different types of tools/equipment in different shops for fabrication purposes. Besides developing the necessary skills, the students will appreciate the importance of quality and safety measures.

DETAILED CONTENTS

Note:

1. The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory, importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.
2. The shops to be offered in I and II semester may be decided at polytechnic level
3. The students should be taken to various shops (not included in the curriculum) in the polytechnic in batches and should be given knowledge of the various

machines/equipment. Such as machine shop, foundry shop, sheet metal shop, etc.

4. Students of diploma in computer Engineering and information Technology will undergo shops 2,6 and 7 only

Following seven shops are being proposed:

1. **Carpentry shop**
2. **Fitting and plumbing shop**
3. **Welding Shop**
4. **Paint Shop**
5. **Forging and sheet metal shop**
6. **Electric shop**
7. **Electronics shop**

1. Carpentry Shop

1.1 Introduction to various types of wood, carpentry tools – their identification with sketches. Different types of wood joints.

1.2 Simple operations viz. hand sawing, marking, planning

1.3 Introduction and sharpening of wood working tools and practice of proper adjustment of tools

1.4 Demonstration and use of wood working machines i.e. band saw, circular saw, rip saw, bow saw and trammels. Universal wood working machine and wood turning lathe

1.5 Making of various joints (Also draw the sketches of various wooden joints in the Practical Note Book)

a) Cross lap joint
b) T-lap joint
c) Corner lap joint
d) Mortise and tenon joint
e) Dovetail joint
f) Prepare a file handle or any utility items by wood turning lathe

2. Fitting and Plumbing shop

2.1 Introduction to fitting shop, common materials used in fitting shop, description and demonstration of various types of work-holding devices and surface plate, V-block

2.2 Demonstration and use of simple operation of hack-sawing, demonstration of various types of blades and their uses

2.3 Demonstrate and use of all important fitting shop tools with the help of neat sketches (files, punch, hammer, scraper, taps and dyes etc.)

2.4 Introduction of chipping, demonstration on chipping and its applications. Demonstration and function of chipping tools.

2.5 Description, demonstration and practice of simple operation of hack saw, straight and angular cutting

2.6 Demonstrations description and use of various types of blades – their uses and method of fitting the blade.

2.7 Introduction and use of measuring tools used in fitting shop like: Try square, Steel rule, Measuring Tape, Outside micrometer, Vernier Calipers and Vernier height Gauge

2.8 Description, demonstration and practice of thread cutting using taps and dies

2.9 Plumbing: Descriptions and drawing of various plumbing shop tools, Safety precautions, Introduction and demonstration of pipe dies, Pipe holding devices, Demonstration and practice of Pipe Fittings such as Sockets, Elbow, Tee, Reducer, Nipple, Union coupling, plug, Bend, Float valves and Taps

Job: Cutting and filing practice on a square of 45 X 45 mm^2 from MS flat
Job: Angular cutting Practice of 45^0 (on the above job)

Job: Preparation of stud (to out external threads) with the help of dies (mm or BSW)

Job: Drilling, counter drilling and internal thread cutting with Taps

Job: H-Fitting in Mild steel (ms) square

Job: Pipe cutting Practice and thread cutting on GI Pipe with pipe dies

3. Welding Shop

3.1 Introduction to welding, type of welding, common materials that can be welded, introduction to gas welding equipment, types of flame, adjustment of flame, applications of gas welding. Welding tools and safety precautions

3.2 Introduction to electric arc welding (AC and DC), practice in setting current and voltage for striking proper arc, precautions while using electric arc welding. Applications of arc welding. Introduction to polarity and their use

3.3 Introduction to brazing process, filler material and fluxes; applications of brazing. Use of solder. Introduction of soldering materials

3.4 Demonstrate and use of the different tools used in the welding shop with sketches. Hand shield, helmet, clipping hammer, gloves, welding lead, connectors, apron, goggles etc.

3.5 Demonstration of welding defects and various types of joints and end preparation

Job: Preparation of cap joint by arc welding
Job: Preparation of Tee joint by arc welding
Job: Preparation of single V or double V butt joint by using Electric arc welding
Job: Brazing Practice. Use of Speltor (on MS sheet pieces)
Job: Gas welding practice on worn-out and broken parts

4. Paint shop

Introduction of painting shop and necessity, Different types of paints. Introduction of powder coating plant their uses.

Job: Preparation of surface before painting such as cleaning, Sanding, putty, procedure and application of primer coat, and painting steel item.

Job: Painting practice by rush on MS sheet

Job: Practice of dip painting

Job: Practice of lettering: Name plates / Sign board

Job: Polishing and painting on wooden and metallic surfaces

Job: Practical demonstration of powder coating

5. Forging and sheet metal shop

Introduction to forging, forging tools, tongs, blowers/pressure blowers, hammers, chisels, punch, anvil, swag-block etc. Forging operations.

5.1 Forge a L hook or Ring from MS rod 6 mm ϕ

5.2 Forge a chisel and give an idea of hardening and tempering

5.3 Lap joint with forge welding

5.4 High strength steel (HSS) tools – forging of Lathe shaper tools like side-tools and V-shape tools

5.5 Making sheet metal joints

5.6 Making sheet metal trey or a funnel of a computer chassis

5.7 Preparation of sheet metal jobs involving rolling, shearing, creasing, bending and cornering

5.8 Prepare a lap riveted joint of sheet metal pieces

6. Electric Shop

6.1 Demonstration of tools commonly used in Electric Shop

6.2 Safety precautions, electric shock treatment

6.3 Demonstration of Common Electric material like: wires, fuses, ceiling roses, battens, cleats and allied items

6.4 Demonstration of Voltmeter, Ammeter, Multimeter and Energy meter

Job: Wiring practice in batten wiring, plastic casing-capping and conduit

Job: Control of one lamp by one switch

Job: Control of one lamp by two Switches

Job: Control of one bell by one switch

Job: Assemble a Tube light

Job: Dismantle, study, find out fault, repair the fault, assemble and test domestic appliances like electric iron, electric mixer, ceiling and table fan, tube-light, water heater (geyser) and desert cooler

Job: Laying out of complete wiring of a house (Single-phase and Three-phase)

7. Electronics Shop

7.1 Identification, familiarization, demonstration and use of the following electronic instruments:

a) Multi-meter digital
b) Single beam simple CRO, function of every knob on the front panel
c) Power supply, fixed voltage and variable voltage, single output as well as dual output.

7.2 Identification, familiarization and uses of commonly used tools; active and passive components; colour code and types of resistor and potentiometers

7.3 Cut, strip, join and insulate two lengths of wires/cables (repeat with different types of cables/wires)

7.4 Demonstrate and practice the skill to remove components/wires by unsoldering

7.5 Cut, bend, tin component, leads, inserts. Solder components e.g. resistor, capacitor, diodes, transistors on a PCB

7.6 Wiring of a small circuit on a PCB/tag strip involving laying, sleeving and use of identifier tags

7.7 Demonstrate the joining (or connecting) methods/mounting and dismantling method, as well as uses of the items mentioned below:

a) Various types of plugs, sockets, connectors suitable for general-purpose audio video use. Some of such connectors e.g. 2 and 3 pin mains plug and sockets, Banana plugs, sockets and similar male and female connectors and terminal strips.
b) various types of switches such as: normal/miniature toggle, slide, push button piano key, rotary, SPST, SPDT, DPST, DPDT, band selector, multi-way Master Mains Switch

7.8 Exposure to modern soldering and de-soldering processes (Field visits)

7.9 De-solder pump, remove and clean all the components and wires from a given equipment a PCB or a tag strip

COMMUNICATION SKILLS – II **030021**

L	T	P
3	-	2

Rationale

Interpersonal communication is a natural and necessary part of organizational life. Yet communicating effectively can be challenging because of our inherent nature to assume, overreact to and misperceive what actually is happening. Poor or lack of communication is often cited as the cause of conflict and poor teamwork. In today's team-oriented workplace, managing communication and developing strategies for creating shared meaning are crucial to achieving results and creating successful organizations. The goal of the ***Communicating Effectively in English*** course is to produce civic-minded, competent communicators. To that end, students must demonstrate oral as well as written communication proficiency. These include organizational and interpersonal communication, public address and performance.

II SEMESTER 48 hrs

1. LISTENING COMPREHENSION 4hrs
1.1 Locating Main Ideas in a Listening Excerpt
1.2 Note-taking

2. ORAL COMMUNICATION SKILLS 14 hrs
2.1 Offering-Responding to Offers
2.2 Requesting-Responding to Requests
2.3 Congratulating
2.4 Expressing Sympathy and Condolences

2.5 Expressing Disappointments
2.6 Asking Questions-Polite Responses
2.7 Apologizing, Forgiving
2.8 Complaining
2.9 Persuading
2.10 Warning
2.11 Asking for and Giving Information
2.12 Giving Instructions
2.13 Getting and Giving Permission
2.14 Asking For and Giving Opinions

3. GRAMMAR AND USAGE 10hrs
3.1 Prepositions
3.2 Pronouns
3.3 Determiners
3.4 Conjunctions
3.5 Question and Question Tag
3.6 Tenses (Simple Present, Simple Past)
*One chapter revising the topics discussed during the first semester.
(Punctuation, Articles, Framing questions, Verbs, Word formation)

4. WRITING SKILLS 10hrs
4.1 Writing Notice
4.2 Writing Circular
4.3 Writing a Memo
4.4 Agenda for a Meeting
4.5 Minutes of the Meeting
4.6 Telephonic Messages
* Writing a paragraph will be a continuous exercise through out the session.
(Writing will be based on verbal stimuli, tables and graphs.)

5. READING SKILLS 10hrs
5.1 Vocabulary Enhancement
5.2 Techniques of reading: Skimming, Scanning, Intensive and Extensive Reading

NOTE: The Reading Skills of the learners (along with vocabulary enhancement) will be through reading thematic articles/essays and/or stories.

