



**MAHARAJA AGRASEN
HIMALAYAN GARHWAL UNIVERSITY
UTTARAKHAND**

**POLYTECHNIC
(DIPLOMA IN ELECTRICAL ENGINEERING)**

REVISED SYLLABUS PREPARED BY

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Registrar

Maharaja Agrasen Himalayan Garhwal University

**RECOMMENDED BY BOARD OF STUDIES DEPARTMENT OF
ENGINEERING AND TECHNOLOGY**

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**APPROVED BY
ACADEMIC COUNCIL, MAHARAJA AGRASEN HIMALAYAN GARHWAL
UNIVERSITY**

W.E.F. – ACADEMIC SESSION 2022-23

Diploma 1st Sem.

Subject Code	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
		Period/Weeks				Theory	Practical	Theory		Practical			
						Max Marks	Max Marks	Max Marks	Hrs. : Min	Max Marks	Hrs. : Min		
DA101	English & Communication Skills -1st	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA102	Applied Mathematics 1st	3	0	0	3	50	0	100	2:15	0	0	150	3
DA103	Applied Physics 1st	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA104	Applied Chemistry 1st	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA105	Basics of Information Technology	3	0	2	5	10	10	50	2:15	30	3:00	100	4
DA106	Engineering Drawing-1st	0	0	6	6	0	50	100	0:00	0	9:00	150	3
DAP107	General Workshop Practice 1st	0	0	6	6	0	50	0	0	50	9:00	100	3
Disc/Game/Sca/Ncc/NSS		0	0	4	4	0	0	0	0	25	6:00	25	2
Industrial Exposure(Assestment at Inst. Level)		0	0	0	0	0	0	0	0	25	0	25	0
Total		15		24	39	120	200	400	11:15	280	36:00:00	1000	27

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 10 Hrs


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Diploma 2nd Sem.

Subject Code	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
		Period/Weeks				Theory	Practical	Theory		Practical			
						Max Marks	Max Marks	Max Marks	Hrs. : Min	Max Marks	Hrs. : Min		
DA201	English & Communication Skills - 2nd	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA202	Applied Mathematics 2nd	3	0	0	3	50	0	100	2:15	0	0:00	150	3
DA203	Applied Physics 2nd	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA204	Applied Chemistry 2nd	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA205	Environmental Science	3	0	0	3	30	0	70	2:15	0	0:00	100	3
DA206	Engineering Drawing-2nd	0	0	6	6	0	50	100	0:00	0	9:00	150	3
DAP207	General Workshop Practice 2nd	0	0	6	6	0	50	0	0	50	9:00	100	3
Disc/Game/Sca/Ncc/NSS		0	0	6	6	0	0	0	0	25	9:00	25	3
Industrial Exposure(Assesment at Inst. Level)		0	0	0	0	0	0	0	0	25	0	25	0
Total		15	0	24	39	140	190	420	11:15	250	36:00:00	1000	27

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 10 Hrs

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Diploma Elect. 3rd Sem.

Subject Code	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
		Period/Weeks				Theory	Practical	Theory		Practical			
						Max Marks	Max Marks	Max Marks	Hrs. : Min	Max Marks	Hrs. : Min		
EE301	Fundamental of Electrical Engineering	3	0	2	5	30	20	70	2:15	30	3:00	150	4
EE302	Electrical & Electronics Engineering Materials	3	0	2	5	30	20	70	2:15	30	3:00	150	4
EE303	Electronic Devices & Circuit	3	0	4	7	30	20	70	2:15	30	6:00	150	5
EE304	Fundamental of Mechanical & Civil Engineering	3	0	2	5	30	20	70	2:15	30	3:00	150	4
EE305	Electrical Measurment and Measuring Instruments	3	0	4	7	30	20	70	2:15	30	6:00	150	5
EEP306	Electrical Workshop Practice	0	0	6	6	0	50	0	0:00	150	9:00	200	3
General Proficiency#		0	0	4	4	0	25	0	0:00	25	6:00	50	2
Total		15	0	24	39	150	175	350	11:15	325	36:00:00	1000	27

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 20 Hrs


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Diploma Elect. 4th Sem.

