CURRICULAM

MECHATRONICS ENGINEERING

2006 BATCH

TECHNICAL EDUCATION
HARYANA

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN MECHATRONICS ENGINEERING

(FOR THE STATE OF HARYANA)

FIRST SEMESTER (Mechatronics, Branch Code-24) 2006 batch

Sr. No	Subject	STUDY SCHEME			EVALUATION SCHEME						TOTAL MARKS
					Internal Assessment		External Assessment (Examination)				
					Theory	Practical	Written Papers		Practicals		
		L	T	P							
		Hrs/week			Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
1.1*	Communication Skills-I(030011)	3	-	2	25	25	100	3	50	2	200
1.2*	Applied Mathematics-I(030012)	4	1	-	50	-	100	3	-	-	150
1.3*	Applied Physics-I(030013)	4	-	2	25	25	100	3	50	3	200
1.4*	Applied Chemistry-I(030014)	2	-	2	25	25	100	3	50	3	200
1.5*	Basics of Information Technology	-	-	4	-	50	-	-	100	3	150
1.6*	Engineering Drawing-I(030015)	-	-	6	-	50	100	3	25 (viva)	2	175
1.7*	General Workshop Practice-I	-	-	6	-	50	-	-	100+	3	150
	# Student centered activities	-	-	4	-	25	-	-	-	-	25
	Total	**13**	**1**	**26**	**125**	**250**	**500**	**-**	**375**	**-**	**1250**

*   Common with that of other diploma programmes.

+   Including 25 marks of viva voce.

Students 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.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN MECHATRONICS ENGINEERING

(FOR THE STATE OF HARYANA)

SECOND SEMESTER (Mechatronics, Branch Code-24) 2006 batch

Sr. No	Subject	STUDY SCHEME			EVALUATION SCHEME						TOTAL MARKS
					Internal Assessment		External Assessment (Examination)				
					Theory	Practical	Written Papers		Practicals		
		L	T	P							
		Hrs/week			Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
2.1*	Communication Skills-I(030021)	3	-	2	25	25	100	3	50	2	200
2.2*	Applied Mathematics-I(030022)	4	1	-	50	-	100	3	-	-	150
2.3*	Applied Physics-I(030023)	3	-	2	25	25	100	3	50	3	200
2.4*	Analog Electronics (030831)	2	-	2	25	25	100	3	50	3	200
2.5*	Applied Mechanics (030026)	3	-	2	25	25	100	3	50	3	200
2.6*	Engineering Drawing-II(030025)	-	-	6	-	50	100	3	25 (viva)	2	175
2.7*	General Workshop Practice-II	-	-	6	-	50	-	-	100+	3	150
	# Student centered activities	-	-	4	-	25	-	-	-	-	25
	Total	**15**	**1**	**24**	**150**	**225**	**600**	**-**	**325**	**-**	**1300**

*   Common with that of other diploma programmes.
+   Including 25 marks of viva voce.
#   Students 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.

THIRD SEMESTER (Mechatronics) 2006 batch

Sr. No	Subject	STUDY SCHEME			EVALUATION SCHEME						TOTAL MARKS
					Internal Assessment		External Assessment (Examination)				
					Theory	Practical	Written Papers		Practicals		
		L	T	P							
		Hrs/week			Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
3.1	* Strength of Materials	3	-	3	25	25	100	3	50	3	200
3.2	Manufacturing Processes	3	-	-	25	-	100	3	50	3	175
3.3	Programming in –C	2	-	3	25	25	100	3	50	3	200
3.4	* Basics Electrical Engineering	3	-	3	25	25	100	3	50	3	200
3.5	* Analog Electronics-II	3	-	3	25	25	100	3	50	3	200
2.7	General Workshop Practice-III	-	-	9	-	50	-	-	100	3	150
	# Student centered activities	-	-	5	-	25	-	-	-	-	25

*   Common with that of other diploma programmes.

+   Including 25 marks of viva voce.

Students 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.

FOURTH SEMESTER (Mechatronics) 2006 batch

Sr. No	Subject	STUDY SCHEME			EVALUATION SCHEME						TOTAL MARKS
					Internal Assessment		External Assessment (Examination)				
					Theory	Practical	Written Papers		Practicals		
		L	T	P							
		Hrs/week			Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
4.1	* Theory of Machines	3	1	-	25	-	100	3			125
4.2	* Hydraulics & Pneumatics	2	-	2	25	25	100	3	50	3	200
4.3	Electrical Machines	3	-	3	25	25	100	3	50	3	200
4.4	Instrumentation Pest Control	3	-	2	25	25	100	3	50	3	200
4.5	Digital Electronics	4	-	3	25	25	100	3	50	3	200
	General Workshop Practice-III	-	-	9	-	50	-	-	100	3	150
	# Student centered activities	-	-	5	-	25	-	-	-	-	25

*　　　Common with that of other diploma programmes.

\+　　　Including 25 marks of viva voce.

\#　　　Students 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.

FIFTH SEMESTER

Sr. No.	Subject (Code)	Study Scheme Hrs./Week L. T. P			Evaluation Scheme						Total
					Internal Assessment		External Scheme (Examination)				
					Theory	Practical	Written Paper		Practical		
					Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
5.1.	*CNC Machines and Automation	3	-	-	25	-	100	3	-	-	**125**
5.2.	*Industrial Management	3	-	-	50	-	100	3	-	-	**150**
5.3.	*Power Electronics	4	-	2	25	25	100	3	50	3	**200**
5.4.	Microprocessor and Applications	4	-	3	25	25	100	3	50	2	**200**
5.5.	Robotics	5	-	-	25	-	100	3	-	-	**125**
5.6.	*Machine Design and Drawing	3	-	3	25	25	100	3	25 (Viva)	2	**175**
5.7.	Robotics and Mechatronics Lab		-	2	-	25	-	-	25	2	**50**
	#Student Centered Activities	-	-	4	-	25	-	-	-	-	**25**
	Total	**22**	**-**	**14**	**175**	**125**	**600**	**-**	**150**	**-**	**1050**

* Common with that of other Diploma Programmes
+ Included 25 Marks for Viva-Voce
# Contents extension lectures, field visits, NCC, NSS and cultural activities etc.

SIXTH SEMESTER

Sr. No.	Subject (Code)	Study Scheme Hrs./Week L. T. P			Evaluation Scheme						Total
					Internal Assessment		External Scheme (Examination)				
					Theory	Practical	Written Paper		Practical		
		L.	T.	P	Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
6.1.	*Installation Testing and Maintenance	3	-	4	25	25	100	3	50	3	200
6.2.	*Entrepreneurship Development and Management	3	-	-	50	-	100	3	-	-	150
6.3.	CAD/CAM FMS	4	-	-	50	50	100	-	50	3	100
6.4.	Micro Controllers and PLC's	4	-	-	25		100				
6.5.	Electronics Instruments and Measurement	4	-	3	25	25	100	3	50	2	200
6.6.	Auto Cad	-	-	3	-	50	-	-	50	3	100
6.7.	Project Work	-	-	8	-	100	-	-	200	3	300
	Student Centered Activates	-	-	4	-	25	-	-	-	1	25
	Total	**18**	**-**	**22**	**175**	**275**	**500**		**400**		**1075**

* Common with that of other Diploma Programmes

+ Included 25 Marks for Viva-Voce

\# Contents extension lectures, field visits, NCC, NSS and cultural activities etc.

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.

1.1 APPLIED MATHEMATICS – 1

RATIONALE   L   T   P   4 1 -
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 npr and ncr, 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 (up to third order) using sarrus rule, expansion method and pivotals's condensation method. Properties of determinants, solution of equations (up to 3 unknowns) by Cramer's rule. Definition of Matrix, addition, subtraction and multiplication of matrices (up to third order). Inverse of a matrix by ad joint 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 (11hrs)
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 (9hrs)

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 a 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. 1 by SS Sabharwal and others by Eagle Prakashan, Jalandhar.
2. Applied mathematics Vol. 2 by SS Sabharwal and others by Eagle Prakashan, Jalandhar.
3. Engineering mathematics Vol. 1 by Ishan Publishing House.
4. Engineering mathematics Vol. 1 by S. Kohli and others: IPH Jalandhar
5. Applied mathematics Vol. 1 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 - 1

RATIONALE   L   T   P   4 - 2

Applied physics includes the story 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 the physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

DETAILED CONTENTS

1. Units and Dimensions (6hrs)

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, conversions 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 (8hrs)

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 and 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, calculations of power in simple cases

3.4 Energy: Definitions and its SI units. Types: Kinetic energy and potential energy with examples of their derivation.

3.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from 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 pressure, 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 and 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 $v = n^\wedge$)

5.5 Sound and light waves

5.6 Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in SHM

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 (6 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

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, Geostationary satellite

8. Temperature and its measurement (8 hrs)

8.1 Principles of measurement of temperature and different scales of temperature.

8.2 Difference between heat and temperature on the basis of KE 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, Kirchoff's law, Wien's law, Planck's black body 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 liquid by capillary rise method

5. To determine and verify the time period of cantilever by drawing graph between load (w) and depression (D)

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 Mc Graw Hill, Delhi

2. Basic Applied Physics by RK Gaur, Dhapat 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 Mc Graw 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 Halliday, Asian Books Pvt. Ltd. New Delhi

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

1.4 APPLIED CHEMISTRY-1

RATIONALE   L   T   P   2 - 2

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 behavior when subjected to different treatment and environment, and the laws of the 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 chemicals formula of a simple chemical compound calculation of percentage composition of chemical compound

1.3 Essentials of the 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 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) in boilers for steam generation

3.2 Methods to remove hardness of water (i) clark's process (ii) permutit process (iii) soda lime process (iv) Lon-exchange process. Simple numerical problems related to soda lime process

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

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

4. Solutions (6 hrs)
4.1 Concept of homogeneous solution, brief introduction of the terms (i) Ionization (ii) acidity (iii) basicity (iv) equivalent weight and gram equivalent weight and suitable examples.
4.2 Strength of a solution (i) normality (ii) molarity (iii) molality 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 industrial applications of 'Electrolysis'
5.5 Elementary 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 standard solution of oxalic acid.
4. Determine the strength of solution of HCI with the help of solution NaOH and an intermediate solution of standard oxalic acid.
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 iron in hematite ore volumetrically.
8. Estimation of amount of iron in hematite are volumetrically.
9. Estimation 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 JC Kuriacose and J Rajaram, Tata Mc Graw Hill publishing company ltd. 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-1" by SS Kumar, Tata Mc Graw Hill, Delhi.
4. "A text book of Applied Chemistry-1" 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 of Environmental Engineers by Swayer and Mc Carty, Mc GRAW HILL, Delhi.
8. Progressive Applied Chemistry-I and II by Dr. GH Hugar, Eagle Prakashan Jalandhar.

1.5 BASICS OF INFORMATION TECHNOLOGY

RATIONALE   L   T   P   - - 4
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 environments, 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, use of various tools of MS office, using internet etc. form the broad competency profile of diploma 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 program, processing.
4. Computer organization, block diagram of computer, CPU, Memory
5. Input devices; keyboard, mouse etc; output devices VDU, Printer, Scanner and Plotter
6. Electrical requirements, inter connections between units, connectors and cables.
7. Secondary storage; magnetic disks- 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 Widows 98 or 2000 etc.
(1) Features of windows as an operating system
-Start
-shutdown and restore
-creating and operating 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 files, protecting files, giving password production 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 page breaks and column breaks
-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 envelopes and labels
-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, softwares and MS words.

8. MS EXCEL
-Starting excel, open worksheet, enter, edit, data, formulas to calculate values, format data, create chart, printing chart, save work sheet, switching from another spread sheet.
-Menu commands:
Create, format charts, organize, manage data, solving problem by analyzing data and 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 and columns, find and replace text, number of cells, formatting worksheets.
-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, and export document.

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 an address book
-attaching a file with e-mail message
-receiving a message
-deleting a message

RECOMMENDED BOOKS
1. Fundamentals of computers by V Rajaraman, Prentice Hall of India Pvt. Ltd. New Delhi.
2. Computers today by SK Basandara, Galgotia Publication Pvt. Ltd. Darya ganj, 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. New Delhi

5. A first course in computer by Sanjay Saxena, Vikas Publishing House Pvt. Ltd. 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. New Delhi

1.6 ENGINEERING DRAWING –I

RATIONALE   L   T   P   - - 6
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) SP 46-1988 should be followed
4) Instruction relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the student.