2.2 APPLIED MATHEMATICS – II

L	T	P
4	1	-

RATIONALE

Applied Mathematics forms the backbone of engineering discipline. Basic elements of differential calculus, integral calculus, differential equations and coordinate geometry have been included in the curriculum as foundation course and to provide base for continuing education to the students

DETAILED CONTENTS

1 Co-ordinate Geometry (18 hrs)

1.1 Area of a triangle, centroid and incentre of a triangle (given the vertices of a triangle), Simple problems on locus

1.2 Equation of straight line in various standard forms (without proof) with their transformation form one form to another, Angle between two lines and perpendicular distance formula (without proof)

1.3 Circle: General equation and its characteristics given:

- The center and radius
- Three points on it
- The co-ordinates of the end's of the diameter

1.4 Conics (parabola, ellipse and hyperbola), standard equation of conics (without proof), given the equation of conic to calculate foci, directrix, eccentricity, latus return, vertices and axis related to different conics Differential Calculus

2. Differential Calculus (22 hrs)

2.1 Concept of function, four standard limits

$\lim_{x \to a} (x^n - a^n) / (x - a)$, $\lim_{x \to} \sin x/x$, $\lim_{x \to 0} (a^x - 1)/x$ $\lim_{x \to 0} (1+x)^{1/x}$

2.2 Concepts of differentiation and its physical interpretation

- Differentiation by first principle of x^n, $(ax + b)^n$, Sin x, cos x, tan x, sec x,, cosec x and cot x, e^x, a^x, log x, differentiation of a function of a function and explicit and implicit functions
- Differentiation of sum, product and quotient of different functions
- Logarithmic differentiation, Successive differentiation excluding n^{th} order

2.3 Application of derivatives for (a) rate measure (b) errors (c) real root by Newton's method (d) equation of tangent and normal (c) finding the maxima and minima of a function (simple engineering problems)

3. Integral Calculus (16 hrs)

3.1 Integration as inverse operation of differentiation

3.2 Simple integration by substitution, by parts and by partial fractions

3.3 Evaluation of definite integrals (simple problems) by explaining the general properties of definite integrals

3.4 Applications of integration for
- Simple problem on evaluation of area under a curve where limits are prescribed
- Calculation of volume of a solid formed by revolution of an area about axis (simple problems) where limits are prescribed
- To calculate average and root mean square value of a function
- Area by Trapezoidal Rule and Simpson's Rule

4. Differential Equations (8 hrs)

Solution of first order and first degree differential equation by
- Variable separation
- Homogeneous differential equation and reducible homogeneous differential equations
- Linear differential equations and reducible linear differential equations

RECOMMENDED BOOKS

1. Higher Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
3. Engineering Mathematics vol. II by S Kohli and others, IPH, Jalandhar
4. Engineering Mathematics by Ishan Publication
5. Applied Mathematics Vol. II by SS Sabharwal and Others; Eagle Parkashan, Jalandhar
6. Engineering Mathematics by IB Prasad

7. Applied Mathematics Vol. II by Dr RD Sharma
8. Advanced Engineering Mathematics by AB Mathur and VP Jai; Khanna Publishers, Delhi
11. Engineering Mathematics by C Dass Chawla; Asian Publishers, New Delhi

2.3 APPLIED PHYSICS – II

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3	-	2

RATIONALE

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various field of engineering and technology are given prominence in the course content.

DETAILED CONTENTS

1. Application of sound waves (6 hrs)

   1.1 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time

   1.2 Ultrasonics – production (magnetostriction and peizo-electric) and their engineering applications

2. Principle of optics (9 hrs)

   2.1 Introduction reflection of light, image formation in mirrors (convex and concave), refraction and refractive index, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection

   2.2 Defects in image formation by lenses and their correction

   2.3 Simple and compound microscope, astronomical and Galileo telescope, magnifying power and its calculation (in each case)

   2.4 Overhead projector and slide projector

3. Electrostatics (9 hrs)

   3.1 Coulombs law, unit change

   3.2 Gauss’s Law

3.3 Electric field intensity and electric potential

3.4 Electric field of point charge, charged sphere (conducting and non-conducting) straight charged conductor, plane charged sheet

3.5 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors

3.6 Dielectric and its effect on capacitors, dielectric constant and dielectric break down

4. Electricity (6 hrs)

4.1 Ohm's law

4.2 Resistance of a conductor, specific resistance, series and parallel combination of resistors, effect of temperature on resistance

4.3 Kirchhoff's laws, wheatstone bridge principle and its applications

4.4 Heating effect of current and concept of electric power

5. Semi conductor physics (9 hrs)

5.1 Energy bands, intrinsic and extrinsic semi conductors, p-n junction diode and its characteristics

5.2 Diode as rectifier – half wave and full wave rectifier, semi conductor transistor prip and npn (concept only)

6. Modem Physics (9 hrs)

6.1 Lasers: concept of energy levels, ionization and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, type of lasers, helium – neon and ruby lasers and applications

6.2 Fibre optics: introduction optical fiber materials, types , light propagation and applications

6.3 Super conductivity: Phenomenon of super conductivity, effect of magnetic field, critical and, type I and type II super conductors and their applications)

6.4 Energy sources – conventional and non-conventional (wind , water, solar, bio, nuclear energy), only elementary idea

LIST OF PRATICALS

1. To verify Ohm's law
2. To verify law of resistances in series and in parallel
3. To determine the magnifying power of a compound microscope
4. To determine the magnifying power of an astronomical telescope
5. To convert a galvanometer into an ammeter of a given range
6. To convert a galvanometer into a voltmeter of a given range
7. To find the wavelength of a He-ne laser
8. To find the frequency of a tuning fork by a sonometer
9. To study characteristics of a pn junction diode

RECOMMENDED BOOKS

1. Applied Physics Vol. II, TTI Publication Tata McGraw Hill, Dehi

2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publicatios

3. Comprehensive Practical Physics – Volume I and II by JN Jaiswal, Laxmi Publishers

4. Numerical Problems in Physics – Volume I and II by RS Bharaj; Tata McGraw Hill

5. Simple Course in Electricity and Magnetism by CL Aroa; S Chand and Co, New Delhi

6. Fundamental Physics – Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar

7. A Text Book of Optics by Subramanian and Brij Lal

8. Physics Laboratory Manual by PK Palanisamy, Scitech Publicatiosn

9. Fundamentals of Physics by Resnick and Halidar, Asian Bookd Pvt. Ltd., New Delhi

10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi

2.4 APPLIED CHEMISTRY-II

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2 - 2

RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. Metallurgy (8 hrs)

1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting calcinations and refining as applied in relation to various metallurgical operations

1.2 Metallurgy of (i) Aluminium (ii) Iron with their physical and chemical properties

1.3 Definition of an alloy, purposes of alloying, composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin, alnico and invar

2. Fuels (10 hrs)

2.1 Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples

2.2 Definition of Calorific value of a fuel and determination of calorific value of a liquid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values

2.3 Brief description of 'Proximate' and 'Ultimate' analysis of a fuel. Importance of conducting the proximate and ultimate analysis of a fuel

2.4 Qualities of a good fuel and merits of gaseous fuels over those of other varieties of fuels

2.5 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas

3 Corrosion (3 hrs)

3.1 Meaning of the term 'corrosion' and its definition

3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory

3.3 Prevention of corrosion by

1. (a) Alloying

(b) Providing metallic coatings

2. Cathodic protections:

(a) Sacrificial
(b) Impressed voltage method

4 Lubricants (4 hrs)

4.1 Definition of (i) lubricant (ii) lubrication
4.2 Classification of lubricants
4.3 Principles of lubrication
(i) fluid film lubrication
(ii) boundary lubrication
(iii) extreme pressure lubrication
4.4 Characteristics of a lubricant such as viscosity, viscosity index, volatility oiliness, acidity, emulsification, flash point and fire point and pour point.

5 Cement and Glass (2 hrs)

5.1 Manufacture of Portland Cement
5.2 Manufacture of ordinary glass and lead glass

6. Classification and Nomenclature of Organic Compounds (5 hrs)

Classification of Organic Compounds, functional group, Homologous Series, Nomenclature, Physical and Chemical properties, and industrial use of Organic Compounds, IUPAC system of nomenclature of Carboxylic acid, Alcohols, Phenols, Aldehydes, Ketones and Amines.

LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used there in
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances
3. Determine the viscosity of a given oil with the help of “Redwood viscometer”
4. Determine the flash point of the given oil with the help of Abel’s Flash Point Apparatus
5. Estimate the amount of moisture in the given sample of coal
6. Estimate the amount of ash in the given sample of coal
7. Electroplate the given strip of Cu with Ni
8. Confirmation test of alcohol, aldehydes, carboxylic acid, amine
9. Determination of copper in the given brass solution, or sample of blue vitriol volumetrically
10. Detection of metal iorn in the rust (solution of rust in concentrated HCL may be given).

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. “A Text Book of Applied Chemistry-I” by SS Kumar; Tata McGraw Hill, Delhi
4. “A Text Book of Applied Chemistry-I” by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi

8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

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2.5 BASIC ELECTRICAL ENGINEERING

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DETAILED CONTENTS

1. DC Circuits

1.1 Concept of electricity, various applications of electricity, advantages of electricity over other types of energy.
1.2 basic terms – voltage, current, potential difference, power, energy and their units.
1.3 Ohm's law and its practical applications, concepts of resistance, conductance, resistivity and their units,
1.4 Effect of temperature on resistance, temperature coefficient of resistance
1.5 Series and parallel combination of resistors, wattage consideration, simple problems
1.6 Kirchhoff's current law and Kirchhoff's voltage low and their applications to simple circuits. Conversion of circuits from Star to Delta and Delta to Star.

2. DC Circuits Theorems

Thevenin's theorem, Norton's theorem, super position theorem, maximum power transfer theorem, application of network theorem in solving d.c circuit problems.
3. Constant Voltage and Constant Current Sources
a) Concept of constant voltage source, symbol and graphical representation characteristics of ideal and practical sources.
b) Concept of constant current sources, symbol, characteristics and graphical representation of ideal and practical current sources.

4. Electro Magnetic Induction

a) Concepts of magnetic field produced by flow of current, Magnetic circuit, concept of magneto-motive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.
b) Faraday's law and rules of electro-magnetic induction, principles of self and mutual induction, self and mutually induced e.m.f, simple numerical problems.
c) Concept of current growth, decay and time constant in an inductive (RL) circuit.
d) Energy stored in an inductor, series and parallel combination of inductors.