Subject Code	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
						Theory	Practical	Theory		Practical			
						Max Marks	Max Marks	Max Marks	Hrs. : Min	Max Marks	Hrs. : Min		
EEP401	Electrical Engineering Design & Drawing	0	0	6	6	0	50	0	0:00	150	9:00	200	3
EE402	DC Machines & Transformers	3	0	2	5	30	20	70	2:15	30	3:00	150	4
EE403	Digital Electronics & Microprocessors	3	0	4	7	30	20	70	2:15	30	6:00	150	5
EE404	Generation, Transmission & Distribution of Electrical Power	3	0	2	5	30	20	70	2:15	30	3:00	150	4
EE405	Industrial Instrumenation & Control	3	0	4	7	30	20	70	2:15	30	6:00	150	5
EE406	Estimeted & Coasting in Electrical Engineering	4	0	0	4	50	0	100	3:00	0	0:00	150	4
Industrial Training		0	0	0	0	0	0	0	0:00	0	0:00	0	0
General Proficiency#		0	0	4	4	0	25	0	0:00	25	3:00	50	2
Total		16	0	22	38	170	155	380	12:00	295	30:00:00	1000	27

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 20 Hrs

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Diploma Elect. 5th Sem.

Subject Code	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
						Theory	Practical	Theory		Practical			
						Max Marks	Max Marks	Max Marks	Hrs. : Min	Max Marks	Hrs. : Min		
EE501	Industrial Training	0	0	0	0	0	20	0	0:00	30	0:00	50	0
EE502	A.C Machines	3	0	4	7	30	20	70	2:15	30	6:00	150	5
EE503	Sub Station Switch Gear & Protection	3	0	2	5	30	20	70	2:15	30	3:00	150	4
EE504	Installation & Maintenance Of Electrical Equipments	3	0	4	7	30	20	70	2:15	30	6:00	150	5
EE505	Energy Management	3	0	0	3	30	0	70	2:15	0	0:00	100	3
EE506	Industrial Electronics & Control of Drieves	3	0	3	6	30	20	70	2:15	30	3:00	150	6
EE507	EDM	3	0	0	3	50	0	150	2:15	0	0:00	200	3
General Proficiency#		0	0	4	4		25	0	0:00	25	6:00	50	2
Total		18	0	17	35	200	125	500	13:30	175	24:00:00	1000	28

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 20 Hrs

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Diploma Elect. 6th Sem.

Subject Code	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
		Period/Weeks				Theory	Practical	Theory		Practical			
						Max Marks	Max Marks	Max Marks	Hrs. : Min	Max Marks	Hrs. : Min		
EE601	Utilization of Electrical energy	3	0	2	5	30	20	70	2:15	30	3:00	150	4
EE602	Micro Hydel & Non conventional energy resources	3	0	2	5	30	20	70	2:15	30	3:00	150	4
EE603	PLC & Micro controllers	3	0	2	5	30	20	70	2:15	30	3:00	150	4
EE604	Electrical installation in buildings	3	0	0	3	50	0	100	2:15	0	0:00	150	3
EE605	Application of computer software in electrical engineering	3	0	2	5	20	30	30	2:15	70	3:00	150	4
EE606	Employable skills	0	0	3	3	0	30	0	0:00	70	4:30	100	6
EEPR607	Project work	0	0	2	2	0	30	0	0:00	70	3:00	100	1
General Proficiency#		0	0	4	4		25	0	0:00	25	6:00	50	2
Total		15	0	17	32	160	175	340	11:15	325	25:00:00	1000	28

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 20 Hrs

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FIRST SEMESTER

DA101 ENGLISH AND COMMUNICATION SKILLS – I

	L	T	P
Periods/Week	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 achieve results and create successful organizations. The goal of the Communicating Skills 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. The objectives of this subject are understanding how communication works, gaining active listening and responding skills, understanding the importance of body language, acquiring different strategies of reading texts and increasing confidence by providing opportunities for oral and written expressions

DETAILED CONTENTS

1. COMMUNICATION SKILLS (12 Periods)
 - 1.1 Introduction and Process of Communication
 - 1.2 Objectives of Communication
 - 1.3 Verbal and Non-verbal Communication
 - 1.4 Process of Communication
 - 1.5 Barriers to Communication; Overcoming Strategies
 - 1.6 Listening and Speaking Skills and Sub-Skills
(All topics should be in detail)
2. GRAMMAR AND USAGE (08 Periods)
 - 2.1 Syntax (Parts of speech)
3. WRITING SKILLS (10 Periods)
 - 3.1 Writing Paragraphs
 - 3.2 Picture Composition
 - 3.3 Developing writing skills based on some audio-visual stimulus

    
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4. READING COMPREHENSION SKILLS (10 Periods)

Unseen comprehension passages (at least 3 passages of literary, scientific, data interpretation).