DETAILED COMMENTS
1. Drawing office practice
1.1 Drawing instruments
1.2 Sizes and layouts of standard drawing sheets
1.3 Sizes of drawing boards
1.4 Drafting table/board
2. Different types of lines and free hand sketching (1 sheet)
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 (2 sheets)
3.1 Instrumental single stroke (capital and inclined) lettering of 35 mm height in the ratios 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. Principles of projections (strictly in first angle projection) (8 sheets)

6.1 Principles 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 other and vice versa.

6.4 Projection of Planes: Planes perpendicular and parallel to either of the planes. Planes perpendicular o one plane and parallel to 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 materials, classifications of sections, conventions in sectioning.

Drawing of full section, half section, partial broken out sections, off-set sections, resolved 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)

Note: Minimum 15 drawing sheets will be prepared by the students.

RECOMMENDED BOOKS

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., 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 1   - - 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 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 the batches and should be given knowledge of various machines/equipment. Such as machine shop, foundry shop, sheet metal shop etc.

4. Students of Diploma in Mechatronics Engineering will undergo shops 1 to 6 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 and 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, 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, scrapper, taps and dye 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, descriptions 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 Caliper, and Vmrnies 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 dyes, 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 filling practice on a square of 45×45 mm2 from MS flat

Job: Angular cutting practice of 45o (on the above job)

Job: Preparation of stud (to cut 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 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 and 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 brush 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 or a computer chassis.
5.7 Preparation of sheet metal jobs involving rolling, shearing, creasing, bending and cornering.
5.8 Prepare a lap riveting 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, multi meter 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 potent ion meters.

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 main plugs 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.

2.1 COMMUNICATION SKILLS-II

RATIONALE   L   T   P   3 - 2
Language is the commonly used and effective medium of the self-expression in al the spheres of human life- personal, social and professional. A student must have a fair knowledge of English language and be able to pursue the present course of study and handle the future jobs in industry. The objective of this course is to assist the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension, improve vocabulary, develop grammatical ability, enhance writing skills, correspond with others, enhance skills in spoken English.

DETAILED CONTENTS
1. Prose Text Book (12 hrs)
The following six chapters of A Book of English for polytechnics- Prose selection, Published by Mac Millan India Ltd. On behalf of Technical Teachers' Training Institute, Chandigarh
a) Uncle Podger hangs a picture
b) Subhash Chandra Bose
c) A pair of Mustachios
d) Guru Gobind Singh
e) With the photographer
f) Sir Jagdish Chandra Bose
There will be one general question from one of these six chapters
2. Precise Writing
(Selected from the prescribed 6 chapters of Prose Text Book) (4 hrs)
3. Grammar (2hrs)
Antonyms change of words in to different parts of speech
4. Correspondence (10 hrs)
a) Business letters such as:
-Registration as supplier
-Floating quotations and tenders
-Quarry for product specification, price and other details etc from the firm/company
-Covering letter for quoting prices against a quotation/tender
-Placing supply order

b) Personal letters such as

-Application for leave and extension of leave

-Application for seeking a job/employment

-Conveying congratulation messages to a relative/friend/colleague on different occasions

-Request letter to guardian for sending money for excursion/study tour

-letter to your brother/sister/friend describing your first day experience in the polytechnic

c) Official letters such as:

-letter to editor for placing an advertisement in the newspaper for purchase/selling of goods.

-Letter to Municipal Commissioner for improving water supply/sanitation system in your locality

-Letter to General Manager, Telephone department for restoring a dead telephone/shifting a telephone.

-Letter to State Electricity Board for repair of street lighting/ correction of bills etc.

-Letter to the supplier for rectifying or replacing a defective machinery/item of purchase

-Letter to Registrar, State Board of Technical Education for allowing to improve grades/marks in diploma examinations.

5. Report Writing (2 hrs)

-Drafting a technical report of a visit to a factory, construction site, modern office etc.

-Report writing on current, general themes/topics related to economy, industry, social issues.

-Elements of periodical progress report.

6. Inspection note (2 hrs)

-Write an inspection note after inspecting technical/industrial goods

-Write an inspection note after visiting a construction site or production shop

7. Writing "Preface" and "acknowledgement" of a project report (2 hrs)

8. A paragraph on current topics/themes (2 hrs)

-Technology

-Science

-Economy

-Politics

-Social

-General

9. Vocabulary (2 hrs)

-Words, idioms, phrases, antonyms and synonyms

-Translation of 100 most popular administrative terms from English to Hindi and from Hindi to English

10. Drafting (4 hrs)

-Press notes

-Memos/circulars

-Notices (lost and found: obituary/auction etc.)

-Telegrams

-Press Releases

-Agenda and minutes of the meeting

-Personal resume/curriculum vitae

11. Communication Techniques (6 hrs)

-Importance of communication

-Types of communication- verbal and non-verbal
-One way and two way communication
-Process of communication-horizontal, vertical, upward, down ward
-Essentials of good communication
-Level of communication- inter and intra personal group to person, group to group
-Methods of effective oral, written and non-verbal communication, horizons-tone, frequency, rate, volume, depth
-Barrier to communication and over coming barriers
-Listening skills
-Use of audio visual aids for effective communication

LIST OF PRACTICALS
1. Presentation of technical report using audio-visual aids.
2. Preparation and presentation on a seminar of a given topic/theme using power point
3. Telephonic conversation-conveying and receiving
4. Mock exercises for an interview for a job/employment
5. Listening comprehension from a radio/cassette talk in English
6. Extempore speech
7. Oral presentation with stress on proper body language, voice modulation
Note: For reading comprehension, listening comprehension and effective speaking skills, English language laboratory manual and workbook published by State Board of Technical Education, Hyderabad (AP) may be used along with text book.

RECOMMENDED BOOKS
1. Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons
2. The essence of effective communication, Ludlow and pantheon, Prentice Hall of India.
3. New Design English Grammar, reading and writing skills by AL Kohli (course A and B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh.
4. New Design English Reading and Advanced Writing Skills for class XI and XII by MK Kohli and AL Kohli, Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh.
5. A practical English grammar by Thomson and Marlinet
6. Spoken English by V Sasikumar and PV Damija, Tata MC Graw Hill
7. English conversation practice by Grount Taylor, Tata MC Graw Hill.
8. Developing communication skills by Krishna Mohan and Meera Banerji, Mac Millan India Ltd. Delhi
9. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan, Tata MC Graw Hill Publishing Company Ltd. New Delhi.
10. Communication Skills by Ms R Datta Roy and KK Dhir, Vishal Production Jalandhar.

2.2 APPLIED MATHEMATICS-II

RATIONALE   L   T   P   3 – 1

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 triangle, centroid and in centre of a triangle (given the vertices of the triangle), simple problems on locus

1.2 Equation of straight line in various standard forms (without proof) with their transformation from 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 coordinates 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 rectum, vertices and axis related to different conics Differential calculus

2. Differential calculus (22 hrs)

2.1 Concept of function, four standard limits

$Lt(X^n-A^n)/(x-a)$, Lt Sin x/x, Lt $(A^x-1)/x$, Lt $(1+x)^{1/x}$

$X{\rightarrow}a$ $X{\rightarrow}0$ $X{\rightarrow}0$ $X{\rightarrow}0$

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 and explicit and implicit functions.

-Differentiation of sum, product and quotient of different functions.

-Logarithmic differentiation, Successive differentiation excluding Nth 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 (e) 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
2. Engineering Mathematics by BS Grewal
3. Engineering Mathematics Volume II by S. Kohli and others, IPH, Jalandhar.
4. Engineering Mathematics by Ishan Publications.
5. Applied Mathematics Volume II by SS Sabharwal and others. Eagle Parkashan, Jalandhar.
6. Engineering Mathematics by IB Prasad.
7. Applied Mathematics Volume II by Dr. RD Sharma
8. Advanced Engineering Mathematics by AB Mathur and VP Jagi; Khanna Publishers, Delhi.
9. Higher Engineering Mathematics by BS Grewal, Khanna Publishers, Delhi.
10. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi.

2.3 APPLIED PHYSICS-II

RATIONALE   L   T   P   3 – 2
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 fields of engineering and technology are given prominence in the course content.

DETAILED CONTENTS

1. Applications 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 Ultrasonic- production (magnetostriction and piezoelectric) and their engineering applications.

2. Principles of optics (9 hrs)
2.1 Introduction: reflection of light, 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 charge
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 charges sheet.
3.5 Capacitance, types of capacitors, capacitance of parallel plate capacitor series and paralleì comrination 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 Kirchoff's laws, wheat stone 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 pnp and npn (concept only)

6. Modern Physics (9 hrs)

6.1 Lasers: concept of energy level, ionizations and excitation potentials, spontaneous and stimulated emission, lasers and its characteristics, population inversion, types of lasers, helium- neon and ruby lasers and applications.

6.2 Fiber optics- Introduction, optical fiber materials, types, light propagation and applications.

6.3 Super conductivity, phenomenon of super conductivity, effect of magnetic field, critical field, type I and 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 PRACTICALS

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 turning fork by a sonometer.
9. To study characteristics of a pn junction diode.

RECOMMENDED BOOKS

1. Applied Physics Vol II, TTTI Publication Tata Mc Graw 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 Mc Graw Hill, Delhi.
5. Simple courses 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 Halliday, Asian Books Pvt. Ltd, New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd, New Delhi.

2.4 ANALOG ELECTRONICS – I

RATIONALE   L   T   P   3 – 2

This subject gives the knowledge of fundamental concepts of basic electronics and aims at providing the students with basic understanding of conductors, semi conductors and insulators, extrinsic and intrinsic semi conductors, p-n junction, need of rectifiers in electronics, understanding of filters in rectifiers, tunnel diodes, LEDs, varactor diodes, LCD; understanding the working of transistors in various configurations, understanding of FETs and MOSFET etc. for effective functioning in the field of electronic service industry. The teacher should give emphasis on understanding of concepts and explanation of various term used in the subject. Practical exercises will reinforce various concepts industrial/field exposure must be given by organizing visit.

DETAILED CONTENTS

1. Semi Conductor Physics: (12 hrs)

Review of basic atomic structure and energy levels, concepts 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 semiconductors and their conductivity. Effect on temperature on conductivity of intrinsic semi conductor. Energy level diagram of conductors, insulators and semi conductors: minority and majority carriers.

2. Semi conductor diode (12 hrs)

PN junction diode, mechanism of current flow in PN junction. Drift and diffusion current, depletion layer, forward and reversed biased PN junction, potential barrier, concept of junction capacitance in forward and reverse bias condition V-I characteristics, static and dynamic resistance and their calculation from diode characteristics. Diodes as half wave, full wave and bridge rectifier. PIV rectification efficiencies and ripper factor calculations, shunt capacitor, filter. Filter, series inductor filter, LC filter and types of diodes, characteristics and applications of Zenor diodes. Zenor and avalanche break down.

3. Introduction to Bipolar transistor (12 hrs)

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 configuration; d.c load line and calculation of current gain, voltage gain using d.c load line.

4. Transistor biasing circuits (6 hrs)

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 (10 hrs)

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. Filed effect transistors (12 hrs)

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 Zenor diode
4. Observes the wave shape of the 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 parameters of transistors in CB configuration
8. Plot V-I characteristics of FET amplifier.
9. Measure the Q-point and note the variation of Q-point.
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 Kulshreshtra, Tata Mc Graw 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 Mc Graw Hill, New Delhi.

4. Electronic devices and circuits by Millman and Halkias, Tata Mc Graw Hill, New Delhi.
5. Principles of electronics by Alber Paul Malvino, Tata Mc Graw Hill, New Delhi.
6. Electronics devices and circuits-I by Naresh Gupta, Jyotesh Malhotra and Harish C Saini.
7. Electronics devices and circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi.

2.5 APPLIED MECHANICS

RATIONALE   L   T   P   3 – 2
The subject applied mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other rallied subjects. The subject enhances the analytical ability of the students.