5. Batteries

5.1 Basic idea about primary and secondary cells
5.2 Construction, working and applications of Lead-Acid battery and Nickel-Cadmium cells, Silver-Oxide cells

5.3 Charging methods used for lead-acid battery (accumulator)
5.4 Care and maintenance of lead-acid battery
5.5 Series and parallel connections of batteries.
5.6 General idea of solar cells, solar panels and their applications

6. AC Fundamentals

6.1 Concept of alternating voltage and current
6.2 Difference between a.c and d.c
6.3 Concept of cycle, frequency, time period, amplitude, instantaneous value, average value r.m.s. value, maximum value, from factor and peak factor.
6.4 Representation of sinusoidal quantities by phasor diagrams.
6.5 Equation of sinusoidal wave from (with derivation)
6.6 Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.

7. AC Circuits

7.1 Inductive reactance and capacitive reactance
7.2 Alternating voltage applied to resistance and inductance in series.
7.3 Alternating voltage applied to resistance and capacitance in series.
7.4 Impedance triangle and phase angle
7.5 Solutions and phasor diagrams for simple RLC circuits (series and parallel).
7.6 Introduction to series and parallel resonance and its conditions
7.7 Power in pure resistance, inductance and capacitance, power in combined RLC circuits, Power factor, active and reactive and reactive power and their significance, importance of power factor.
7.8 j-notation and its application in solving a series and parallel AC circuits
7.9 Definition of conductance, susceptance and admittance.

8. Various Types of Power Plants

Brief explanation of principle of power generation in thermal, hydro and nuclear power stations and their comparative study.
Elementary block diagram of above mentioned power stations

LIST OF PRACTICALS

1. Familiarization of measuring instruments viz voltmeter, ammeter, CRO, Wattmeter and multi-meter and other accessories
2. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.
3. To measure (very low) resistance of an ammeter and (very high) resistance of a voltmeter
4. To verify in d.c circuits:
a. Thevenin's theorem.
b. Norton's theorem.
c. Super position theorem.
d. Maximum power transfer theorem,

5. To observe change in resistance of a bulb in hot cold conditions, using voltmeter and ammeter.
6. Verification of Kirchhoff's Current Law and Kirchhoff's Voltage Laws in a dc circuit

7. To find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance
8. To find the voltage current relationship in a single phase R-L and R-C series circuits, draw their impedance triangles and determine the power factor in each case.
9. To test a lead – acid storage battery and to charge it.
10. Measurement of power and power factor in a single phase R.L.C. circuit and to calculate active and reactive power.
11. Visit to a nearby Power Station(s)

RECOMMENDED BOOKS

1. Electrical Technology, Fifth Edition by Edward Hughes, Longman Publishers
2. Electrical Technology by BL Theraja, S Chand and Co, New Delhi
3. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi
4. Experiments in Basic Electrical Engineering by SK Bhatacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi
5. Basic Electricity by BR Sharma; Satya Prakashan; New Delhi
6. Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi
7. Basic Electrical Engineering by PS Dhogal, Tata Mc Graw Hill, New Delhi
8. Basic Electrical Engineering by JB Gupta ; SK Kataria and Sons, New Delhi
9. Experiments in Basic Electrical Engineering by GP Chhalhotra,Khanna Publishers, New Delhi
10.
10. ElectricalEngineering by Mool singh,Gilgotia Publications Pvt.Ltd. New Delhi
Publishing House, New Delhi

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2.6 ANALOG ELCECTRONICS

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4 – 2

DETAILED CONTENTS

1. Semi conductor physics:

Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Ge and Si, covalent bonds Concept of intrinsic and extrinsic semi conductor, P and N impurities, doping of impurity. P and N type of semiconductors and their conductivity. Effect of temperature on conductivity of intrinsic semi conductor. Energy level diagram of conductors, insulators and semi conductors; minority and majority carriers.

2. Semi conductor diode:

PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential n=barrier, concept of junction capacitance in forward and reverse bias condition.
V-I characteristics, static and dynamic resistance and their calculation from diode characteristics. Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC filter and filter. Types of diodes, characteristics and applications of zenor diodes. Zenor and avalanche breakdown.

3. Introduction to Bipolar transistor:

Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow; Current relations in transistor; concept of leakage current; CB, CE, CC configuration of the transistor; Input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; Current amplification factors. Comparison of CB CE and CC Configurations; Transistors as an amplifier in CE Configurations; d.c. load line and calculation of current gain, voltage gain using d.c load line.

4. Transistor biasing circuits:

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.

5. Single stage transistor amplifier:
Single stage transistor amplifier circuit, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit. Explanation of phase

reversal of output voltage with respect to input voltage. H- parameters and their significance. Calculation of current gain, voltage gain, input impedance and output impedance using h-parameter.

6. Field effect Transistors

Construction, operation and characteristics of FET and its application.
- Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications.
- C MOS – advantages and applications
- Comparison of JFET, MOSFET and BJT.
- FET amplifier circuit and its working principle. (No analysis)

LIST OF PRACTICALS

1. Familiarization with operation of following instruments.
Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant electrical quantities with their help.
2. Plot V-I characteristics for PN junction diode
3. Plot V-I characteristics of Zeno diode
4. Observe the wave shape of following rectifier circuit
a. Half wave rectifier
b. Full wave rectifier
c. Bridge rectifier
5. Plot the wave shape of full wave rectifier with
a. Shunt capacitor filter
b. Series inductor filter
c. Filter
6. Plot input and output characteristics and calculate parameters of transistors in CE configuration.
7. Plot input and output characteristics and calculate of parameters of transistor in CB configuration.
8. Plot V-I characteristics of FET amplifier.
9. Measure the Q-Point and note the variation of Q-Point.
a. By increasing the base resistance in fixed bias circuit.
b. By changing out of bias resistance in potential divider circuit.
10. Measure the Voltage Gain, input, output impedance in single state CE amplifier circuit.

BOOKS RECOMMENDED

1. Basic Electronics and linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi

3. Electronic Components and Materials by SM Dhir, Tata McGraw Hil, New Delhi.

4. Electronic Devices and Circuits by Millman and Halkias; McGraw Hill.
5. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill, New Delhi
6. Electronics Devices and Circuits-I by Naresh Gupta, Jyotesh Malhotra and harish C Saini, Eagle Prakashan, Jalandhar
7. Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C.Kuriacose and J.Rajaram; Tata McGraw-Hill Publishing Company Limited. New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. "A Text Book of Applied Chemistry-I" by SS Kumar; Tata McGraw Hill, Delhi
4. "A Text Book of Applied Chemistry-I" by Sharma and Other; Technical Bureau of India. Jalandhar
5. Engineering Chemistry by Jain PC and Jain M
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry of Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry – I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

2.7 GENERAL WORKSHOP PRACTICE – II

Please see the contents of workshop practice-I
At the page no(s) – 34 to 36

3.1 TRANSDUCERS

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DETAILED CONTENTS

1. Basic concepts

- Definition and classification of transducers

2. Variable Resistance Transducers Construction, working principle, selection criteria and application of

- Potentiometer, strain gauge, load cell
- Hot wire anemometer, photo resistors
- Resistire temperature transducers
- Themistors
- Carbon Microphones
- Aceelometer advantages, disadvantage and limitation

3. Variable Inductance transducer

- Construction, working principles, selection criteria and application of
- Electromagnetic pick up
- Induction potentiometer
- Linear variable differential transformer
- Synchronous transmitter and receivers, advantages, disadvantages and limitations

4. Variable capacitance Transducers

- Construction, basis principle selection criteria and application of
- Capacitance pick up
- Condenser microprocessor
- Differential capacitor pick up advantages, disadvantages and limitations

5. Piezoelectric Transducers

- Construction basic principle, selection criteria and application of
- Piezoelectric Transducer
- Selsmic pick up
- Ultrasonic, Transducer
- Advantage, disadvantages and limitations

6. Other types of transducers

- Transducers based upon hall effect
- Optical transducers-photo diode, photo transistor LDR, and LED
- Digital transducer-single shaft encoder
- Techno generator
- Advantage and disadvantage and limitations

LIST OF PRACTICALS

1. Study of strain gauge and measurement of strain for a given sample
2. Study of piezoelectric pressure transducer
3. Study of RTD (Resistance Temperature detector)
4. Study of thermistors
5. Study of calibration of LVDT
6. Study of capactive transducer and measurement of angular displacement
7. Study of magnetic pick up
8. Study of draw the characteristics of a capacitance transducer
9. Study of Thermocouple
10. To study and draw the characteristics of following

- LDR
- Photo diode
- Photo transistor

LIST OF RECOMMENDED BOOKS

1. Electrical and Electronics Measurement and Instrumentation by A.K. Shawney, Dhanpat Rai and Co., New Delhi
2. Mechanical and industrial measurement by R.K.Jain, Khanna Publishers, New Delhi
3. Transducers by Peter Norton
4. Mechatronics by Bolton, Prentice Hall of India, New Delhi

3.2 ELECTRONIC COMPONENTS AND MATERIALS

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1. Materials

1.1 Classification of materials

Conducting. Semi-conducting and insulating materials through a brief reference to their atomic structure.

1.2 Conducting Materials

Resistors and factors affecting resistivity such as temperature, alloying and mechanical stressing. Classification of conducting materials into low resistivity and high resistivity materials.

1.3 Insulating Materials

Important relevant characteristics (electrical, mechanical and thermal) and applications of the following material:

Mica, Glass, Copper, Sliver, PVC, Silicon, Rubber, Bakelite, Cotton, Ceramic, Polyester, Polythene and Varnish.

1.4 Magnetic Materials

Different Magnetic materials; (Dia, Para, Ferro) and their properties. Ferro magnetism, Domains, permeability, Hysteresis loop. Soft and hard magnetic materials, their examples and typical applications.

2. Components

2.1 Capacitors

a) Concept of capacitance and capacitors, units of capacitance, types of capacitors, constructional details and testing specifications

b) Capacity of parallel plate capacitors, spherical capacitors, cylindrical capacitor.

c) Energy stored in a capacitor.

d) Concept of di-electric and its effects on capacitance, di-electric constant, break down voltage.

e) Series and parallel combination of capacitor. Simple numerical problems of capacitor.

f) Charging and discharging of capacitor with different resistances in circuit, concept of current growth and decay, time constant in R-C circuits, simple problems.

2.2 Resistors: Carbon film, metal film, carbon composition, wound and variable type (presets and potentio-meters)

2.3 Transformer, inductors and RF coils:

2.4 Surface Mounted Devices (SMDs):

Constructional detail and specifications.

2.5 Connectors, Relays, switches and cables:

Different types of connectors, relays, switches and cables, their symbols, construction and characteristics.