5. FACETS OF LITERATURE (24 Periods)

5.1 Fiction

5.1.1 Homecoming – R.N. Tagore

5.1.2 The Selfish Giant - Oscar Wilde

5.1.3 The Missing Mail – R K Laxman

5.2 Prose

5.2.1 Of Studies – Francis Bacon

5.2.2 Art of Conversation – Richard Steel

5.2.3 Democracy – Dr. Radhakrishnan

5.3 Poems

5.3.1 Ozymandias – P.B. Shelley

5.3.2 Daffodils – William Wordsworth

5.3.3 Stopping by Woods on a Snowy Evening – Robert Frost

LIST OF PRACTICALS

(Note: The following contents are only for practice. They should not be included in the final theory examination)

DEVELOPING ORAL COMMUNICATION SKILLS

- Greeting, Starting a Conversation
- Introducing Oneself
- Introducing Others
- Leave Taking
- Thanking, Wishing Well
- Talking about Oneself
- Talking about Likes and Dislikes
- Mock Interview



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LIST OF REFERENCE BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. High School English Grammar and Composition by Wren and Martin; S. Chand & Company Ltd., Delhi.
3. Communication Techniques and Skills by R. K. Chadha; Dhan pat Rai Publications, New Delhi.


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DA102 APPLIED MATHEMATICS - I

	L	T	P
Periods/Week	3	-	-

RATIONALE

Applied Mathematics forms the backbone of engineering students. The curriculum of mathematics has undergone changes from time to time in accordance with growth of subject. Diploma in Engineering is a launching stage where the students learn the basics of engineering. The revised syllabus has been designed keeping in view the emerging needs of all categories of students. Great emphasis has been laid on application of various contents like algebra, complex numbers, trigonometry and coordinate geometry. This course will develop analytical abilities to make exact calculations and provide continuing educational base to the students.

Note: - Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Algebra

(30 Periods)

- 1.1 Series: A.P. and G.P., n th term of AP and GP, sum to n th term, Value of nP_r and nC_r .
- 1.2 Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof)
- 1.3 Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors only)
- 1.4 Determinants and Matrices – expansion of determinants (up to third order), properties of determinants, solution of equations (up to 3 unknowns) by Cramer's rule. Definition of matrix, addition, subtraction, multiplication of matrices (up to third order), minors and co-factors, inverse of a matrix by adjoint method (up to second order)
- 1.5 Scalar and vector product of two /three vectors

2. Trigonometry

(20 Periods)

Review of ratios of some standard angles (0,30,45,60,90 degrees), T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).


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3. Complex numbers (10 Periods)



Definition of complex numbers, real and imaginary parts of a complex number, polar and Cartesian form and their inter-conversion, conjugate of a complex number, modulus and argument of a complex number, addition, subtraction, multiplication and division of a complex number. De-Moivre's Theorem (simple problems)

4. Co-ordinate Geometry (20 Periods)

- 4.1 Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines, perpendicular distance formula (without proof)
- 4.2 General equation of a circle and its characteristics. To find the equation of a circle, given:
- * Centre and radius
 - * Three points lying on it
 - * Coordinates of end points of a diameter
- 4.3 Equations of conics (ellipse, parabola and hyperbola), simple problems related to engineering (standard forms only)

RECOMMENDED BOOKS

1. Applied Mathematics by Dr. RD Sharma, Dhan pat Rai Publications, Delhi
2. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
3. Applied Mathematics-I (Hindi) by Dr. Kailash Sinha, Nav Bharat Publication, Meerut.
4. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
5. Applied Mathematics, Vol. I & II by SS Sabharwal and Sunita Jain, Eagle Parkashan, Jalandhar

 
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DA103 APPLIED PHYSICS – I

	L	T	P
Periods/Week	3	-	2

RATIONALE

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

Note: - Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Units and Dimensions (8 Periods)

- 1.1 Physical quantities
- 1.2 Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units)
- 1.3 Dimensions and dimensional formulae of physical quantities
- 1.4 Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis
- 1.5 Error in measurement, random and systematic errors, types of errors, propagation of errors, significant figures

2. Force and Motion (12 Periods)

- 2.1 Concept of Scalar and Vector quantities – examples, types of vectors.
- 2.2 Resolution and Composition of vectors, Vector multiplication (scalar product and vector product of vectors), addition of vectors (Parallelogram law)
- 2.3 Force: Newton's laws of motion, linear momentum and conservation of linear momentum, impulse and its application, simple numerical problem in brake system of vehicles and trains etc.
- 2.4 Friction: Types of friction and its application.