DETAILED CONTENTS

1. Introduction (6 hrs)
1.1 Concept of engineering mechanics, definition of mechanics, static's dynamics, applications of engineering mechanics in practical fields.
1.2 Concept of rigid body

2. Laws of forces (6 hrs)
2.1 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces.
2.2 Parallelogram law of forces, triangle law of forces, polygon law of forces (graphically and analytically) resolution of forces, resolving a force into two rectangular components.
2.3 Free body diagram
2.4 Equilibrium force and its determination.
2.5 Lami's theorem

3. Moment (6 hrs)
3.1 Concept of moment
3.2 Moment of a force and units of moment
3.3 Varignon's theorem (definition only)
3.4 Principle of moment and its applications.
3.5 Parallel forces (like and unlike) and calculating their resultant
3.6 Concept of couple, its properties and effects
3.7 General conditions of equilibrium of bodies under co-planar forces
3.8 Position of resultant force by moment.

4. Friction (6 hrs)
4.1 Definition and concept of friction, types of friction.
4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction.

4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane, friction in simple screw jack

4.4 Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force.

a) acting along the inclined plane

b) horizontally

c) at some angle with the inclined plane

5. Centre of gravity (6 hrs)

5.1 Concept, definition of center of gravity and centroid of plain figure and symmetrical solid body.

5.2 Determination of centroid of plain and composite lamina using moment method, centroid of bodies with removed portion.

5.3 Determination of center of gravity of solid bodies- cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed.

6. Application of the laws of motion (10 hrs)

Simple problems on second law of motion, piles, lift, and bodies tied with strings.

7. Simple machines (8 hrs)

7.1 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machine

7.2 Simple and compound machine

7.3 Definition of ideal machine, reversible and self locking machine

7.4 Effort lost in friction, determination of maximum mechanical advantage and maximum efficiency.

7.5 System of Pulley (first, second and third systems of pulleys), determination of velocity ratio, mechanical advantage and efficiency.

7.6 Working principles and applications of wheel and axle, different pulley blocks, simple screw jack, worm and worm wheel, single and double purchase winch crab, expression for their velocity ration and field of their application.

Note: Simple problem/numericals may be included in all the above topics wherever feasible

LIST OF PRACTICALS

1. Verification of the following laws:

a) Parallelogram law of forces

b) Triangle law of forces

c) Polygon law of forces

2. To verify the forces in different members of a jib crane.

3. To verify the reaction at the supports of a simply supported beam

4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.

5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack

6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel

7. To find the mechanical advantage, velocity ratio and efficiency of single purchase winch crab

8. To find center of gravity of regular lamina

9. To find center of gravity of irregular lamina

10. To determine coefficient of friction between different surfaces on horizontal plane

RECOMMENDED BOOKS

1. A text book of engineering mechanics (applied mechanics) by RK Khurmi; S Chand and Co; Ltd. New Delhi.

2. Text book in Applied Mechanics by MM malhotra, R Subramanian, PS Gahlot and BS Rathore, Wiley Eastern Ltd. New Delhi

3. Engineering Mechanics by SS Bhavikatti, KG Rajashekarappa, Wiley Eastern, New Delhi

4. Engineering Mechanics and Strength of Materials by S Ramamurtham; Dhanpat.

5. Engineering Mechanics by AB Basu, Tata Mc Graw Hill, New Delhi.

6. Engineering Mechanics- Volume I and II by VS Mokashi, Tata Mc Graw Hill, New Delhi.

7. Elements of strength of materials by SP Timoshenkho, DH Young, east West press pvt. Ltd.

8. Schaum's Outline Series: Theory and problems of strength of materials by William A Nash, Tata Mc Graw Hill, New Delhi.

9. A text book of applied mechanics by NL Arora and RK Dhawan, India Publishing House, Delhi

10. A text book of applied mechanics by RK Rajput, Laxmi Publications, New Delhi

11. Text Book of applied mechanics by Birinder Singh, caption Publishing House New Delhi.

2.6 ENGINEERING DRAWING-II

RATIONALE   L   T   P   - - 6

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. SP 46-1988 should be followed.

4. Instructions relevant to various drawings may be given along with the appropriate demonstration, before assigning drawing practice to the students.

DETAILED CONTENTS

1. Detailed and Assembly Drawing (2 sheets)

1.1 Principle and utility of detail and assembly drawings.

1.2 Wooden joints i.e corner mortice and tenon joint, Tee halving joint, Miter faced corner joint, Tee bridle joint, crossed wooden joint, cogged joint, dovetail joint, through motice and tenen joint, corner and through halving joint. Closed mortise and tenon joint.

2. Threads (3 sheets)

2.1 Nomenclature of threads, types of threads (metric), single and multiple start threads.

2.2 Forms of various external thread sections such as V, square and acme threads, BA, BSW and knuckle metric, seller thread, buttress threads

2.3 Simplified conventions of left hand and right hand threads, both external and internal threads.

3. Locking devices (1 sheet)

Lock nuts, castle nuts, split pin nuts, sawn nuts, slotted nut.

4. Nuts and Bolts (3 sheets)

Different views of hexagonal and square nuts; different views of hexagonal and square nuts; assembly of hexagonal headed, square headed, square headed with square neck bolts with hexagonal and square nuts and washers.

Foundation Bolts-

-Rag bolt and Lewis bolt

5. Screws, Studs and Washers (1 sheet)

5.1 Drawing various types of machine screws

5.2 Drawing various types of studs and set screws.

6. Keys and Cotters (3 sheets)

6.1 Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position

6.2 Cotter joints (i) sleeve and cotter joint (ii) gib and cotter joint (iii) knuckle joint (iv) spigot and socket joint

7. Rivets and Riveted Joints (2 sheets)

7.1 Types of structural and general purpose rivet heads

7.2 Caulking and fullering of riveted joints.

7.3 Types of riveted joints- lap, butt (single riveted, double riveted lap joint, single cover plate and double cover plate) chain and zigzag riveting.

8. Welded Joints (1 sheet)

8.1 Various conventions and symbols of welded joints (IS 696)

8.2 Practical applications of welded joints say joints on steel frames, windows, doors and furnitures.

9. Couplings (2 sheets)

9.1 Muff or box coupling, half lap muff coupling

9.2 Flange coupling (protected and non-protected)

9.3 Flexible coupling

10. Symbols and conventions (2 sheets)

10.1 Civil engineering sanitary fitting symbols

10.2 Electrical fitting symbols for domestic interior installations.

10.3 Building plan drawing with electrical and civil engineering symbols.

11. Development of surfaces (3 sheets)

11.1 Construction of geometrical figures such as square, pentagon, hexagon

11.2 Development of surfaces of cylinder, square, pentagonal and hexagonal. Prism, Conc, Pyramid, Sequence pentagonal and hexa pyramid.

12. Interpenetration of surfaces (2 sheets)

12.1 Cylinder to Cylinder

12.2 Cylinder to cone

13. Auto cad

13.1 Concept of auto cad, tools bar in auto cad, coordinate system, snap grid and ortho mode

13.2 Drawing commands- point, line, arc, circle, ellipse

13.3 Editing commands- scale, erase, copy, stretch, lengthen and explode

13.4 Dimensioning and placing text in drawing area

13.5 sectioning and hatching

13.6 Inquiry for different parameters of drawing entity

Note: A minimum of 15 sheets should be prepared by each student

RECOMMENDED BOOKS

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. Delhi

3. Engineering Drawing by PS Gill published by SK Kataria and sons, New Delhi.

3.1   STRENGTH OF MATERIAL

RATIONALE   L   T   P   3 – 3
Diploma holders in this course are required to analyze reasons for failure of different components and select the required materials for different applications for this purpose. It is essential to teach those concepts, principles, applications and practices covering stress, strain bending moment, shearing force, shafts, columns and springs. Hence the subject has been introduced. It is expected that efforts will be made to provide appropriate learning experiences in the use of basic principles to the solution of applied problems to develop the required competencies.

DETAILED CONTENTS
1. Stresses and Strains (6 hrs)
-Concept of load, stresses and strain
-Tensile, compressive and sheer stresses and strains
-Concept of elasticity, elastic limit and limit of proportionality
-Hooke's law, young's modulus of elasticity, yield point, plastic stage, and strain hardening. Stress strain diagram, ultimate strength and breaking stress. Percentage elongation, principle of superposition, frees body diagram, proof stress and working stress. Factor of safety, bars of varying cross section. Temperature stresses and strains. Composite sections under compression and tension, lateral strain, Poisson's ration, numerical problems.
2. Resilience and instantaneous stress (5 hrs)
-Concept of Resilience, proof Resilience and coefficient of Resilience.
-Modes of loading: gradual loading, sudden loading and failing load
-Calculation of instantaneous stress induced due to gradual loading, sudden load and falling loads
-Numerical problems on the above

3. Beams and bonding stress (8 hrs)
-concept of beams
-types of beams
-types of loading
-Concept of end supports-roller, hinged and fixed

-concept of bending moment and shearing force
-bending moment and shearing force diagram for cantilever and simply supported beams with and without overhang subjected to concentrated and UDL. Point of contra flexure
-numerical problems

4. Moment of inertia (6 hrs)
-radius of gyration
-theorem of parallel axes
-theorem of perpendicular axes
-section modulus
-moment of inertia of plane figures such as rectangle, square, triangle, circle, trapezium (without proof)
-numerical problems on; angle section, T section, I section, circular section, channel section, Z section, hollow section and removed section.

5. Bending stress (7 hrs)
-concept of bending stresses
-theory of simple bending, assumptions made in bending theory
-use of equation o/y=M/1=E/R
-concept of moment of resistance
-bending stress diagram
-calculation of maximum bending stress in beams of rectangular, I and T sections
-Permissible bending stress, section modulus for rectangular, circular and symmetrical I sections

6. Springs (4 hrs)
-Determination of number of plates
-maximum bending stress and deflection
-closed coil helical spring subjected to axial load
-stress deformation
-stiffness and angle of twist and strain energy
-falling loads on springs
-numerical problems

7. Columns (5 hrs)
-concept of column, modes of failure
-types of columns
-buckling load, crushing load
-slenderness ratio
-factors effecting strength of a column
-end restraints
-effective length
-strength of column by Euler Formula without derivation
-Rankine Gourdan formula (without derivation)
-Numerical problems

8. Torsion (7 hrs)
-concept of torsion, difference between torque and torsion
-derivation and use of torque equation
-shear stress diagram for solid and hollow circular shaft
-comparison between solid and hollow shaft with regard to their strength and weight
-power transmitted by shaft

-concept of mean and maximum torque
-numerical problems

LIST OF PRACTICALS
1. Tensile test on bars of mild steel and aluminum
2. Shear test on specimen of two different metals
3. Impact test on metals (a) Izod test (b) Charpy test
4. Torsion test on specimens of different metals for determining the angle of twist for a given torque
5. To determine the stiffness of a helical spring and to plot a graph between load and extension
6. Hardness test on metal and finding the Rockwell hardness

RECOMMENDED BOOKS
1. Strength of materials by RS Khurmi, S Chand and company, Delhi
2. Strength of materials by DR malhotra, Satya Prakashan, Delhi
3. Strength of materials by RK Rajput, SK kataria and sons, Delhi
4. Strength of materials by Birender Singh
5. Strength of materials by Dr. Sadhu Singh

3.2 MANUFACTURING PROCESSES

RATIONALE   L   T   P   3 - -

DETAILED CONTENTS
1. Welding-principle of welding
-welding positions and techniques, symbols, gas welding
-types of gas welding flames and their applications
-gas welding equipments – gas welding torch, oxy, acetylene cutting torch, blowpipe, pressure regulators, filter rods and fluxes
-arc welding
-arc welding machines and equipment
-A.C and D.C. arc welding
-effect of polarity, current regulation and voltage regulation
-electrodes: classification, BIS specification and selection
-flux for arc welding
Other welding processes
-Principle of resistance welding, working and applications of spot welding, seam welding, projection welding and percussion welding
-welding defects and inspection of welding joints
Modern welding methods
Principles of operation, advantages, disadvantages and applications of
-Tungsten inert gas (TIG) welding
-Metal inert gas (MIG) welding
-Thermit welding
-Electro slag welding, soldering and brazing
2. Pattern making and Moulding- Types of pattern
-pattern material
-pattern allowances
-properties of moulding sand, their impact and control of properties viz. permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility
-Various types of moulding sand, moulding making
-Introduction to moulding tools
-types of moulds
-steps involved in making a mould
-moulding boxes, hand tools used for mould making