2.7 Semi Conductors and Integrated Circuits

Basic characteristics of Semiconductor materials, testing of diodes, transistors, FETs and SCRs.

Various processes in IC manufacturing. Hybrid IC technology

Superconductivity and piezoelectric ceramic transducer elements

RECOMMENDED BOOKS

1. Electronic components and Materials by Grover and Jamwal; Dhanpat Rai and Sons, New Delhi

2. Basic Electronics and Linear Ciruits by NN Bhargava and Kulshreshta; Tata McGraw Hill, New Delhi

3. Electronic components and Materials aby SM Dhir, Tata McGraw Hill, New Delhi

4. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi

5. Electronic Engineering Materials by ML Gupta, Dhanpat Rai and Sons; New Delhi.

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3.3 PRINCIPLES OF INSTRUMENTATION

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DETAILED CONTENTS

1. Basic building blocks of any instrumentation systems
- Scope and necessity of instrumentation
- Name of important process variables, their units
- Building blocks of instrumentation system
- Various testing signals

2. Performance characteristics of Instruments
- Static and dynamic characteristics of instruments
- Concept of time constant, response time, natural frequency, damping co-efficient
- Order of instruments (1^{st} and 2^{nd} order) with industrial applications
- Ramp, sinusoidal, step response of different orders of instruments systems
- Analytical execution

3. Display and recording devices
- Operating mechanism in indicators and recording devices
- Various indicating. Integrating and recording methods and their combination
- Merits and demerits of circular chart and strip chart recorder
- Basics of printing devices
- Scanning, data logging and field buses
- Bar graph LCD, seven segment display, X-Y recorder, scanners
- Design experiments for display system

4. Instrument selection
- Factors affecting instrument selection, accuracy, precision,
linearity, resolution, sensitivity, hysteresis, reliability, serviceability, loading effect, range advantage and limitation, cost effectiveness and availability
- Static and dynamic response
- Environmental effects
- Calibration tools

5. Errors
- Sources and classification of errors, the remedial action

- Grounding earthing, guarding and shielding
- Precautions
- Analytical execution

LIST OF PRACTICALS

1. To study the 1ST order instrument
2. To Study the 2nd order instrument
3. To find the response of 1st order instrument with step, sinusoidal and ramp input
4. To find the response of 2nd order instrument with step, sinusoidal and ramp input
5. To assemble seven segment display using LEDs
6. To make fourteen segments display using LCD and verify it
7. To make the DOT Matrix display and its verification
8. Make any word using LCD and LED
9. To study circular and strip chart recorder

RECOMMENDED BOOKS

1. Mechanical and Industrial Measurement of by RK Jain, Khanna Publishers, New Delhi
2. Industrial Instrumentation by Donald P Eickrman
3. Electrical and Electronics Measurement of by AK Shawney, Dhanpat Rai and Company, New Delhi
4. Advanced Instrumentation and Control by MF Kureshi

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3.4 DIGITAL ELECTRONICS

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DETAILED CONTENT

1. Introduction

a) Define digital and analog signals and systems, difference between analog and digital signals

b) Need of digitization and applications of digital systems

2. Number Systems

a) Decimal, binary, octal, hexadecimal number systems

b) Conversion of number from one number system to another including decimal points

c) Binary addition, subtraction, multiplication, division, 1^{st} and 2^{nd} complement method of subtraction

d) BCD code numbers and their limitations, addition of BCD coded numbers, conversion of BCD to decimal and vice-versa

e) Excess-3 code, gray code, binary to gray and gray to binary conversion

f) Concept of parity, single and double parity, error detection and correction using parity

3. Logic Gates

a) Logic gates, positive and negative logic, pulse waveform, definition, symbols, truth tables, pulsed operation of NOT, OR,AND, NAND, NOR, EX-OR, EX-NOR gates

4. Logic Simplification

a) Rules and laws of Boolean algebra, logic expression, Demorgan's theorems, their proof

b) Sum of products form (minterm), Product of sum form (maxterms), simplification of Boolean expressions with the help of Rules and laws of Boolean algebra

c) Karnaugh mapping techniques upto 4 variables and their applications for simplification of Boolean expression

5. Arithmetic Circuits

a) Half adder, full adder circuits and their operation

b) Parallel binary adder, 2-bit and 4-bit binary full adder, block diagram, working

6. Multiplexer/Demultiplexer

a) Basic functions, symbols and logic diagrams of 4-inputs and 8-inputs multiplexers.
b) Function/utility of 16 and 32 inputs multiplexers.
c) Realization of Boolean expression using multiplexer/demultiplexers

7. Decoders, Display Devices and Associated Circuits

a) Basic Binary decoder, 4-line to 16 line decoder circuit
b) BCD to decimal decoder, BCD to 7-segment decoder/driver, LED/LCD display

8. Encoders and Comparators

a) Encoder, decimal to BCD encoder, decimal to BCD priority encoder, keyboard encoder
b) Magnitude comparators, symbols and logic diagrams of 2-bit and 4-bit comparators

9. Latches and Flip-Flops

a) Letch, Sr-latch, D-latch, Flip-flop, difference between latch and flip-flop
b) S-R, D flip-flop their operation using waveform and truth tables, race aroung condition
c) JK flip-flop, master slave and their operation using waveform and truth tables

10. Counters

a) Asynchronous counter, 4-bit Asynchronous counter, Asynchronous decade counter
b) Asynchronous counter, 4-bit Synchronous binary counter, Asynchronous
c) Up/down Asynchronous counters, divide by N counter MOD-3, MOD-5, MOD-7, MOD-12 counters
d) Ring counter, cascaded counter, counter applications

11. Shift Registers

a) Shift registers functions, serial-in-serial out, serial-in-parallel-out, parallel-in serial-out, parallel-in-parallel out
b) Universal shift register, shift register counter and applications of shift registers

LIST OF PRACTICALS

1. Study of logic breadboard with verification of truth table for AND, OR, NOT, NAND,EX-OR, NOR GATE
2. Verification of NAND and NOR gate as universal gates
3. Construction of half-adder and full adder circuits using EX-OR and NAND gate and verification of their operation
4. Verify the operation of
a) multiplexer using an IC
b) de-multiplexer using an IC
5. a) Verify the operation of BCD to decimal decoder using an IC
b) Verify the operation of BCD to 7 segment decoder using an IC
6. Verity operation of SR,JK,D-flip-flop master slave JK filp-flop using IC
7. Verify operation of SISO, PISO, SIPO,PIPO shift register, (universal shift register)
8. Study of ring counter, Up/down counter
9. Construct and verify the operation of and asynchronous binary decade counter using JK flip flop
10. Verification of truth tables and study the operation of tristate buffer IC 74126 or similar IC and construction of 4/8 bit bi-directional bus by using as IC
11. Testing of digital ICs using IC tester

RECOMMENDED BOOKS

1. Digital Electronics and Applications by Malvino leach, Tata McGral Hill, New Delhi
2. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
3. Digital Fundamentals by Thomas Floyds, Universal Book Stall
4. Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi
5. Digital Electronics by KS Jamwal, Dhanpat Rai & Co., New Delhi
6. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
7. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
8. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
9. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi

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3.5 ELECTRICAL MACHINES

L	T	P
3	-	3

DETAILED CONTENT

1. Three Phase Supply

a) Advantages of 3 phase system over single phase system
b) Star delta connections
c) Relation between phase voltage and line voltage, also between phase current and line current in a 3 phase system
d) Power and power factor in 3 phase system and their measurements

2. Transformer

Principles of trandormer, construction, voltage and current transformation, methods of connection 3 phase transformers, current and voltage relationship, auto transformer and its uses, instruments transformer, voltage regulation and its significance, nee for isolation , electrical and transients suppression, principles of isolation transformer, specifications of all types of transformers Losses in a transformer

3. DC Motor

Principles, significance of back emf, types of motors and their constructions, motor characteristics for shunt and series, speed control of DC motors and factors controlling the speed. Starting methods. Construction and working of 3 point starter, applications (simple problems)

4. 3 Phase Induction Motors

Principles, construction, concept of slip, torque and characteristics, effect of motor resistance on torque (running and starting), rotor current, output power, different methods of speed control. Starting methods and constructional and working of 3 point starter, applications (simple problems)

5. Synchronous Motors

Principles, constructions and working, effect of load and excitation on synchronous motor. Starting of motor and their applications

6. Single Phase Motors

Principles, construction, working speed control, starting and applications of the following motors:
a) Induction motor
c) Universal motor

7. Stepper Motor and Server Motor

Types, construction, working and their applications

(Note: No derivation of any formula)

LIST OF PRACTICALS

1. Introduction to electrical machines
Measurement of the angular displacement of rotor of the three phase synchronous machine with respect to the stator on application of DC to the filed winding and simultaneously to each phase-winding in sequence
OR
Measurement of the angular displacement of the rotor of a slip-ring induction motor on application o DC to stator winding in sequence and simultaneously to each phase of rotor winding
2. DC machines
2.1 Speed control of dc shunt motor (i) Armature control method (ii) Field control method
2.2 Study of dc series motor with starter (to operate the motor on no load for a moment)
3. Transformers (single phase)
3.1 To perform open circuit and short circuit test for determining parameter of a transformer
3.2 To determine the regulation and efficiency from the data obtained from open circuit and short circuit test
4. Three-phase transformers
4.1 Checking the polarity of the windings of a three phase transformer and connecting the windings in various configurations
4.2 Finding the voltage and current relationships of primary and secondary of a three phase transformer under balanced load in various configurations conditions

RECOMMENDED BOOKS

1. Electrical Machine by SK Bhattacharya, Tata Mc Graw Hill, New Delhi
2. Electrical Machines by SK Sahdev, Unique International Publications, Jalandhar
3. Electrical Machines by Nagrath and kothari, Tata Mc Graw Hill, New Delhi

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3.6 ELECTRONIC INSTRUMENTS AND MEASUREMENT

L	T	P
4	-	3

DETAILED CONTENTS

1. Basics of Measurements

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

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

Advantages over conventional multimeter for volt measurement with respect to input impendence and sensitivity
Principles of voltage , current and resistance measurement (block diagram only)
Specifications of electronics voltmeter

4. A C Milli voltmeter

Types of AC milli voltmeters and their block diagram description
Typical specification and their significance

5. Cathode Ray Oscilloscope

Construction and working of different blocks used in CRT
Time base operation and need for banking 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 principal

6.Singal Generators and Analysis Instruments

Explanation of block diagram specifications of low frequency and RF generators ,

Pulse generator , function generator
Distortion factor meter; wave analyzer and spectrum analyser

7. Impedance Bridges and Q Meters

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

Comparison of analog and digital instruments
Working principle of ramp, dual slope and integration type digital voltmeter
Block diagram 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 voltage across a low resistance and high resistance
2. To observe the limitations of a multimeter for measuring high frequency valtage
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

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

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4.1 BASIC OF CONTROL SYSTEMS

L	T	P
4	-	3

DETAILED CONTENTS

1. Introduction

Basic elements of control system, open loop control system, closed loop control system, manually controlled closed loop systems, automatic controlled closed loop systems, control system examples from mechanical systems, electrical systems, introduction to laplace
transform

2. Control system representation

Transfer function, block diagram, reduction of block diagram, Mason's formula signal flow graph

3. Time Response Analysis

Standard test signals, time response of first and second-order system, time constant, time response of second other system, time response specifications, steady-state errors and error constants.