-moulding processes: bench moulding, floor moulding, pit moulding and machine moulding

Special casting processes
-Principle
-Centrifugal casting

Gating and Risering system
-elements of gating system
-pouring basin, sprue, runner, gales
Types of risers, location of risers

Casting Defects
-Different types of casting defects
-Testing of defects, radiography, magnetic particle inspection and ultrasonic inspection

3. Lathe
-description and function of various parts of lathe
-classification and specification of various types of lathe
-work holding devices
-lathe operations- Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling
-Cutting parameters- speed, feed and depth of cut for various materials and for various operations, machine time
-lathe accessories- centers, dogs, chucks, collets, face plate, angle plate, mandrel, steady rest, taper turning attachment, tool post grinder

4. Cutting tools and cutting materials
-various types of single point cutting tools and their uses
-single point cutting tool geometry, tool signature
-properties of cutting tool material.
-study of various cutting tool materials viz High speed steel, tungsten carbide, cobalt steel, cemented carbides, satellite, ceramics and diamond
-Cutting fluid-their types, importance, properties and advantages and applications

5. Milling
-specification and working principle of milling machine
-classification, brief description and applications of milling machines
-Details of column and knee type milling machine
-milling machine accessories and attachment- arbors, adaptors, collets, vices, circular table, indexing head and tail stock, vertical milling attachment, spiral milling attachment, slotting attachment and rack milling attachment.
-Milling methods- up milling and down milling
-identification of different milling cutters and work mandrels
-work holding devices
-Milling operations- face milling, angular milling, form milling, straddle milling and gang milling
-Cutting speed and feed, depth of cut
-Indexing on dividing heads, plain and universal dividing heads
-Indexing methods: direct, plain or simple, compound differential and angular indexing

6. Shaping, Planning and slotting
-working principle of shaper, planer and slotter

-quick return mechanism applied to shaper, slotter and planer machine
-Specification of shaper, planer and slotting machine.
-Speeds, feeds and depth of cut

7. Metal forming process

-press working

a) Press working- types of presses, type of dies, selection of press die, die material

b) Press operations- shearing, piercing, trimming, punching, notching, shaving, gearing, embossing, slamping

-Forging

a) Open die forging, closed die forging

b) Cold and hot forging

Rolling

a) Elementary theory of rolling

b) Types of rolling mills

c) Rolling defects and remedies

-Extrusion and drawing

a) Type of extrusion- Hot and cold, direct and indirect

b) Pipe drawing, tube drawing.

3.3 PROGRAMMING IN -C
(Common with Computer Engineering)

RATIONALE   L   T   P   2 - 3

Computers play a vital role in present day life, more so, in the professional life of technician engineers. People working in the field/computer industry use computers in solving problems more easily and effectively. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various applications of computers. The knowledge of C language will be reinforced by the practical exercises.
Note:
The subject is totally practical based. Students should be given clear idea about the basic concepts of programming. In practical session student should be asked to write algorithm and then write program for the algorithm and run on computer. It is required that student should maintain records (files with printouts)

DETAILED CONTENTS

1. Algorithm and Programming Development (4 hrs)
1.1 steps in development of a program
1.2 flow charts, algorithm development
1.3 program debugging

2. Program structure (4 hrs)
2.1 I/o statements, assign statements
2.2 constants, variables and data types
2.3 operators and expressions
2.4 standards and formatted

3. Control Structure (8 hrs)
3.1 Introduction
3.2 Decision making with IF- statement
3.3 IF-Else and nested IF
3.4 While and do-while, for loop
3.5 Break and switch statements

4. Functions (4 hrs)
4.1 Introduction to functions

4.2 Global and local variables
4.3 Function declaration
4.4 Standard functions
4.5 Parameters and parameter passing
4.6 Call- by value/reference
5. Arrays (4 hrs)
5.1 Introduction to arrays
5.2 array Declaration
5.3 Single and multidimensional array
5.4 arrays of characters

6. Pointers (4 hrs)
6.1 Introduction to pointers
6.2 Address operator and pointers
6.3 Declaring and initializing pointers
6.4 Assignment through pointers
6.5 Pointers and Arrays
7. Structures and Unions (4 hrs)
7.1 Declaration of structures
7.2 Accessing structure members
7.3 Structure initialization
7.4 Arrays of structure
7.5 Unions

LIST OF PRACTICALS
1. Programming exercises on executing and editing a C program.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetic and relational operators.
4. Programming exercises on arithmetic expressions and their evaluation.
5. Programming exercises on formatting input/output using print f and scarf.
6. Programming exercises using if statement.
7. Programming exercises using if – Else.
8. Programming exercises on switch statement.
9. Programming exercises on do- while statements.
10. Programming exercises on for – statement.
11. Programs on one-dimensional array.
12. Programs on two-dimensional array.
13. (i) Programs for putting two strings together.
(ii) Programs for comparing two strings.
14. Simple programs using structures.
15. Simple programs using pointers.

RECOMMENDED BOOKS
1. Programming in C by Schaum Series, Mc Graw Hills Publishers.
2. Thinking in C by PB Mahapatra- Wheeler Publication.
3. Exploring C by Yashwant kanetkar- BPB Publications.

4. Programming in C by Stefin G. Coachin
5. Programming in C by R Subbraj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi.
6. Programming with C language by C Balaguruswami, Tata MC Graw Hill, New Delhi.
7. Elements of C by MH Lewin.
8. Programming in C by Stephan G Kochan, TMH/Prentice Hall of India.
9. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi.
10. Let us C by Yashwant kanetkar, BPB Publication, New Delhi.

3.4 BASIC ELECTRICAL ENGINEERING

RATIONALE   L   T   P   3 - 3

This course will enable the students to understand the basic concepts and principles of d.c and a.c fundamental, a.c circuits, batteries, electromagnetic induction etc. A diploma holder may be involved in various jobs ranging from preventive maintenance of electrical installation to fault locations etc. In addition, he may be working in testing laboratories where he uses measuring instruments. To carry out these and similar jobs effectively, knowledge of basic concepts, principles and their applications is very essential.

DETAILED CONTENTS

1. DC Circuits (5 hrs)

1.1 Concept of electricity, various applications of electricity, advantages of electricity over other types of energy. Differences between ac and dc.

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, receptivity 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 law and their applications to simple circuits. Conversion of circuits from star to delta and delta to star.

2. DC Circuit Theorems (4 hrs)

Thevenin's theorem, Norton's theorem, super position theorem, maximum power transfer theorem, and application of network theorem in solving dc circuit problems.

3. Electro magnetic Induction (6 hrs)

3.1 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.

3.2 Faraday's law and rules of electro-magnetic induction, principle self and mutual induction, self and mutually induced e.m.f simple and numerical problems.

4. Batteries (5 hrs)

4.1 Basic idea about primary and secondary cells.

4.2 Construction, working and applications of lead-acid battery and nickel cadmium cells.

4.3 Charging methods used for lead –acid battery (accumulator)

4.4 Care and maintenance of lead-acid battery.
4.5 Series and parallel connections of batteries.
5. AC fundamentals (8 hrs)
5.1 Concept of alternating voltage and current.
5.2 Difference between ac and dc
5.3 Concept of cycle, frequency, time period, amplitude, instantaneous value, average value r.m.s. value, maximum value, form factor and peak factor.
5.4 Representation of sinusoidal quantities by phasor diagrams.
5.5 Equation of sinusoidal wave form (with derivation)
5.6 Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.

6. AC Circuits (8 hrs)
6.1 Inductive reactance and capacitive reactance.
6.2 Alternating voltage applied to resistance and inductance in series.
6.3 Alternating voltage applied to resistance and capacitance in series.
6.4 Impedance triangle and phase angle.
6.5 Solutions and phasor diagram for simple RLC circuits (series and parallel)
6.6 Introduction to series and parallel resonance and its conditions.
6.7 Power, factor, active and reactive power and their significance, importance of power factor.
7. Various types of power plants (4 hrs)
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 dc circuits:
a. Thevenin's theorem.
b. maximum power transfer theorem.
5. To observe change in resistance of a bulb in hot and 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 RLC circuit and to calculate active and reactive power.

RECOMMENDED BOOKS

1. Electrical Technology, fifth edition by Edward Hughes, Longman Publishers.
2. Electrical Technology by BL Thareja, 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 Bhattacharya, KM Rastogi, New Age International Pvt. Ltd., Publishers New Delhi.
5. Basic electricity by BR Sharma, Satya Prakshan 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. Basic Electrical Engineering by Mool Singh, Gilgotia Publications Pvt. Ltd. New Delhi.
11. Electrical Science by S. Chaudhari, R Chakarbati and PK Chattopathyay, narosa Publishing House, New Delhi.

3.5 ANALOG ELECTRONICS-II

RATIONALE   L   T   P   3 - 3
Having attained basic knowledge of electronic devices like diodes, transistors and elementary circuits, in second semester, this course will enable the students to learn about the use of transistors in analog circuits like power amplifier, multistage amplifier, oscillators, wave shaping circuits and multi vibrators etc. it also gives information about timer, operational amplifier, voltage regulator, ICs and their applications for effective functioning in the field of electronic service industry.

DETAILED COMMENTS
1. Multistage amplifiers
a) Need for multistage amplifier
b) Gain of multistage amplifier
c) Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled and their frequency response and bandwidth (8hrs)
2. Large signal amplifier
a) Difference between voltage and power amplifiers.
b) Importance of impedance matching in amplifiers.
c) Class A, Class B, Class AB and Class C amplifiers.
d) Single ended power amplifiers, push pull amplifier, and complimentary symmetry push-pull amplifier.
(8 hrs)
3. Feedback in amplifiers
a) Basic principles and types of feedback.
b) Derivation of expression for gain of an amplifier employing feedback
c) Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier
d) RC coupled amplifier with emitter bypass capacitor
e) Emitter follower amplifier and its applications.
4. Sinusoidal Oscillators
a) Use of positive feedback
b) Barkhausen criterion for oscillations
c) Different oscillator circuits-turned collector, Hartley Colpitts, phase shift, Wien's Bridge, and crystal oscillator. Their working principles and simple numerical problems.

d) Series and parallel resonant circuits and bandwidth of resonant circuits.

e) Single and double tuned voltage amplifiers and their frequency response characteristics.

(8 hrs)

6. Wave shaping circuits

a) General idea about different wave shapers.

b) RC and RL integrating and differentiating circuits with tier applications.

c) Diode clipping and clamping circuits and simple numerical problem on the circuits

(04 hrs)

7. Multi vibration circuits

a) Working principle of transistor as switch

b) Concept of multi vibrator: astable, monostable and bistable and their applications.

c) Block diagram of IC555 and its working

d) IC555 as monostable and astable multi-vibrator

(08 hrs)

8. Operational Amplifiers

a) Characteristics of an ideal operational amplifier and its block diagram

b) Definition of differential voltage gain CMMR, PSRR, slew rate and input offset current

c) Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator and integrator

d) Concept of Schmitt triggers circuit and sample/hold circuit using operational amplifier and their applications.

(06 hrs)

9. Regulated DC Power supplies

a) Concept of DC power supply. Line and load regulation (06 hrs)

b) Concept of fixed voltage, IC regulators (like 7805, 7905) and variable voltage regulator like (IC 723)

c) Idea of SMPS

LIST OF PRACTICALS

1. Plot the frequency response of two staged RC couple amplifier and calculate the bandwidth and compare it with single stage amplifier.

2. To measure the gain of push pull amplifier at 1 KHz

3. To measure the voltage gain of emitter follower circuit and plot its frequency response.

4. Plot the frequency response curve of Hartley and Colpitts Oscillator.

5. Plot the frequency response curve of phase shift and Wein bridge oscillator.

6. To observe the output waveforms of series and shunt clipping circuits.

7. To observe the output fro clamping circuits.

8. To observe the output waveform of Bistable multi vibrator.

9. Use of IC 555 as monostable multi vibrator and observe the output for different values of RC.

10. Use of IC 555 as astable multi vibrator and observe the output at different duty cycles.

11. To use IC 741 (op-amplifier) as

i) Inverter

ii) Adder

iii) Subtracter

iv) Integrator

12. To realize positive and negative fixed voltage AC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

RECOMMENDED BOOKS

1. Basic Electronics and linear circuits by NN Bhargava, Tata Mc Graw Hills, New Delhi.
2. Electronics principles by Malvino, Tata Mc Graw Hills, New Delhi.
3. Electronics devices and circuits by Millman and Halkias, Tata Mc Graw Hills, New Delhi.
4. Basic electronics by Grob. Tata Mc Graw Hills, New Delhi
5. Art of electronics by Horowitz.
6. Electronic principles by Sahadev, Dhanpat Rai and Sons, New Delhi
7. Electronic Circuit theory by Boylstead
8. Electronic devices and circuit by BL Thareja, S Chand and Co. Ltd. New Delhi
9. Operational Amplifiers and Linear Integrated circuits by Ramakant A Gaykwad
10. Electronic devices and circuit by Rama Reddy, Narosa Publishing House Pvt. Ltd. New Delhi.
11. Electronic devices and circuits-II by Naresh Gupta, Jyotesh Malhotra and Harish C. Saini, Eagle Prakashan, Jalandhar.

3.6 WORKSHOP PRACTICE III

RATIONALE   L   T   P   - - 9
Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose skills in various machining processes, modern machining methods, processing of plastic, CNC machining, tool, jigs and fixtures is required to be imparted. Hence the subject of workshop practices.

LIST OF PRACTICALS

WELDING

1. Making following types of joints by gas welding
-Preliminary joining practice
-Vertical welding
2. Exercises of gas welding on the following
-Aluminum
-Brass
-Copper
-C.1.
3. Gas cutting of the following types
-Preliminary gas cutting practice
-Stock cutting by oxy acetylene
-C.I. cutting
4. Making following types of joints by arc welding on MSCI and aluminum
-Joining practice by arc welding
-Butt and lap joint (in vertical position, travel up and down)
-Welding of outside corner joint
-Inspection of the welding defects occurred in the job
5. Exercise on the spot welding
6. Exercise on projection welding (industrial visit should be arranged)
7. Exercise on brazing
8. Exercise on TIG welding
9. Exercise on MIG welding

FOUNDRY

10. Preparation of the following types of moulds.
-Floor Molding

11. Moulding and casting of
-A solid pattern
-A split pattern
12. Testing and inspection of casting defects visually.
13. Study of constructional features of coupla furnace.

TURNING

14. Simple exercise on turning and step turning.
15. A composite job involving turning, taper turning, thread cutting and knurling and eccentric turning.
16. Exercise on internal threading on Lathe.

DRILLING AND FITTING

17. Marking and drilling practice using column and knee type drilling machine and radial drilling machine.
18. A job on drilling, threading, reaming, counter boring and counter sinking.
19. Exercise on boring with the help of boring bar
20. Dovetail fitting in mild steel piece.
21. Radius fitting in mild steel piece.
22. Exercise on pipe bending on MS pipe and PVC pipe using pipe bending machine.

PATTERN MAKING

23. Preparation of solid pattern (single piece)
24. Preparation of split pattern
25. Preparation of self cored pattern.

Note: 1. The Workshop Superintendent will prepare and finalize the specific drawings of all jobs in the beginning of semester in consultant with staff.
2. The institutions where foundry shop does not exist, they should arrange a visit to foundry industry in the nearby area.

4.1 THEORY OF MACHINES

RATIONALE   L   T   P   3 1 -
Diploma holders in Mechatronics Engineering come across many machines. He must have the knowledge of various mechanisms, power transmission, balancing of masses vibrations etc. Hence this subject is offered.

DETAILED CONTENTS
1. Basic concepts (5 hrs)
-Definition of static's, kinetics, kinematics and dynamics
-Right body and resistant body
-Links
-kinematics pairs and their types
-Degree of freedom
-Kinematics chain and their types
-Constrained motions and mechanisms
-Classification of mechanisms
-Equivalent mechanisms
-Laws of inversion of mechanisms
-Single side crank chain and its inversions
-Quick return mechanism and IC engine mechanism
-Double slider crank chain mechanism and its inversions like scotch yoke mechanism
-Indicator mechanism, pantograph
-Steering gear mechanism

2. Fly Wheel (5 hrs)
-Functions of fly wheel
-Kinetic energy of rotating masses, turning moment design
-Types of fly wheels
-Co-efficient of energy and speed
-Simple problems

3. Governor (4 hrs)
-Functions of governor; comparison between a fly wheel and a governor.

-Types of governor- principle, construction and working of Watt governor porter, governor, Hartnell governor.
-Simple problems on watt and porter governor.
-Terminology used in governors: Height, equilibrium speed, hunting, isochronisms, stability, sensitiveness (no numerical problem)

4. Cams (5 hrs)
-Definition of cam
-Classifications of cam
-Followers and their classifications
-Brief description of different types of cams and followers with simple line diagram
-Simple cam profile for uniform velocity, SHM and uniform acceleration and deceleration with flat, knife edge and roller type follower.

5. Power Transmission Devices (Belt, Rope and chain Drive) (8 hrs)
-Introduction
-Belt and rope drives, open and crossed belt drives, actions of belt on pulleys, velocity ratio.
-Material for belts and ropes
-Slip in belts and ropes
-Types of V belt and flat belt
-Types of pulleys- step pulley and flat pulley
-Crowning in pulley
-Laws of belting and length of belt (open and cross belt)
-Ratio of tensions
-Power transmitted and max power transmitted by belt
-Centrifugal effect on belt
-Initial tension
-Chain drive, classification of chains
-Selection of rope based on the load to be lifted

6. Gear Drive (7 hrs)
-Functions of gear
-Classification of gear
-Gear nomenclature
-Forms of teeth, cycloid profile and involutes profile teeth
-Simple, compound, reverted and epicyclic gear train
-Simple problems on gear trains

7. Friction & Clutches (6 hrs)
-Frictional torque in screws for both square and V-threads
-Screw jack
-Calculation of power required for raising a load
-Friction in collars and pivots
-Frictions in plate clutch and conical clutch
-Different types of bearings & their applications

-Derivation of formula for torque wasted in friction bearing and torque transmission capacity of clutches

8. Balancing (6 hrs)
-Need of balancing
-Concept of static and dynamic balancing
-Balancing of rotating mass by another mass in the same plane
-Concept of reference plane
-Simple problems pertaining to several masses rotating in different planes

9. Vibration (2 hrs)
-Introduction
-Types of vibration-longitudinal, transverse and torsional vibration
-Causes, remedial measures and harmful effects of viberations.

RECOMMENDED BOOKS
1. JS Rao and Dukkipati; Mechanism and machine Theory; Wiley Eastern, New Delhi.
2. A Ghosh and AK malik; Theory of mechanism and machine; east west press Pvt. Ltd. New Delhi.
3. MF Spotts; Design of machine elements; prentice hall of India Ltd. New Delhi.
4. RC Jindal, Theory of machines and mechanisms, Ishan Publications, Ambala city.
5. SS Rattan, Theory of machines, tat Mc Graw Hill, New Delhi.

4.2 HYDRAULICS & PNEUMATICS

RATIONALE   L   T   P   3 – 2

The diploma holders are supposed to have knowledge of hydraulic and pneumatic. Hence this subject has been introduced.

DETAILED CONTENT

1. Introduction
Properties of liquid, intensity of pressure, pressure head, centre of pressure, total pressure on vertical and inclined flat surfaces. Gauge pressure and absolute pressure, atmospheric pressure, vacuum differential pressure with simple problems
(6 hrs)

2. Pressure Measurement
Measurement of pressure by piezometer tube, manometer, inclined manometer, differential manometer, inverted differential manometer, simple problems, bourdon's pressure gauge. Pressure gauge calibration
(6 hrs)

3. Flow Measurement
Types of flow, total energy, velocity head, pressure head, potential head, measurement of velocity. Bernoulli's theorem, Cc, Cv and Cd. Practical applications of Bernoulli's theorem, simple problems.
(8 hrs)

4. Flow through orifices
Types of orifices, jet of water, vena contracta. Hydraulic coefficients, relation between Cc, Cv and Cd. Time for emptying a tank.
(4 hrs)

5. Pumps
Study of pumps. Reciprocating and centrifugal.
(4 hrs)

6. Flow through pipes

Minor and major losses, darcy's equation, chezy's equation (without proof). Simple problems
(6 hrs)

7. Hydraulic Circuits
Study of construction of elements of hydraulic power pack such as hydraulic pump, filter and reservoir, cooler, heater, oil level gauge and temperature gauge.

8. Pneumatic systems
Comparison of Pneumatic with fluids, elements of Pneumatic system, types of compressors-reciprocating, rotary. Selection of compressor. Air receives. Industrial applications of Pneumatics. Air filters, pressure regulator and lubricators. Pneumatic valves- direction control valve, pilot operated valve. Pneumatic actuators. Pneumatic tools- rotary, piston type, hammer type.
(10 hrs)

LIST OF PRACTICALS
1. Study of piezometer tube, manometer and pressure gauge and its calibration.
2. To verify Bernoullie's theorem.
3. To find coefficient of discharge for a venturimeter.
4. To determine coefficient of contraction, coefficient of velocity and coefficient of discharge for a given orifice.
5. Study of following equipment with a view to illustrate its constructional details, common problems and their remedies.
a. Centrifugal pumps.
b. Single acting reciprocating pumps.
c. Hydraulic jack.
6. Study of hydraulic circuit in general and its application on a surface grinder.
7. To study Pneumatic circuit of any available machine or of Pneumatic brake of a vehicle.
8. To find the velocity of the water flowing through pipe and also calculate the major head loss due to friction.

RECOMMENDED BOOKS
1. Hydraulics and hydraulic machines by Sarao and Khosla.
2. Hydraulics and hydraulic machines by DR Malhotra.
3. Fluid power and Tribology by Anil Aggarwal and ML Bhatia, scientific publishers (India), Jodhpur-342 001
4. Hydraulics and fluid mechanics by Dr. Jagdish Lal, Metropolitan Book Co. Pvt. Ltd.
5. Hydraulics by RS Khurmi
6. Hydraulics: Fluid mechanics and fluid machines by S. Ramamurthan, Dhanpat Rai & Sons, Delhi.

4.3 ELECTRICAL MACHINES

RATIONALE   L   T   P   3 – 3

This is a subject dealing with various types of electrical machines being employed in industries, power stations, domestic and commercial appliances etc. It is envisaged that after studying the subject, the students will gain competence in operation of such machines and give suggestions for improvement in their performance. The practical will enable students to perform various tests necessary for installation and commissioning of such machines.

DETAILED CONTENT

1. Three phase supply (08 hrs)

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 (08 hrs)

Principle of transformer, construction, voltage and current transformation. Methods of connection 3 phase transformers, current and voltage relationship, auto transformer and its uses, instruments transformers, voltage regulation and its significance, specifications of all types of transformers. Losses in a transformer.

3. DC Motor (08 hrs)

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 (06 hrs)

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 applications (simple problems)

5. Synchronous Motors (04 hrs)

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

6. Single Phase Motors (04 hrs)

Principles, construction, working, starting and applications of the following motors:

a) Induction motor

b) Universal motor.

c) Stepper motor

d) Servo motor

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 field winding and simultaneously to each phase winding in sequence.

OR

Measurement of the angular displacement of rotor of a slip ring induction motor or application of DC to stator winding in sequence and simultaneously to each phase of the rotor winding.

2. DC machines

2.1 Speed control of dc stunt motor (i) armature control method (ii) Field control method

2.2 Study of dc series motor will 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 ny nagrath and Kothari, Tata Mc Graw Hill, New Delhi.

4.4 INSTRUMENTATION AND PROCESS CONTROL

RATIONALE   L   T   P   3 – 2
This subject deals with the various instruments, their construction and working which control the various parameters and operations in an industry, supervisor employed in maintenance of electrical equipment machinery is required to diagnose faults, rectify them and test the local system for good performance. Thus there is the need of introducing diploma holders to the basic of instrumentation and control.