4. Stability

Routh Hurwitz Criterion, Root Locus, Bode Plotting

5. Multiloop Control System

Introduction to feed forward, cascade, ratio, split range, control system.

6. Non-Linear Control System

Introduction, behaviour of non-linear control system, Different types of nonlinear ties, saturation, backlash, hystersis, dead zone, relay, friction, characteristics of non-linear control system, jump resonance, jump phenomenon. Difference between linear and non-linear control system.

LIST OF PRACTICALS

1. Study of characteristic of servomotor
2. Characteristics and speed control of a stepper motor
3. Study of non-linearity in a relay

4. Study of dead-zone non-linearity
5. To study cascade control system
6. To study ratio control system
7. To study feedforward control system
8. To study split-range control system
9. Study of ON-OFF controller

RECOMMENDED BOOKS

1. Control Systems by Nagrath and Gopal
2. Control Systems by KUO
3. Control Systems by Ogata
4. Chemical Process Control by Stephenapolis
5. Control Systems by RC Shukla

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4.2 MICROPROCESSORS AND APPLICATIONS

L	T	P
3	-	3

DETAILED CONTENTS

1. Introduction to microprocessor

- Architecture of 8085
- Pin Diagram of 8085
- Timing Diagram
- Instruction set of 8085
- Interrupts
- Programming of 8085
- Interfacing and I/O ports
- PPI e.g. 8255 A
- Programming of 8255A
- 8155 in detail
- 8257 in detail
- Serial I/O data communication
- Introduction to 16-bit microprocessor
- Introduction to microcomputers
- Introduction to 8086
- Block Diagram of 8086
- Microprocessors based development system

2. Microprocessor applications

- Industrial application of 8257

3. Programming exercises can be performed available kits

LIST OF PRACTICALS

1. Familiarization with 8085 kits
2. Verification of arithmetic and logic operations using the above kits (at least five programs)
3. Development of interfacing circuits for various control applications based on 8085
4. Application of assembly language using 8057 instruction set to develop various programs
5. Application of data movement instruction to develop relevant program

LIST OF 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

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4.3 COMPUTER PROGRAMMING AND APPLICATIONS

L	T	P
3	-	3

DETAILED CONTENTS

1. Information Storage and Retrival

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.
6. Use of design packages (appropriate design packages may be selected depending upto 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 Riechle 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
7. Programming in C by Kris A Jansa, Galgotia Publications Pvt.Ltd., Daryaganj, New Delhi
8. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
9. Elements of C by MH Lewin, Khanna Publishers, New Delhi

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4.4 LINEAR INTEGRATED CIRCUITS

L	T	P
3	-	3

DETAILED CONTENTS

1. Introduction to operational amplifiers
- Introduction to op-amp
- block diagram representation of a typical op-amp
- schematic symbol
- development of integrated circuits
- integrated circuit package types, pin identification,
- Package types
- pin identification

2. Interpretation of data sheets and characteristics of an op-amp
- the ideal op-amp
- equivalent circuit of an op-amp
- ideal voltage transfer curve
- open loop op-amp configuration
- the differential amplifier
- the inverting amplifier
- the non-inverting amplifier

3. An op-amp with negative feedback
- block diagram representation of feedback configuration
- introduction voltage-series feedback amplifier
- introduction voltage-shunt feedback amplifier
- introduction differential amplifiers
- differential amplifiers with one op-amp
- differential amplifiers with two op-amp

4. The Practical op-amp
- input offset voltage
- input bias current
- total ouput offset voltage
- thermal drift
- common mode configuration
- common mode configuration

5. General linear application

- summing, scaling, and averaging amplifiers
- inverting configuration
- non-inverting configuration
- differential configuration
- instrumentation amplifier

6. Active filters
- introduction of filters
- active filters
- Low pass Filter
- High pass Filter
- band-pass filter
- band reject filters
- all pass filter

7. comparators
- introduction basic comparator
- Schmitt trigger

8. Timer and Multivibrator
- 555 time IC Pin diagram
- the 555 as a monostable multivibrator
- the 555 as an astable multivibrator
- phase-locked loop

LIST OF PRACTICALS

1. Identification of the Operational Amplifiers IC 741
2. Inverting Configuration of Opamp
3. Non Inverting Configuration of Opamp
4. Opamp as a Summing Amplifier
5. Opamp as a Integrator
6. Opamp as a Differentiator
7. Pin identification of 555 Timer
8. 555 timer as monostable multivibrator
9. 555 timer as astable multivibrator
10. Study of PLL

073645

4.5 FUNDAMENTALS OF TELEMETRY

L	T	P
3	-	3

DETAILED CONTENTS

1. Introduction
a) Need for modulation and demodulation in communication system
b) Basic schemes of modern communication system

2. Modulation
a) Amplitude Modulation Definition, derivation of expression for an A.M. component modulation index,
b) Frequency Modulation Definition, modulation index, Comparison of FM and AM in communication system
c) Phase Modulation
Definition Comparison with FM
d) Pulse Modulation (PAM, PWM, PPM)
basic idea of pulse amplitude modulation (PAM), pulse width modulation (PWM) and pulse position modulation Basic concept of TDM and FDM

3. Introduction to telemetry
Land line telemetry
- Pneumatic system
- Flapper nozzle
- Pilot relay
- Non bleed type
- Bleed types feed back

4. Electric system
- Current system
- Impulse system
- Position system or Ratio system
- Frequency system
- Voltage system

5. Transmitters
- Pneumatic Transmitter

- PDPT bellow type
- PDPT diaphragm type
- Electric transmitters
- Electronic force balance DPT
- Hydraulic transmitter

6. Instrumentation Buses
- introduction to buses
- Application in the field of instrumentation

LIST OF PRACTICALS

1. To observe the AM wave
2. To observe the FM wave
3. To observe the PAM wave
4. To observe the PPM wave
5. To observe the PWM wave
6. Measurement of pressure using pneumatic transmitter
7. Study of hydraulic transmitter
8. Study of magnetic tape recorder.
9. To demonstrate the synchro characteristic and use a synchro pair as error detector

RECOMMENDED BOOKS

1. Mechanical and industrial measurements by R.K.Jain
2. Modern Control Engineering by Ogata
3. Fundamentals of Instrumentation by A.E. Fribance

4.6 ELECTRONIC & INSTRUMENTATION WORKSHOP

L	T	P
-	-	6

DETAILED CONTENTS

1. Identification of Electrical symbols
2. Identification of Electronic symbols
3. Identification of Pneumatic symbols
4. Use of Multimeter to measure voltage, Current, Resistance, Frequency
5. Use of C.R.O. to measure different quantities component
6. Testing of component like diode, Transistor, Different SCRs, Relay, Contractors.
7. Testing of linear ICs using IC tester
8. Practically making of PCB, Different stages involving in making PCB such as Power supply, Timers, Amplitude and soldering
9. Component mounting of jobs taken in practical number 7.
10. Testing and functioning of jobs.
11. To make extension board with 3 sockets.
12. To make a simple ckt using a relay.
13. Study of different gauges such as Vacuum, Pressure, Temperature, strain.
14. Calibration exercise for voltmeter and ammeter.

of the above jobs minimum 10 jobs are compulsory

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5.1 POWER ELECTRONICS

L	T	P
3	-	3

DETAILED CONTENTS

1. Introduction to Thyristors and other power electronics devices

a) Construction, Working principles of SCR, two transistor analogy of SCR, VI characteristics of SCR.
b) SCR specifications & ratings.
c) Different methods of SCR triggering.
d) Different commutation circuit for SCR.
e) Series & parallel operation of SCR.
f) Construction & working principle of DIAC, TRIAC & their V-I characteristics.
g) Construction, working principle of UJT, VI characteristics of UJT. UJT as relaxation oscillator.
h) Brief introduction to Gate Turn off thyristor (GTO),
Programmable uni-junction transistor (PUT), MOSFET, IGBT.
i) Basic idea about the selection of Heat sink for thyristors.
j) Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.

2. Controlled Rectifiers

a) Single phase half wave controlled rectifier with load (R, R-L)
b) Single Phase half controlled full wave rectifier (R,R-L)
c) Fully controlled full wave bridge rectifier.
d) Single phase full wave centre lap rectifier.

3. Inverters, Choppers, Dual Converters and Cyclo converters.

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

4. Thyristorised Control of Electric drives

a) DC drive control
i) Half wave drives.
ii) Full wave drives.

iii) Chopper drives (Speed control of DC motor using choppers)
b) AC drive control
i) Phase control (Speed control of induction motor using variable frequency)
ii) Constant V/F operation
iii) Cycloconverter/Inverter drives.
iv) Slip power control of AC drives.