DETAILED CONTENTS
1. Measurements (06 hrs)
Importance of measurement, basic measuring systems, advantages and limitations of each measuring systems, generalized measurement system, single conditioning and display devices.
2. Transducers (08 hrs)
Theory, construction and use of various transducers (resistance inductance, capacitance, electromagnetic, piezo electric type)
3. Measurements of displacement and strain (08 hrs)
Displacement measuring devices wire wound potentiometer, LVDT, Strain gauges, different strain gauge such as inductance type, resistive type, wire and foil etc. Gauge factor materials and their selections, sources of errors and its compensations. Use of electrical strain gauge, strain gauge bridges and amplifiers.
4. Force and Torque measurement (10 hrs)
Different types of force measuring devices and their principles, load measurements by using elastic transducers and electrical strain gauge load cells, proving rings. Measurements of torque by brake, dynamometer and electrical strain gauge speed measurements, different method devices.
5. Pressure measurement (08 hrs)
Bourdon pressure gauges, electrical pressure pick ups and their principle, construction application and use of pressure cells.
6. Measurement of flow and temperature (08 hrs)

Basic principle of magnetic and ultrasonic flow meter, pressure thermometers, thermoelectric thermometers, resistance thermometer, thermocouple, thermisters and pyrometer, errors in temperature measurements in rapidly moving fluids.

7. Elements of Telemetry and data acquisition system.

8. Control system (16 hrs)

Basic elements of control system, open loop control system, closed loop control system, control system terminology manually controlled closed loop system, automatic control system, example of automatic control system, use of equivalent system for system analysis, linear system. Introduction to Lap lace Transform, Transfer function, Block diagram and reduction of block diagram, problems on block diagram, mason's formula, signal flow graph

LIST OF PRACTICALS

1. Measurement and plot of characteristics of optical devices like photodiodes, photocells.
2. Characteristics of light operated switch using photo transistor and LDR
3. Measurement of pressure using pressure cell
4. Measurement of temperature using themistor and thermocouples.
5. Measurement of load using load cell
6. Measurement of liner and angular displacement
7. Measurement of flow rate using flow sensors
8. Measurement of angular distance using liner variable capacitor
9. Measurement of strain using strain gauges

RECOMMENDED BOOKS

1. Electric measurement and instrumentation by Dr. Rajindra Prasad.
2. Electric and electronics measurement and instrumentation by AK Sawhney, Dhanpat Rai and Co. New Delhi.
3. Electronics instrumentation and measurement techniques by WD cooper, AD Helfrick Prentice hall of India Pvt. Ltd., New Delhi.
4. Electronics tests and measurements techniques by Rajiv Sapra.
5. Control system by Ogata.
6. Control system by Nagrath and Gopal

4.5 DIGITAL ELECTRONICS

RATIONALE   L   T   P   3 – 3

The objective of this subject is to enable the students to know the basic concepts of digital electronics and gain familiarity with the available IC chips, the student swill learn about number system logic gate, various codes parties, Boolean algebra mux and demux, flip flop counters shift registers. This will form a broad base for studying digital system design advanced microprocessors and future studies.

DETAILED CONTENT

1. Introduction (01 hrs)

a) Define digital and analog signals and systems, differences between analog and digital signals.

b) Need of digitalization 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 1s and 2s complement methods 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 party, error detection and correction using parity.

3. Logic gates

a) Brief idea of logic family like TTL, CMOS, ECL.

b) Logic gates, positive and negative logic, pulse waveform, symbols and truth table, pulsed operation of NOT,OR,AND,NAND,NOR,EX-OR,EX-NOR Gates

c) NAND and NOR as universal gates

4. Logic simplification

a) Rules and laws of Boolean algebra, logic expiration, Demogran's theorems, their proof.

b) Sum of products from (Mimterm) product of sum from (Maxterms) simplification of Boolean expressions with the help of rules and laws of Boolean algebra.

c) Karnaugh mapping techniques up to 4 variables and their application for simplification of Boolean expression

5. Arithmetic circuits (04 hrs)

a) Half adder full adder circuits and their operation

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

c) Basic idea of arithmetic and unit w.r.t IC74841

6. Multiplexer/de multiplexer, encoders, decoders (6 hrs)

a) Basic function, symbols and logic diagram of 8-input and 16-input Multiplexer/de multiplexer

b) Basic binary decoder, 4-line to 16-line decoder circuit.

c) BCD to decimal decoder BCD to 7 segment decoder/driver LED/LCD display

d) Encoder decimal to BCD priority encoder keyboard encoder

7. Latches and Flip-flops (6 hrs)

a) Latch Sr, Latch, d Latch flip flop difference latch and flip flop

b) S-R, D flip flop their operation using waveform and truth table, race around condition.

c) JK flip flop master slave and their operation using waveform and truth table

8. Counters (5 hrs)

a) Asynchronous counter, 4 bit Asynchronous counter, Asynchronous decade counters

b) Synchronous counters 4 bit Synchronous binary counters, Synchronous decade counters, counter applications

9. Shift registers (5 hrs)

a) Shift registers function, serial in serial out, serial in parallel out parallel in serial out, parallel out.

10. A/D and D/A converters (5 hrs)

a) D/A converters: performance characteristics of D/A converters, binary resister network and resistance ladder network methods of D/A converters and applications.

b) A/D converters performance characteristics of A/D converters successive approximation and parallel A/D converters.

11. Memories (4 hrs)

Memory organization classification of semi conductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM expansion of memory CCD memories programmable logic

devices programmable logic array (PLA) programmable array logic (PAL), familiarization with common ICs.

12. Introduction to microprocessor (11 hrs)
Evolution of micro processor, architecture of 8085 microprocessor, pin diagram, addressing mode, instruction set and simple programmes.

LIST OF PRACTICALS
1. Study of logic bread board 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. Very the operation of
a. Multiplexer using in IC
b. De-multiplexer using an IC
4. Verify the operation of BCD to 7 segment decoder using an IC
5. Verify the operation of SR JK, D-flip flop master slave JK FLIP-FLOP using IC
6. Verify the operation of SISO, PISO SIPO AND PIPO shift register
7. Study of decade counter
8. Testing of digital ICs using in IC tester.
9. Verify the operation of D/A converter
10. Verify the operation of A/D converter
11. Verify the writing and reading operation of RAM IC
12. Simple programs on 8085 microprocessor kit.

RECOMMENDED BOOKS
1. Digital electronics and application by Malvino Leach, Tata Mc Graw Hill, New Delhi
2. Digital logic design by Morris Mano Prentice Hall of India New Delhi.
3. Digital fundamental by Thomas Floyds Universal Book Stall.
4. Digital electronics by RP Jain Tata Mc Graw Hill New Delhi.
5. Digital electronics by KS Jamwal Dhanpat Rai & Co. New Delhi.
6. Digital electronics by BR Gupta Dhanpat Rai & Co. New Delhi.
7. Digital system Principal and Application by RJ Tocci, Prentice Hall of India, New Delhi.
8. Digital electronics by Rajaram V. Pren tics hall of India New Delhi
9. Digital organization by TC Bartee, Prentice Hall of India New Delhi
10. Microprocessors by Gaonkar.

WORKSHOP PRACTICE – IV

RATIONALE   L   T   P   3 – 3
Diploma holders are responsible for supervising production processes to achieve
production targets and for optional utilization of resources. For this purpose skills in
various machining processes, modern machining methods, processing of plastic, CNC
machining, tool jigs and fixtures is required to be imparted. Hence, the subject of
workshop practices.

LIST OF PRACTICALS
1. Produce a rectangular block by face milling and prepare a slot on one face with a
slotting cutter/side and face cutter.
2. Gear manufacturing by some indexing device on a milling machine and gear hobber,
inspection of gear.
3. Job on grinding using
-surface grinding
-cylindrical grinding
-centre less grinding
4. Milling cutter grinding on tool and cutter grinder.
5. Prepare a V-block to $\pm$ 0.2 mm accuracy on shaper machine.
6. Exercise on key way cutting and spline cutting.
7. Preparation of job through eccentric turning
8. Exercise on EDM for preparation of electrodes (male and female)

Note: The Workshop Superintendent will finalize the specific drawings of all the jobs in
the beginning of semester in consultant with staff.

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5.1 CNC MACHINES AND AUTOMATION

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LTP
3 - -

RATIONALE

Diploma holders are required to supervise and handle specialized machines and equipment like CNC machines. For this purpose, knowledge and skills about NC machines, part programming in NC machines and tooling for CNC machines are required to be imparted for enabling them to perform above functions. This subject aims at development to knowledge and skills about CNC machines, tools, equipment and use of high tech machines for increased productivity and quality.

DETAILED CONTENTS

1. **Introduction (6 hrs)**
- Basic concepts of NC, CNC & DNC, Adoption controls
- Advantages & Disadvantage of CNC Machines.
- Application of CNC Machines.
- Difference between conventional & CNC Machines.
- Profitable applications of CNC Machines.

2. **Construction of CNC Machines (12 hrs)**
- Machine control unit.
- NC Control
- PLC control, its advantages & disadvantages.
- Application aid Limitations of PLC machines.
- Axis designate of CNC machines.
- Special constructional requirement of CNC machines
- Slide ways, bolt screw & nut assembly
- Lubrication & Cooling of CNC machines.
- Spindle & spindly motors, axis drives motor.

- Swarf removal & safety provision of CNC machines
- Feedback mechanism in CNC machines.

3. **Tooling of CNC Machines (6 hrs)**
- Introduction.
- Various cutting tools for CNC machines.
- Work holding devices.
- Automatic tool changer.

4. **Control System (8 hrs)**
1. Open & Close loop control system
2. Fundamental problem in control: Accuracy, resolution, repeatability, instability, response & damping,
3. Type of position control:
I. Point to point
II. Straight line
III. Continuous.

5. **Part Programming (8 hrs)**
   Part Programming and basic concepts of part programming, NC words, part programming formats, simple programming for rational component, part programming using conned cycles, subroutines and do loops, tool off sets, cutter radius compensation and wear compensation.

6. **Common Problems in CNC Machines (4 hrs)**
   Common problems in mechanical, electrical, pneumatic, electronic and PC components of NC machines, diagnostic study of common problems and remedies, use of on-time fault finding diagnosis tools in CNC machines

7. **Industrial Automation (4 hrs)**
- What is automation?
- Need of automation.
- Different types of automation.
- Advantages/disadvantages of automation.

   RECOMMENDED BOOKS

1. CNC Machines -- Programming and Applications by M. Adithan and BS Pabla; New Age International (P) Ltd., Delhi
2. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata Mc Graw Hill, New Delhi
3. Numerical Control of Machines Tools by Yorem Korem and IB Uri; Khanna Publishers, New Delhi.
4. CNC Machine by Bharaj; Satya Publication, New Delhi.
5. Mechatronics by HMT, Banglore.

5.2 INDUSTRIAL MANAGEMENT

LTP
3 - -

RATIONALE
The knowledge of this subject is required of all diploma holders who wish to choose industry/field as this career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about safety and labour, industrial laws and management in different areas.