5. Uninterrupted Power supplies
i) UPS, on-line, off line & its specifications
ii) Concept of high voltage DC transmission

LIST OF PRACTICALS
1. To plot VI characteristic of an SCR.
2. To plot VI characteristic of TRIAC.
3. To plot VI characteristic of UJT.
4. To plot VI characteristic 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
8. Observation of wave shapes and measurement of voltage at relevant points in TRIAC based
AC phase control circuit for
9. Varying lamp intensity of AC fan speed control.
10. Installation of UPS system and routine maintenance of batteries
11. Speed control of motor using SCRs

RECOMMENDED BOOKS

1. Power Electronics by P.C. Sen Tata Mc Graw Hill. New Delhi
2. Power Electronics by P.S. Bhimbhrah, Khanna Publishers, New Delhi
3. Power Electronics by M.S. Berde, Khanna Publishers, New Delhi
4. Power Electronics by MH Rashid
5. Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi

6. Power Electronics by S Rama Reddy, Narosa Publishing House Pvt.Ltd., New Delhi
7. Power Electronics by Sugandhi and Sugandhi
8. Power Electronics – Principles and Applications by J Michael Jacob, Vikas Publishing House, New Delhi

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5.2 BIOMEDICAL INSTRUMENTATION

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DETAILED CONTENTS

1. Anatomy and Physiology
Elementary ideas of cell structure, heart and circulatory system, control nervous system, Musclo-skeletal system, Respiratory system Body temperature and reproduction system.

2. Classification of Biomedical Equipment
Diagnostic, therapeutic and clinical laboratory equipment

3. Bioelectric signals and their recording
Bioelectric signals (ECG, EMG, ECG, EOG & ERG) and their characteristics, Bioelectrodes,
electrodes tissue interface, contact impedance, effects of high contact impedance, types of electrodes, electrodes for ECG, EEG and EMG.

4. Transducers for Biomedical Application
Resistive transducers – Muscle force and Stress (Strain guge), Spirometry (Potentiont), humidity, (Gamestrers), Respiration (Thermistor)
Inductive Transducers – Flow measurements, muscle movement (LVDT)
Capacitive Transducers – Heart sound measurement, Pulse pick up
Photoelectric Transducers – Pulse transducers, Blood pressure, oxygen Analyses
Piezoelectric Transducers – Pulse pickup, ultrasonic blood flowmeter
Chemical Transducer – Ag-Agfallas (Electrodes, PH electrode)

5. Bioldectric Signal recording machines
Physiological pre-amplifier and specialized, ECG lead systems details of ECG, EMG, and EEG machines

6. Patient Monitoring system
Heart rate measurement pulse rate measurement, respiration, rate measurement, blood pressure measurement, microprocessor applications in patient monitoring

7. X-Ray Machine
Basic X-Ray components and circuits, types of X-ray machines e.g. general purpose, dental image intensifier system, table shooting and maintenance of X-Ray machine

8. Safety Aspect of Medical

Gross current, Micro Current shock, safety standards rays and considerations, safety testing instruments, biological effects of X-rays and precautions

LIST OF PRACTICALS

1. Minimum of eight exercise to be carried out and one field visit
2. Operation and function of all the controls of hospital X-Ray machine (visit at hospital)
3. Operation and function of all the controls of dental X-Ray Machine (Visit to Hospital)
4. Identification of different block/sub system of circuits in X-Ray machine
5. Measurement of skin contact impedance and technique to reduce it.
6. Observe its wave shape on CRO the output of blood pressure transducers body temperature transducers and pulse sensors
7. Use of sphygrmanometer for measurement of blood pressure
8. Concept of ECG system and placement of electrodes
9. Measurement of leakage currents with the help of safety tester
10. PH measurement of given biological sample
11. Concept of EMG system and placement of electrode
12. Measurement of respiration rate using thermistor
13. Concept of EEG system and placement of electrode
14. Identification of different types of PH electrode

RECOMMENDED BOOKS

1. Medical Instrumentation by John. G.Webster – John Wiley
2. Principles of Applied Biomedical Instrumentation by Goddes & Baker – John Wiley
3. Biomedical Instrumentation & Measurement by Carr & Brown-Pearson
4. Biomedical Instrument by Cronwell-Prentice Hall of India, New Delhi
5. Hand Book of Medical Instrumentation by Sanjay Guha – University Publication
6. Medical Electronics and Instrumentation by Sanjay Guha – University Publication
7. Introduction to Biomedical electronics by Edwand J.Bukstein – sane and Co. Inc. USA

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5.3(a) INTELLIGENT INSTRUMENTATION

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DETAILED CONTENTS

1. Review of Virtual Instrumentation
Historical perspective, advantages etc., block diagram and architecture of a virtual instrument

2. Data-Flow Techniques
Graphical programming in data flow, comparison with conventional programming

3. VI Programming Techniques
Vis and Sub-Viz, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O

4. Data acquisition basics
ADC, DAC, DIO, counters and timers, PC hardware structure, timing, interrupts, DMA software and hardware installation

5. Common Instrumentation interfaces
Current loop RS232C/RS485, GPIB

6. Use of Analysis Tools
Some tools from the advanced analysis tools relevant to the discipline may be included e.g., Fourier transformer, power spectrum, correlation methods, windowing and filtering

7. Applications of VI:IV Application in various fields

RECOMMENDED BOOKS

1. Lab VIEW Graphical Programming by Gary Johnson, McGraw Hill, New York
2. Lab VIEW for Everyone, Lisa K Wells and Jertrey Travis, Prentice Hall
3. Basic concepts of Lab VIEW 4 by Sokoloft, Prentice Hall
4. PC Interfacing for Data Acquisition and Process Control by S. Gupta, JP Gupta Instrument Society of America

031552-D

5.3(b) ADVANCED MEASUREMENT TECHNIQUES

L T P
4 - 0

DETAILED CONTENTS

1. Review of Measurement System
Functional elements of a measuring system
Input-output configuration of instrumentation system
Method of correction for interfering and modifying inputs

2. Measurement of Vibraton
Nature of vibration
Quantities involved in vibration measurements
Seismic transducer
Types of accelerometers – potentio-metric type accelero-meter, LVDT accelerometer, piezo electric accelerometer

3. High Frequency Measurement
Resonance methods
Measurement of inductance and capacitance
Measurement of effective resistance by resistance variation method and reactance variation method
T networks parallel T networks and bridge T networks
Radio frequency measurement – sensitivity and selectivity measurement of radio receiver

4. Opto Electronic Measurement
Photo sensitive devices – light emitting diodes, photo diodes, photo conductors
Photo voltaic cell, photo thyristors, photo transistors
Light modulating techniques – light suppression, light attenuation, photometric and radiometric fittings

5. Ultrasonic Measurement
Ultrasonic method of flow measurement, and measurement of thickness, measurement of displacement etc
Ultrasonic digitizer

INSTRUCTIONAL STRATEGY

This being an advanced subject the teacher should lay emphasis on fundamental concepts for measurement techniques. Field application of various transducers should be dealt thoroughly. For exposure the students may be taken to industry

RECOMMENDED BOOKS

1. Measurement systems, Application and Design – E O Doebin, McGraw Hill International Editions
2. A Course in Electrical and electronics Measurement and Instrumentation by AK Sawhney; Dhanpat Rai and Co. Pvt.Ltd., New Delhi

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5.4 INDUSTRIAL PROCESS CONTROL

L	T	P
3	-	3

DETAILED CONTENTS

1. Basic Control Loops and Characteristics
Basic of process control, process variables, Process Lag, Measurement lag, transmission lag, dead time.

2. Controller Modes and Characteristics
Concept of on-off, proportional, integral, derivative, PI, PD & PID, Examples, Relative merits and demerits, Response of different control modes to step and ramp test inputs.

3. Electrical Control Elements
Construction and principle of operation of solenoids, stepper motor, limit switches, relays, auto transformer.

4. Pneumatic control elements
Pneumatic pressure supply, pneumatic actuator, pneumatic relay, pressure switches, power cylinders, contractors, electro-pneumatic relays

5. Hydraulic control elements
Hydraulic actuators, hydraulic valves

6. Control Valves
Principle of operation and constructional details of solenoid valves, diaphragm operated valve, piston operated valve, valve positioners, control valve characteristics and their sizing, temperature switchers, interlocking and sequencing circuits.

7. Computer Control system
Introduction to DDC, DCS, SCADA Data loggers
Fuzzy logic, Neural Network.

LIST OF PRACTICALS

1. To control the level of fluid with the help of on-off control system.
2. To study the control loop of a system of a flow control
3. To find the differential gap of on-off control system
4. To rig up an electronic proportional controller unit

5. To rig up an electronic proportional integrated controller unit
6. To rig up an electronic PID controller and verify its working
7. To study the characteristics and controller specifications of different types of control valves and other repair and maintenance
8. To study and obtain Input/Output relationship of a pneumatic relay

RECOMMENDED BOOKS

1. Process Control by Harrist P;McGraw Hill
2. Automatic Process Control by Eckman D P; Wiley Eastern, 1975
3. Instrument Engineers Handbook by liptak B G.; 3rd edition
4. Process Control Instrumentation Technology by Johnson, Curtis D; John Wiley and Sons
5. Automated Process Control Systems: Concepts and Hadware by Ronald P Hunta, PE, Prentice Hall Inc., New Delhi
6. Principles of Industrial Process Control; by Eckman, Donal P; John Wiley and Sons
7. Process Measurement and Analysis, third edition by Liptak Bila G

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5.5 PROCESS INSTRUMENTATION

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DETAILED CONTENTS

1. Introduction
Trends in process control, selection of key variables for process control, hydraulic, pneumatic and electronic instrumentation

2. Flow Measurement
Construction, working principle, selection criteria and application of flow measurement with orifices, magnetic, ultrasonic, vortex flow meters, turbine flow meter and rotameter.

3. Level Measurement
Construction, working principle, selection criteria and application of level detectors, float level devices, level gauges, optical level devices, radiation level sensors, thermal level sensors, level switch.

4. Temp. Measurement
Construction, working principle, selection criteria and application of temp sensors – thermocouples, RTD's thermisters, radiation pyrometry, IR detectors

5. Pressure Measurement
Construction, working principle, selection criteria and application of pressure sensors – bellows, tiaphragon, bourdon and helical types, electronic pressure sensor, manometers, pressure gauges, vaccum sensors, high pressure sensors, pressure switch

6. Measure system for Density, pH, humidity, moisture and viscosity measurement

LIST OF PRACTICALS

1. To measure flow using rotameter
2. To measure flow using ventusi tube and V-tube manometer
3. To measure temperature using thermocouple, RTD and thermistor
4. To measure the pH value of given solution
5. Study of characteristics of various transmitters (electronic/pneumatic/hydraulic etc.)

6. To study the characteristics of different types of pressure, flow, level gauges
7. To measure pressure using V-tube manometer

RECOMMENDED BOOKS

1. Mechanical measurements by AK Sawhney; Dhanpat Rai and Co. New Delhi
2. Process control instrumentation technology by Custis D Johnson: Joh Wiley and sons
3. Process/Industrial Instruments and Control Handbook by considine: Douples M: Magraw Hill
4. Mechanical Measurement by Becwith and Buch: pearson
5. Mechanical and Industrial Msrunts by RK Jain, Khanna Publisher, New Delhi

5.6 MINOR POROJECT WORK

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Minor project work aims at exposing the students to the industries dealing with electronics components, devices, circuits and micro processors, They are expected to learn about the working principles of different electronics and micro-process based instruments. It is expected that students get acquainted with environment at the shop floor. Depending upon the interest of students they are sent to:

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. Micprocessor application oriented industries
23. Computer aided controls industries
24. Control-panel designing, fabrication and installation industry
25. Medical electronics industries
26. Repair and maintenance work shops
27. Consumer electronic goods industries
28. PC based temperature measurement, display and control using thermocouple; LM
29. Interfacing of various devices with PC and their switching through relays
30. Design a parallel port-data acquisition card using DC 804; DAC 804

31. PC as a function generator
32. PC based automatic jar filling system
33. PC based pressure measurement and control system
34. Tele-medicare

35. Communication industry and telephone Exchange.
36. Various microprocessor oriented industries
37. Micro processor based control system industries
38. Medical electronics industries
39. Repair and maintenance work shops

As a minor project activity each student is supposed to study operations and prepare a detailed project report of the observations /processes/activities by him/her. The students will be guided by respective subject teacher and each teacher may guide a group of 4 to 5 students. The teacher along with field supervisors/engineers will conduct performance assessment of students.

Criteria for assessment will be as follows:

Criteria Weightage

a) Attendance and punctuality 15%
b) Initiative in performing tasks / clearing new things 15%
c) Relation with people 15%
d) Report writing and seminar 55%

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6.1 MICRO CONTROLLERS AND PLC BASED INSTRUMENTATION

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DETAILED CONTENTS

1. Micro Controllers

1. Comparing micro controllers and micro-processors
2. MCS 51 series of controller architecture of 8051, hardware, I/O pins, ports and interfacing circuits, connecting external memory, counters and timers, serial data I/O, interrupts.
3. Minimum system using 8051 microcontroller
4. Typical applications of micro-controllers

2. PLCs

1. Introduction to PLCs, Areas of applications
2. Basic Design and Structure and Architecture of a typical PLC
3. Programming of PLCs, systematic solution finding
4. Programming languages, PLC Programmers, PC interface
5. Function block diagram, ladder diagram, instruction list, structured text
6. Sequential function chart, logic control systems, timers, counters
7. Commissioning and operational safety of a PLC, data transmission interface and communication in the field area
8. Guidelines and standards

LIST OF PRACTICAL

Micro Controllers

1. Familiarization with a study of Architecture of 8085 kit, basic sub systems and input output connectors, functions keys on micro controllers kit
2. Familiarization of Micro Controllers (8051) kit
3. Familiarization of Micro controller (8051) based kit

PLCs

1. Components/sub-components of a PLC, learning functions of different modules of a PLC system
2. Practical steps in programming a PLC (a) using a Hand held programmer (b) using computer interface
3. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT functions
5. Logic control operations using latching properties e.g. in activating a cylinder
6. Logic control systems with time response as applied to clamping operation
7. Sequence control system e.g. in lifting a device for packaging and counting
8. Use of PLC for various mechanical outputs viz motion of a piston in single cylinder multiple cylinders, driving machine operation etc.
9. Use of PLC for an application

RECOMMENDED BOOKS

1. Programmable Logic Controllers by Thomas E.Kissel
2. Design with Micro Controller by C Nagara, Murthy, S Ramgopal, Joshi B Peatman; McGraw Hill, 1988
3. The 8051 Micro controller Architecture Programming and Applications, Second Edition by Kanneth J; Ayala Penram International Publishing (India) 1996
4. Festo Didactic – Programmable Logic Controllers Basic Level – TP 301 – A Training Manual on PLCs
5. Instrument Engineers Handbook Vol.II, by Liptak, P,Chittor Book Company
6. Process control Instrumentation Technology by Johnson, Curtis; EEE Editon, Prentice Hall of India
7. Programmable Logic Controller by Job Dan Otter; P.H. International Inc, USA
8. Humphries and Lesly P Sheets, FourthEditon by James T: Demar Publisher Inc by Mazidi

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6.2 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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DETAILED CONTENTS

(1) Entrepreneurship

1.1 Concept/Meaning
1.2 Need
1.3 Competencies/qualities of an entrepreneur

(2) Entrepreneurial Support System

2.1 District Industry Centres (DICs)
2.2 Commercial Banks
2.3 State financial Corporations
2.4 Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural
Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State level

(3) Market Survey and Opportunity Identification (Business Planning)

3.1 How to start a small scale industry
3.2 Procedures for registration of small scale industry
3.3 List of items reserved for exclusive manufacture in small scale industry
3.4 Assessment of demand and supply in potential areas of growth
3.5 Understanding business opportunity
3.6 Considerations in product selection
3.7 Data collection for setting up small ventures

(4) Project Report Preparation

4.1 Preliminary Project Report
4.2 Techno-Economic feasibility report
4.3 Project viability

(5) Managerial Aspects of Small Business

5.1 Principles of Management (Definition, functions of management viz planning, organization, coordination and control

5.2 Operational Aspects and Production
5.3 Inventory Management
5.4 Basic principles of financial management
5.5 Marketing Techniques
5.6 Personnel Management
5.7 Importance of Communication in business

(6) Legal Aspects of Small Business

6.1 Elementary knowledge of income Tax, Sales Tax, Patent Rules, Excise Rules
6.2 Factory Act and Payment of Wages Act

(7) Environmental considerations

7.1 Concept of ecology and environment
7.2 Factors contributing to Air, Water, Noise pollution
7.3 Air, water and noise pollution standards and control
7.4 Personal Protection Equipment (PPEs) for safety at work places

(8) Miscellaneous

8.1 Human relations and performance in organization
8.2 Industrial Relations and Disputes
8.3 Relations with subordinates, peers and superiors
8.4 Motivation – Incentives, Rewards, Job Satisfaction
8.5 Leadership
8.6 Labour Welfare
8.7 Workers participation in management

(9) Motivation

9.1 Factors determining motivation
9.2 Characteristics of motivation
9.3 Methods of improving motivation
9.4 Incentives – pay, promotion, rewards

(10) Leadership

10.1 Need for leadership
10.2 Functions of a leader
10.3 Factors to be considered for accomplishing effective leadership

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi
4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan, New Delhi

5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi
9. Principles of Management by Philip Kotler TEE Publication

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ELECTIVE – 2
6.3 (a) OPTICAL FIBRE COMMUNICATION

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DETAILED CONTENTS

1. Introduction
Historical perspective, basic communication systems, optical frequency range, advantages optical fibre communication, application of fibre optic communication

2. Light Wave Fundamentals
Nature of light, acceptance angle and numerical aperture, electromagnetic waves, dielective wave guide, modes in planar guide dispersion and distortion in wave guide.

3. Optical Fibre Waveguides
Fibre structure, step-index fibre, graded – index fibre, attention, modes in step, index and graded index fibres, pulse dispersion and information rate in optical fibres construction of optical fibres, optic fibre cables

4. Light Sources
Light emitting diodes (LEDs), Operating characteristics of LEDs, Laser principles, Laser diodes, Operating characteristics of laser-diodes, distributed feedback laser diode, optical amplifier, fibre laser.

5. Light Detectors
Principles of photodetection, photomultiplier semiconductor photodiode, PIN diode and avalanche photodiode.

6. Optical Fibre Joints
Fibre, alignment and joint loss, fibre end preparation, splices, connectors, source coupling.

7. Distribution Networks and Fibre Components
Distribution network, directional couplers, star couplers, Switches fibre optical isolators, attenuators, wave length division multiplexing.

RECOMMENDED BOOKS

1. Optical Fibre Communication by Joseph, C. Palais, Pearson Education Publications, Published by Addison Wesley hangman (Singapore) Pvt.Ltd., Delhi
2. Optical Fibre Communication and its Applications by S.C.Gupta, Prentice Hall India – New Delhi.
3. Fibre – Optic Communication Systems by G.P. Agrawal; John Wiley and Sons, New Delhi
4. Optical Fibres Communication, by John M.Senior, Prentice Hall India, New Delhi
5. Optical Communication Systems by J.Gower; Prentice Hall India, New Delhi
6. Optical Fibre Communication by Gerd Keiser; MC Graw Hill, International Editions.

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6.3(b) COMPUTER ARCHITECTURE & ORGANISATION.

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DETAILED CONTENTS

1. Basic computer organization & design
Instruction lodes, indirect & direct address, computer registers, common bus system, computer instructions, timing control, instruction memory reference, Register reference & reference instructions, Interrupts, hard wire & micro programmed control unit.

2. Central Processing Unit
Introduction, general register organisation, control and word, examples of microinstructions, stack organisation, register stack, reverse. Polish notation evaluation of anith expressions. Instruction formats, Addressing modes, 3 address instructions, 2 Address instructions. One address instructions, zero address instructions. Types of interrupts compare RISC & CISC.

3. Computer Arithmetic
Introduction, addition & subtraction, multiplication, & Division algorithms.

4. Register transfer & micro operations
Register transfer language, arithmetic, logic & shift micro operation:

5. Input-output organisation
Input-output interface, I bus, & interface4 module, I vs memory bus. Isolated Vs memory mapped I, Modes of data, transfer, first in first out buffer, priority interrupt, daisy chaining priority, parallel priority interrupt priority encoder, interrupt cycle, Direct memory access, DMA controller, DMA transfer.

6. Memory organisation
Memory hierarchy, main memory, memory, address, map, RAM & ROM chips, memory connection to CPU, Anxillary memory, Associative memory, Read & write operation, Cache memory, Associative maping, Virtual memory, memory management hardware, memory segmentation.

RECOMMENDED BOOKS

1. Computer System and Architecture by M.Mano: Prentice Hall India Pvt.Ltd.,New Delhi.

2. Computer Architecutre and Organization by JP Hays, MC Graw Hill company, New Delhi.
3. Computer Organization and Architecute by W. Stallings: Prentice Hall of India Ltd. New Delhi.