DETAILED CONTENTS
1. Principals of Management (2 hrs)
o Management, different functions of management: Planning organizing, coordination and control.
o Structure of and industrial organization.
o Functions of different departments Relationship between individual departments.
2. Human and Industrial Relations (4 hrs)
o Hunan Relations and performance in organization
o Understand self and other for effective behavior,
o Behavior modification techniques.
o Industrial relations and disputes.
o Relations with subordinates, peers and superiors.
o Characteristics of group behavior and trade unionism.
o Mob psychology
o Grievance, handling of grievances.
o Agitations, strikes, lockouts, picketing and gherao
o Labour welfare.
o Workers' participation in management.
3. Professional Ethics (4hrs)
o Concept of Ethics.
o Concept of professionalism
o Need for professional ethics.
o Code of professional ethics.
o Typical problems of professional engineers
o Professional bodies and their role.
4. Motivations (4 hrs)
o Factors determining motivation
o Characteristics of motivation.
121
o Method for improving motivation
o Incentives, pay, promotion, rewards.
o Job satisfaction and job enrichment.
5. Leadership (4hrs)
o Need for leadership
o Functions of a leder.
o Factors for accomplishing effective leadership

- o Manager as a leader
6. Human Resource Development (4 hrs)
- o Introduction
- o Staff development and career development.
- o Training strategies and methods.
7. Wage payment (4 hrs)
- o Introduction
- o Classification of wage payment scheme.
8. Labour, Industrial and Tax Laws (4 hrs)
- o Importance and necessity of industrial legistation.
- o Types of labour laws and disputes.
- o Brief description of the following Acts: The Factory Act 1948: Payment of Wages Act 1936: Workmen Compensation Act 1923: Industrial Dispute Act 1947: Employee' Stage Insurance Act, 1948: Provident Fund Act.
- o Various types of Taxes-Production Tax, Local Tax, Sales Tax, Excise Duty, Income Tax.
- o Labour Welfare scheme.
9. Accidents and Safety (4 hrs)
- o Classification of accidents: according to nature of unjuries i.e. fatal, temporary: according to event and according to place.
- o Cause of accidents-psychological, physiological and other industrial hazards.
- o Effects of accidents
- o Accidents-prone workers.
- o Action to be taken in case of accident with machines, electric shock, road accident, fires and erection and construction accidents.
- o Safety consciousness &publicity.
- o Safety procedures.
- o Safety measures-Do's and don'ts & good housekeeping (58)
- o Safety measures during executions of Electrical Engineering works.
10. Environment Management (4 hrs)
Basics of environmental pollution, various management techniques for control of environmental pollution, various control acts for air, water, solid waste and noise. 122
11. Materials Management (4 hrs)
Material in industry, inventory control model, ABC Analysis, Safety stock, Reorder, level, Economic ordering quantity, Stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex, Material handling, Manual lifting, Hoist, Cranes, Conveyors, Trucks, Fork Tructs.
12. Financial Management (3 Hrs)
Important, ledger, journal, Profit and Loss Account, Balance Sheet, Interpretation of Statements, Ration Analysis, Project financing, Project appraisal, return on investments.
13. Marketing and sales (3 Hrs)
Sellets and Buyers markets, Marketing, Sales Market conditions, monopoly, oligraphy, perfect competition, Cost Elements of Cost, Contribution, Break even analysis, Budgets, Pricing Policies.

RECOMMENDED BOOKS

1. Industrial Engineering and Management by TR Banga.
2. Industrial Engineering and Management by OP Khanna, Dhanpat Rai Publications, Delhi
3. Industrial Management by VK Sharma, OP Harkut.
4. Sharma BR, Environmental and Pollution Awareness: Satya Prakashan New Delhi.
5. Thakur Kailash, Environment Protection Law & Policy in India: Deep & Deep Publication, New Delhi
6. Handbook of Small Scale Industry by P.M. Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Principles of Management by Philip Kotlet, TEE Publication.
9. Industrial Organization and Management by Tara Chand, New Chand and Brothers, Roorkee.

5.3 POWER ELECTRONICES

LTP
4 - 2

RATIONALE

Diploma holders in Electronics and Instrumentation and Control are required to handle a wide
variety of power electronic equipment used in process control Industry. This subject will provide
the student basic understanding of the principles of their working. The practical training will further
re-inforce the knowledge and skill of the students.

DETAILED CONTENTS

1. **Introduction to thyristors and other power electronics devices**
   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 idea about the selection of Heat sink for thyristors.
   i. Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.

   (12 hrs)

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 tap rectifier.

   (06 hrs)

3. **Inverters, Choppers, Dual Converters and 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

   (12   hrs)

4. **Tyristorised 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.

(08 hrs)

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

(04 hrs)

LIST OF PRACTICALS
1. To plot VI Characteristic of an SCR
2. To plot VI Characteristic of an TRIAC
3. To plot VI Characteristic of an UJT
4. To plot VI Characteristic of an DIAC
5. Study of UJT relaxation oscillator. And observe I/P and O/P wave forms
6. Observation of wave shape of voltage of relevant point of single-phase half wave controlled rectifier and effect of change of firing angle
7. Observation of wave shapes of voltage of relevant point of single phase full wave controlled rectifier and effect of change of firing angle
8. Observation of wave shapes and measurement of voltage at relevant points in TRIAC based
AC phase control circuit for
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.C. Bhimbhrah, Khanna Publishers, New Delhi
3. Power Electronics by M.C. Berde, Khanna Publisher 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 by S Rama Reddy, Narosa Publishing House Pvt. Ltd. New Delhi

7. Power Electronics by Sugandhi And Sigandhi
8. Power Electronics-Principles and Applications by J. Michael Jacob, Vikas Publishing House, New Delhi.

5.4 MICROPROCESSORS AND APPLICATIONS

LTP
4 - 3

RATIONALE

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

DETAILED CONTENTS   (04 hrs)

1. **Introduction**
Microprocessors – evaluation, importance and application

2. **Architecture of Microprocessor – 8085**   (16 hrs)
a. Concept of bus and bus organization
b. Functional block diagram and function of each block
c. Pin details of 8085 and related signals
d. De-multiplexing of address/data bus and memory/IO read/write control signals

3. **Introduction Set for Intel 8085**   (16 hrs)
a. Instruction and data format – opcode and operand and is word size
b. Instruction cycle, machine cycle, T-states, fetch cycle, and execute cycle
c. Different addressing modes.
d. Status flags and their importance
e. Data transfer, arithmetic and logical operation, branding and machine control instructions.
f. Use of stack and subroutines
g. Assembly language programming

4. **Interfacing and Data Transfer Schemes**   (08 hrs)
a. Memory mapped I/O and I/O mapped I/O schemes
b. Interrupts of 8085
c. Programmable date transfer, DMA data transfer and interrupt driven data transfer schemes with their applications.

5. **Peripheral Devices** (12 hrs)

Detailed study of the following
a. 8255 PPI
b. 8253 PIT
c. 8257 DMA Controllers
d. 8253 PIC
e. 8279 Programmable KB/Display interface
f. 8251 Communication interface adapter

6. **Introduction to other** (08 hrs)

8-bit Microprocessor like Z-80, 6800 and their comparison with 8085

LIST OF PRACTICALS

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

RECOMMENDED BOOKS

1. Microprocessor Architecture, Programming Applications with 8085 by RS Gaonkar**.**
2. Microprocessor and Application by B Ram.

5.5   ROBOTICS TECHNOLOGY

LTP
4 - -

Introduction Robot and Its Classification, robot physical configurations, Basic robot motions robot anatomy.   (5 hrs)

Manipulators: Robot manipulator Drives, general structure of robot, functional parameters, specifications of robot, advantages and disadvantages of various kinematics structure, servo and non servo manipulator.   (5 hrs)

Actuators and transmissions system: Pneumatic, hydraulic and electrical actuators and their character ticks and control system.   (5 hrs)

Feed back systems and sensors: encoders and other feed back systems, vision ranging systems textile sensors.   (5 hrs)

Programming language: Description of VAN, RAII and other languages. (5 hrs)

Artificial intelligence: Logged Locomotion, export system, concept of spatial description and transformation, manipulator, Kinematics; Inverse manipulator, Kinematics jacobians; velocities and static forces; manipulator dynamics, position control of manipulators.
                                                                                                                         (8 hrs)

Air Cylinders: Their design and mounting, pneumatic and hydraulic valves, flow control valves metering valves, direction control valves, hydraulic servo system, pneumatic safety and remote control circuits.   (8 hrs)

Industrial Applications: of robots for material transfer, machine loading/unloading, welding, assembly and spray painting operations, Assembly automation, automatic packaging and automatic inspection   (7 hrs)

RECOMMENDED BOOKS:

1. Introduction of ROBOTICS by CRAIG.
2. Robotics Engineering by Dr. Surender Kumar, Dr.S.K.Mukherjee.
3. ROBOT Engineering and integrated approach by Richard D. Klafter.
4. ROBOTIC Technology by james G. Kermas.

5.6 MACHINE DESIGN & DRAWING

LTP

- - 6

RATIONALE

A diploma holder in this course is required to assist in the design and development of prototype and other equipments. For this, it is essential, that he is made conversant with the principles related to design of components and application of these principles for designing and prepare drawing of the same and hence this subject.

DETAILED CONTENT

1. Introduction

(14 hrs)

o   Design – Definition, types of designs necessity of design.
o   Comparison of designed and undersigned work.
o   Design procedure.
o   Practical examples related with design procedure
o   Characteristics of a good designer
o   Characteristics of environment required for a designer.
o   Design terminology: Stress, strain, factor of safety, factors affecting factor of safety, stress concentration, method to reduce stress concentration, fatigue, endurance limit.
o   General design considerations.
o   Code and standards.

2. Design of keys and shafts.

o   Design of keys: Types of keys, materials of keys, and functions of keys design of keys.   (14 hrs)
o   Design of shafts: Types of shaft, type of loading on shafts, shaft materials, Effect of keyway on shaft strength, Design of shafts under various loading.

3. Design of Joint   (14 hrs)

o   Types of joints: Temporary and permanent, utility of joints.
o   Permanent joints.
o   Welded joints.
o   Types of welded joints, strength of parallel and transverse fillet welds
o   Strength of combined parallel and transverse welds.
o   Axially loaded welded joints.
o   Riveted joints: Rivet materials, rivet heads, leak proofing of riveted joints- caulking and fullering
o   Different modes of rivet joint failure
o   Design of riveted joints: Lap, butt, diamond (Lozenzo)
o   Design of boiler joints i.e. circumferential and longitudinal boiler joints.

4. Design of Couplings

                                                                                      (14 hrs)

o   Necessity of a coupling, advantages of a coupling and types of couplings, design of flanged couplings

5. Assembly Drawing of the following   (18 hrs)

o   Tool Post
o   Bench-vise
o   Safety Value

6. **Cams** (12 hrs)
- o Cam profile nomenclature
- o Types of followers
- o Motions of followers
- o To draw cams with different followers with different motions
7. **Gears** (10 hrs)
- o Types of gears
- o Nomenclature of gears.
- o Conventional representation of gears.
- o Draw profile of spar gear.

RECOMMENDED BOOKS

1. Machine Design by Panday and Shah
2. Machine Design by Sharma and Aggarwal; Katson Publishing house, Ludhiana.
3. Machine Design by R.S. Khurmi & JK Gupta; Eurasia Publishing Housr (Pvt.) Ltd.
4. Machine Design by element by VB Bhandari; Tata Mc Graw Hill; Delhi
5. Engineering Design by George Dieter; Tata Mc Graw Hill; Delhi
6. Mechanical Engineering Design by Joseph Edwerd Shigley, Mc Graw Hill.
7. Machine Design by Sadhu Singh
8. Machine Design by GP Nagpal
9. Machine Design Data Book

5.7 Robotics Mechatronics Laboratory (Experiments)

L T P
- - 2

Objective:- Understanding the Multidisciplinary Engineering concepts of Machine Automation as well as interfacing between the various subsystems and components using actual controllers and virtual laboratories.

1. Building of Pneumatic Circuits and Hydraulic circuits for automated systems using cross section simulation of the components.
2. Study of position, velocity and Torque Control of DC Servo Motor using actual Programmable Motion Controller and XY Position table.
3. Study of Point to point control, linear and circular Interpolation using actual Programmable Motion Controller and XY Position table and its simulation.
4. Study of 3D Robotic Simulation, Pick and Place Robot, in manual mode (Teach Pendant) and thru programming (Point, Linear and Circular interpolation)
5. Programmable Logic controller programming in ladder logic and functional block Diagram (FBD), interfacing of actual PLC with non servo motor, sensor using actual PLC and simulation of the same.
6. Study of Characteristics of Actuating systems used in Robotics.

6.1 Installation, Testing & Maintenance

L T P
3 - 4

RATIONALE

A diploma engineer comes across installation, maintenance and testing of various Machines and equipments in industries. The layout of different machines, their foundations is an important phenomenon of an industry. HE should know the various methods of testing & maintenance. This subject sill enable the diploma holders to deal with such aspects.