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6.3(c) TROUBLE SHOOTING AND SERVICING OF ELECTRONIC EQUIPMENT

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DETAILED CONTENTS

1. REPAIR, SERVICING AND MAINTENANCE CONCEPTS

1.1 Importance of maintenance and servicing in electronic equipments.
1.2 Concept of mean time to repair (MTR) mean time between policy, concepts of job cadre and service report cards, potential problems, preventive and corrective maintenance, zero defect (A.D)

2.0 FUNDAMENTAL TROUBLE SHOOTING PROCEDURE

2.1 Trouble shooting techniques: functional area approach, split half method, divergent, convergent and feedback path circuit analysis, measurement techniques.
2.2 Fault location and finding aids:
service manuals, test and special tools.

3.0 TESTING

3.1 Jigs and fixtures for operational testins of modulas/sub assemblies, sequence testing for failure analysis, environmental testing at elevated temperature and humidity, vibration and mechanical endurance testing packing for transportation.

4.0 TESTING LINEAR IC'S

Procedure for testing of operational amplifier, voltage regulators and timer ic's(eg.741,723,3085,78 series, 555 & 7555)

5.0 TROUBLE SHOOTING TECHNIQUES IN DIGITAL CIRCUITS

Digital ic troubleshooting using the following:
Logic chip, logic probe, logic pulser, curve tracer logic comparator, ic tester.

6.0 TYPICAL EXAMPLES OF TROUBLE SHOOTING

Trouble shooting procedures for the following oscilloscope power supplies, digital multimeters, signal generator, PA system, tape recorder and stereo amplifier.

7.0 LOG BOOKS

Introduction, preparation and significance of log book use of data book for semiconductor component and transistor equivalent.

REFERENCE BOOKS:

1. Maintenance techniques by NITF electronic training center Bangalore.
2. Hand book of electronics instrumentation, testing and trouble shooting by Vester Robinson.
3. Electronics trouble shooting with simplified circuit analysis by Leo Rozman.
4. Systematic electronic troubleshooting : a flow approach by James Perzzo.
5. Manuals of different equipments and data books.

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6.4 COMPUTER AIDED INSTRUMENTATION

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DETAILED CONTENTS

1. PC OPEND UP AND ARCHITECTURE

General structure of pc based instrumentation
Advantages and disadvantages of computer based instrumentation
Comparison with other control systems
Introduction to various instrumentation packages like lab view, flex pro etc

2. BUSES AND STANDARDS

Introduction
Bus type
The I/O bus ISA bus, EISA bus, PCI bus, GPIB, RS-232
USB

3. VIRTUAL INSTRUMENTATION

Basics concepts of virtual instrumentation
Need

4. COMPUTERS IN PROCESS CONTROL

Programmable controller
Data logging
Supervisory control
Computer based controller

5. LINEAR CIRCUITS AND SIGNAL CONDITIONING

Op-amps
Instrumentation amplifiers and signal conditioning
Multiplexer and demultiplexer
ADC and DAC

6. PARALLEL PORT (PP) INTERFACING TEHNIQUES

Introduction to parallel port
Parallel port as output port

Programming of PP
Parallel port as input port and its programming

7. SERIAL PORT(SP) INTERFACING TECHNIQUES

Introduction to serial port
Serial port as output port
Programming of SP
Serial port as input port and its programming

8. USB PORT INTERFACING TECHNIQUES

Introduction to USB port
USB port as output port

9. USING INSTRUMENTATION PACKAGE LIKE LAB. VIEW/DAISY LAB/GENIE GRAPHICAL PROGRAMMING.

10. CASE STUDY

CNC motion controller
Power plant controller
Cement plant control
Sugar plant control
Textile plant control

LIST OF PRACTICAL

1. Controlling of relay and devices using parallel port
2. Analog to digital conversion using ADC 804
3. Digital to analog conversion using DAC 800
4. Generation of a square wave through parallel port
6. Implementation a data acquisition application using an8-bit data acquisition card on lab. View/flex pro software.
7. Implementing a low pass/high-pass filters on a samples of data acquired using lab. View/flex pro software.
8. Data representation in line/graph/bar graph using lab. View/flex pro software.
9. Application of lab. View/flex pro software.

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6.5 DATA COMMUNICATION NETWORK

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DETAILED CONTENTS

1.3 THE INTERNET
A brief history
The internet today
1.4 PROTOCOLS AND STANDARDS
Protocols
Standards
Standards organizations
Internet standard
2. NETWORK MODELS
2.1Layered Tasks
Sender, receiver, and carrier
Hierarchy
Services
2.2 Internet Model
Peer-to-peer processes
Function of layers
Summary of layers
2.3 Osi Model
3. DIGITAL TRANSMISSION
3.1 Modulation of Digital Data
Amplitude shift keying(ASK)
Frequency shift keying (FSK)
Phase shift keying (PSK)
Quadrature amplitude modulation (QAM)
Bit/baud comparison
3.2 Telephone Modems
Modem Standards
3.3 Modulation Of Analog Signals
Amplitude modulation(AM)
Frequency modulation(FM)
Phase modulation(PM)
4. TRANSMISSION MEDIA

4.1 Guided Media
Twisted-Pair Cable
Coaxial Cable
Fiber – Optic Cable
4.2 Unguided Media: Wireless
Radio Waves
Microwaves
Infrared

5. WIRELESS LANs
5.1 IEEE 802.11
Architecture
Physical Layer
Mac Layer
Addressing Mechanism
5.2 Bluetooth
Architecture
Bluetooth Layers
Radio Layers
Baseband Layer
L2cap
Other upper layers

6. CELLULAR TELEPHONE AND SATELLITE NETWORKS
6.1 Cellular Telephony
Frequency-Reuse Principal
Transmitting
Receiving
Handoff
Roaming
First Generation
Second Generation
Third Generation
6.2 Satellite Networks
Orbits
Footprint
Three Categories Of Satellite
Geo Satellite
Meo Satellite
LEO satellite

LIST OF PRACTICALS

1. Observe wave forms at pulse code modulation and demodulation
2. To study the construction and working of a telephone handset
3. To study the construction and working of a Fax machine.
4. To study the features and working of an EPABX.
5. To study the working & features of a cellular mobile system and pagers.

6. To study the working of LAN system.

NOTE

Visits to the sites of all types of telephone exchanges including mobile and rural exchanges be made with a view to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

RECOMMENDED BOOKS

1. Mobile and Wireless Communication by W.Stalling, Pearson Publishers
2. Electronics Communication System by KS Jamwal, Dhanpat Rai & Co., New Delhi
3. Computer Network by Tenenbaun Andrews, Prentice Hall of India, New Delhi
4. Data Communication and Networking by Foronzan TMH, New Delhi

6.6 MAJOR PROJECT WORK

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RATIONALE

Major Project work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work in intended to place students for project oriented practical training in actual work situation for the stipulated period with a view to:

i) Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study.
ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
iii) Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
iv) Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc. The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work should not be considered as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faulty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/field organizations. Each teacher is expected to supervise and guide 5-6 students.

Some of the project activities are given below:

- Projects related to designing small electronic equipment / instruments
- Projects related to increasing productivity in electronic manufacturing areas.
- Projects related to quality assurance.

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- Projects connected with repair and maintenance of plant and equipment.

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- Projects related to design of PCBs.
- Projects related to suggesting substitutes of electronics components being used.
- Projects related to design of small oscillators and amplifier circuits.
- Projects related to design, fabrication, testing and application of simple digital circuits and components
- Projects related to microprocessor based circuits/ instruments.

Some of the projects based on above areas are listed below for the benefit of students:

1. Microprocessor based rolling display/bell and calendar
2. Microprocessor based stepper motor control.
3. Speed control of DC Machines by Microprocessors.
4. Temperature monitoring using microprocessor based systems.
5. Microprocessor based liquid level indicator and control/solar tracking system
6. Fabrication and assembling of digital clock.
7. Design and fabrication of timing circuits using 555 and counters.
8. Design and fabrication of amplifiers and oscillators circuits.
9. Fabrication of demonstration type Radio receiver
10. Fabrication of PCB circuits using ORCAD/Fagu Software.
11. Fabrication of ON line/OFF line UPS of different ratings and inverters
12. Design, fabrication and testing of different types of experimental boards as per the curriculum of Electronics and Communication Engineering.
13. Repair of X-Ray Machines, ECG, EEG, EMG, Calorimeter and Centrifuge etc.
14. Repair and fault location of telephone exchanges and intercom system.
15. Repair of oscilloscope, function generator, Power supply
16. Design and developing web sites of organizations
17. Installation of computer network (LANS).
18. Microprocessor based solar tracking system
19. Car or home security system
20. Bank token display
21. Printer sharing unit

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22. Caller Identification unit for phone
23. LCR-Q meter and frequency meter
24. μP-Based A/D converter
25. μP-Based D/A converter
26. Simulation of half wave and full wave rectifiers using ORCAD
27. Simulation of following circuits:

Integrator, differenciator, adder, substractor, V-I converter comparator etc. using OPAMPs.
28. Simulation of class A, Class B, Class AB and Class C amplifiers
29. Simulation of different wave forms like sine, square, triangular waves etc.

NOTE:

The list is only the guideline for selecting a project, however a student is at liberty to select any other related project of his choice independently under guidance of his teacher

Human Resources

Weekly work schedule, annual work schedule, student teacher ratio for various groups and the class size, Staffing pattern, work load norms, qualification experience and job description of the teaching staff workshop staff and other administrative and supporting staff be worked out as per the norms and the standards laid down by the AICTE, New Delhi.

Faculty Requirements

It is calculated based on the contact hours in theory classes and the practical classes keeping in view student teacher ratio as 11:1 following faculty strength is required.

Sr.No.	Subject	Year			Total
		I	II	III	
1	Communication Skills	1	-	-	1
2	Mathematics	1	-	-	1
3	Physics	1	-	-	1
4	Chemistry	1	-	-	1
5	Electrical Engineering	-	1	-	1
6	Electronics Engineering	-	2	2	4
7	Instrumentation Engineering	-	2	2	4
Total		**4**	**5**	**4**	**13**

Note: Four positions or Electronics and Four positions from Instrumentation & Control Engineering shall be filled with the persons holding the qualification of BE/ME in the field of Electronics/ Instrumentation & Control/ Electyronics & Instrumentation Engineering