DETAILED CONTENTS
1. Introduction
(4 hrs)

Necessity of testing, repair and maintenance, Economic aspects, manpower planning and materials management, Fits and tolerance – common fits and tolerance used for various machine parts.

2. Execution and commissioning of machines (Installation)
(4 hrs)

Location ,layout and positioning of machines, Foundation-type of foundation, foundation plan, erection and leveling, grouping, vibration damping, vibration isolation-methods of isolation.

3. Inspection, Servicing, Repair & Overhauling of machines and equipments
(8 hrs)

Inspection of various machines and equipments, Servicing of various machines and equipments, Repair of various machines and equipments, Overhauling and various machines and equipment, Recalibration of various Measuring instruments, testing the speed of machines, accuracy of machines, alignment and performance of machines.

4. Maintenance, Planning & stages of Maintenance
(6 hrs)

Maintenance Planning, Various stages of Maintenance.

5. Reliability , availability and Maintainability
(5 hrs)

6. Overhauling
(6 hrs)

Frequent failure of common parts, their causes & remedial measures, Maintenance schedule, Parts which require frequent maintenance such as belts, coupling, nut, bolts, their repair & Maintenance to avoid downtime.

7. Maintenance
   (10 hrs)

Meaning to Maintenance, advantages & disadvantages, types of Maintenance, Preventive, Predictive & break down maintenance, Maintenance organization

- Centralized maintenance and decentralized maintenance, computerization of maintenance.

8. Storage of Parts
- Storage of parts used frequently for replacement and parts which are not normally available in local market.
- History cards to different machines.
- Machine repairs / replacements decision

LIST OF PRACTICALS

1. Preparation of preventive maintenance check
2. Condition, monitoring by Non Destructive Testing
3. Case study on trouble free maintenance
4. Project on maintenance of utility equipment
5. List compressor, pump , driers and actuator type valves.
6. Equipment/machine leveling and alignment.
7. Maintenance of material handling equipment – pull block, hand operated crains , fork life, hydraulic jack, mobile Crain and inches.
8. Use of lubrication equipment like oil gun, grease gun.
9. Removing all the lubricants, draining & replacing and fill with fresh lubricants.
10. Reconditioning of machine parts
11. Visit to maintenance department of industry and prepare a report.

RECOMMENDED BOOKS

1. Industrial Maintenance by H.P. Garg and published by S.Chand & Co.
2. Plant Maintenance Engg. by R.K. Jain Pulished by Khanna publishers.
3. Installation, Servicing and Maintenance by S.N. Bhattacharya published by S Chand & Co.
4. Installation ,Maintenance , Servicing by A.R. Basu published by M Datta & Co.
5. Maintenance Engg. & Management by R.P.Mishra & K Pathak Published by Prentice Hall of India Pvt. Ltd. New Delhi.

6.2 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L T P
3 - -

RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resources. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/vocational stream students to start their own small scale business/enterprise. Based on the board competencies listed above, following detailed contents are arrived to develop the stated competencies.

DETAILED CONTENTS

(1) Entrepreneurship (4hrs)

2.1.Concept/Meaning

2.2.Need

2.3.Competencies/qualities of an entrepreneur

(2) Entrepreneurial Support System (6 hrs)

2.1.District Industry Centres (DIC's)

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) (6 hrs)

3.1 How to start a small scale industry

3.2 Procedures for registration of small scale industry

3.3 List of items reserved fro 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 (6 hrs)

4.1 Preliminary Project Report

4.2 Techno-Economic feasibility report

4.3 Project Viability

(5) Managerial Aspects of small business (8 hrs)

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

5.2 Operational aspects of production

5.3 Inventory Management

5.4 Basic Principles of financial management

5.5 Marketing Techniques

5.6 Personal Management

5.7 Importance of Communication in business

(6) Legal Aspects of small business (6 hrs)

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 (6 hrs)

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 (6 hrs)

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

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathor and Dr. JS Saini; Aa[ga 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 Kaiash, Environmental Protection Law and policy in India; Deep and Deep Publications, New Delhi
6. Handbook of small scale Industry by PM Bhandari

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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

6.3 CAD/CAM AND FMS

L T P
4 - -

1. **Introduction:-** CAD/CAM contents and tools; history of CAD/CAM tools, industrial look at CAD/CAM. (5 hrs)

2. **CAD/CAM Hardware: Introduction;** types of system; CAD/CAM system evaluation criteria; input devices; output devices, hardware integration and networking; hardware trents.

   (5 hrs)

3. **CAD/CAM Software:** Introduction; Graphics standards; basic definition and modes of graphic operations; user interface; software modules. Modeling and viewing; software documentation; software development; efficient use of CAD/CAM software; software trends. (8 hrs)

4. **Microprocessor based CAD/CAM:-** Introduction; several features, system implementation; hardware components and configuration; micro-based CAD software; file translation; operating system; mechanical applications; micro-CAD trends; product distribution trends.
   (8 hrs)

5. **Group Technology (GT):** Part families; part classification and coding system: Group technology machine cells: Advantages of GT. (8 hrs)

6. **Computer Aided Process Planning:** Introduction and benefits of CAPP. Types of CAPP systems, machinability data selection system in CAPP.

7. **Flexinle Manufacturing System (FMS) AND Computer Integrated manufacturing System:** FMS and its advantages, components of a FMS system. Introduction to CIMS. (6 hrs)

BOOKS

1. CAD/CAM by Groover & Zimmer, PHI Publications.
2. Computer Intergraded Design and Manufacturing by DD Bedworth, & PM Wolfe, Tata Mc Graw Hill Pub. Co.
3. CAD/CAM-Theory and practice by ZEID ibraham, TAta Mc Grw Hill Pub Co.

6.4 MICRO CONTROLLERS AND PLCs

L T P
4 - -

RATIONALE

In industry, many manufacturing processes demand a sequence of operation which are to be performed repetitively. Early automation systems were mechanical in design timing and sequencing being effected by gears and cam. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design, modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum. Micro-controllers have assumed a great significance in the electronic and consumer goods industry and are very vital field

DETAILED CONTENTS

1. **Microcontroller Series (MCS) – 51 Overview**   **(8 hrs)**
   - Pin details
   - I/O Port structure
   - Memory Organization
   - Special Function Registers (SFRS)
   - External Memory

2. **Instruction Set; Addressing Modes, Instruction Types**   **(08 hrs)**
   - Timer operation
   - Serial Port operation
   - Interrupts

3. **Assembly language programming**   **(08 hrs)**
   - **Assembler directives**
   - **Assembler operation**

4. **Design and interface**   **(08 hrs)**
   Examples like keypad interface, 7 – segment interface etc.

5. **Introduction to PLCs (06 hrs)**
   - Architectural details – Processor
   - Memory Structure, I/O Structure
   - Programming terminal, Power Supply

6. **Working of PLC** (06 hrs)

Basic principle, response time, effects of response time, relay replacing basic instructions, PLC registers and program scan

7. **Instruction Set** (04 hrs)

Latching

Counter, timers one shet, shift register, math, Boolean instructions

8. **Ladder diagram Programming** (04 hrs)

9. **Applications of PLCs** (04 hrs)

Industry with case studies from electronics industry

RECOMMENDED BOOKS

1. The 8051 Micro Controller by I Scot Machenzie, Prentice Hall International, London
2. The 8051 Micro Controllers Architecture, Programming and applications by Ayala; Penram International
3. Process Control Instrumentation Technology by Johnson, Curtis; EEE Edition, Prentive Hall of India New Delhi
4. Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA

L T P
4 - 3

RATIONALE

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

DETAILED CONTENTS

1. Basics of Measurements

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

(04 hrs)

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 deagram of multimeter and measurement of voltage, current and resistance using multimeter. Specification of multimeter and their applications. Limitations with regard to frequency and input impedance.

(08 hrs)

3. Electronc Voltmeter

Advantages over conventional multimeter for volt measurement with respect or input impedance and sensitivity. Principles of voltage, current and resistance measurement (Block Diagram only) Specifications of electronics voltmeter

(06 hrs)

4. AC Milli Voltmeter

Types of Ac milli voltmeters and their block diagram description typical specifications and their significance.

(04 hrs)

5. Cathode Ray Oscilloscope

Construction and working in different blocks used in CRT. Time base operation and need for blanking during flyback, synchronization block diagram description of a basis CRO and triggered sweep oscilloscope, front panel controls. Specification of CRO and their explanation Measurement of current, voltage, frequency, time period and phase using CRO. CRO Probes. Special features of dual beam, dual trace, delay sweep. Digital storage oscilloscope: block diagram and working principle

(05 hrs)

6. Signal 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 analyzer

(06 hrs

7. Empedance Bridges and Q Meters

Wheat stone bridge AC bridges: Maxwell's induction bridge, Hay's bridge, De Sauty's Bridge schering bridge and Andeerson bridge block diagram description of laboratory type RCL bridge, specifications of RLC bridge Block diagram and working principle of Q meter

(12 hrs)

8. Digital Instruments

Comparison of analog and digital instruments working principle of ramp, dual slope and integration type digital voltmeter block diagram and working of a digital multimeter measurement of time interval, time period and frequency using universal counter/frequency counter Working principle of logic probe, logic pulser, logic analyzer, logic comparator signature analyzer and logic analyzer

(08 hrs)

List of Practical

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

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 Parkashan, New Delhi

6.6 AUTO CAD LAB

L T P
- - 3

Introduction to CAD

- Introduction
- Elements of Auto CAD SCREEN
- Basic steps to stare Auto CAD

Draw Commands

- Line, Circle, Ellipse, Plane, Polygon, Rectangle and other commands

Visualization Techniques

- Actual and apparent view concept
- Zoom with various options
- Pan, Arial View

Edit Commands

- Object selection methods
- Copy, Mirror, Array commands
- Move, Rotate, Scale commands
- Trim, Break, Fillet, Chamfer commands
- Group command
- Edit with help of GRIPS

Objects properties

- Transparent layer concept
- Line type command
- Change properties and match properties

Dimensioning

- Elements of dimensioning
- Linear, Radial, diametrical, Aligned dimensioning methods
- Use Tolerance and surface finishing symbols

Use of Blocks

- Block Wblock, Insert command
- Defining attributes
- Use of External reference

Inquiry Commands

- Area, Distance, List, Dblist commands
- Miscellaneous commands like setting preference etc.

Hard Copy output

- Plot, Print preview Command

Isometric Drawings

- Isoplane Isonap command
- Isocircle commands.

6.7 PROJECT WORK

L T P
- - 8

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The Students have various aptitudes and strength. Project work, therefore, should match the strength of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignment. 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 for a group. The students should identify or given project assignment at least two to three month in advance. The project work identified in collaboration with industry may be preferred.

Each teacher is expected to guide the project work of 5-6 students.

-Projects related to increasing productivity
-Projects related to quality assurance
-Projects related to estimation and economics of production
-Projects connected with repair and maintenance of plant and equipment
-Projects related to identification of raw material thereby reducing the wastage
-Any other related problems of interest of host industry

A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max. Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1	Selection of Project Assignment	10	10	8	6	4	2
2	Planning and execution of considerations	10	10	8	6	4	2
3	Quality of performance	20	20	16	12	8	4
4	Providing solution of the problems or production of final product	20	20	16	12	8	4
5	Sense of responsibility	10	10	8	6	4	2
6	Self expression/communication skills	5	5	4	3	2	1
7	Interpersonal skills/human relations	5	5	4	3	2	1
8	Report writing skills	10	10	8	6	4	2
9	Viva voce	10	10	8	6	4	2
	Total	**100**	**100**	**80**	**60**	**40**	**20**

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The overall grading of the practical training shall be made as per following table:

Sr.No.	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 <>65	Very good
iii)	64<>50	Good
iv)	49<>40	Fair
v)	Less than 40	Poor

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance of undergoing 8-10 weeks of project oriented professional training in the same industry and re-evaluated before being disqualified and declared "not eligible to receive diploma" . It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

Important Notes
1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.
2. The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.
3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.
4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific near by industries are approached for instituting such awards.
The teachers are free to evolve another criteria of assessment, depending upon the type of project work.
It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading industrial organizations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of institute. It would be better if specific industries are approached for instituting such awards.