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- 2.5 Circular motion: Angular displacement, angular velocity and angular acceleration
 - 2.6 Relation between linear and angular variables (velocity and acceleration)
 - 2.7 Centripetal force (derivation) and centrifugal force with application such as banking of roads and bending of cyclists
 - 2.8 Application of various forces in lifts
- 3 Rotational Motion (6 Periods)
- 3.1 Concept of translatory and rotating motion with examples
 - 3.2 Definitions of torque, angular momentum and their relationship
 - 3.3 Conservation of angular momentum (qualitative) and its examples
 - 3.4 Moment of inertia and its physical significance, radius of gyration, Theorems of parallel and perpendicular axes (statements), Moment of inertia of rod, disc, ring and sphere (Formulae only).
 - 3.5 Application of rotational motions in transport vehicles, trains and aero plane turbine/engine.
- 4 Work, Power and Energy (8 Periods)
- 4.1 Work: definition and its SI units
 - 4.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application
 - 4.3 Power: definition and its SI units, calculation of power with numerical problems
 - 4.4 Energy: Definition and its SI units: Kinetic energy and Potential energy with examples and their derivation
 - 4.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application
- 5 Properties of Matter (10 Periods)
- 5.1 Elasticity: definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke's law with its applications
 - 5.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications
 - 5.3 Surface tension: concept, its units, angle of contact, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension
 - 5.4 Viscosity and coefficient of viscosity: Stoke's Law and derivation of terminal velocity, effect of temperature on viscosity.

7

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2

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6 Thermometry (10 Periods)

- 6.1 Difference between heat and temperature
- 6.2 Principles of measurement of temperature and different scales of temperature and their relationship
- 6.3 Types of thermometers (Concept only)
- 6.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
- 6.5 Modes of transfer of heat (Conduction, convection and radiation with examples)
- 6.6 Co-efficient of thermal conductivity
- 6.7 Engineering Application of conduction, convection and radiations

7. Waves and Vibrations (10 Periods)

- 7.1 Simple Harmonic Motion(SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. Equation of simple harmonic progressive wave
- 7.2 Wave motion: transverse and longitudinal wave motion with examples, sound and light waves, velocity, frequency and wave length of a wave (relationship $v = n\lambda$) and their applications
- 7.3 Free, forced and resonant vibrations with examples
- 7.4 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications
- 7.5 Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering and medical applications

LIST OF PRACTICALS (to perform minimum ten experiments)

- 1. To find the diameter of wire using a screw gauge
- 2. To find volume of solid cylinder and hollow cylinder using a vernier calipers
- 3. To determine the thickness of glass strip and radius of curvature using a spherometer
- 4. To verify parallelogram law of forces
- 5. To find the time period of a simple pendulum and determine the length of second's pendulum.
- 6. To find the velocity of sound by using resonance apparatus at room temperature.
- 7. To determine the viscosity of glycerin by Stoke's method
- 8. To determine the coefficient of friction on horizontal plane.

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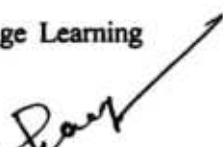
9. To determine the Young's Modulus by Searles apparatus
10. To determine force Constant of spring using Hooke's Law


INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics of mechanics, work power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
3. Applied Physics Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, New Delhi
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi
6. Comprehensive Practical Physics, Vol. I & II, JN Jaiswal, Laxmi Publishers
7. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
8. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
9. Applied Physics by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
10. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi


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DA104 APPLIED CHEMISTRY - I

	L	T	P
Periods/Week	3	-	2

RATIONALE

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

DETAILED CONTENTS

1. Basics Concepts (08 Periods)
 - 1.1 Definition of chemistry and its importance
 - 1.2 Definition of matter, element, compound and mixtures, atom, molecule, ion, symbol, formula, valency and chemical equation.
 - 1.3 Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of a chemical compound and form the empirical and molecular formula of the compound
 - 1.4 Essentials of a chemical equation, balancing of a chemical equation by hit and trial method
2. Atomic Structure and Chemical Bonding (08 Periods)
 - 2.1 Fundamental particles i.e. electron, proton and neutron, their characteristics (discovery is not included)
 - 2.2 Electronic concept of valency
 - 2.3 Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency giving suitable examples to each
 - 2.4 Hydrogen bonding and its effect on physical properties of the compounds
 - 2.5 Electronic configuration of elements (up to $Z = 30$) with special reference to Aufbau principle

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3. Water (16 Periods)
- 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 with special reference to sludge and scale formation; foaming and priming in boilers
- 3.2 Methods to remove hardness of water (i) Clark's Process (ii) Permutit Process (iii) Soda Lime process (iv) Ion-Exchange resin 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. Estimation of hardness of water sample by O'Hehner's Method and E.D.T.A. Method
- 3.4 Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply
- 3.5 Disinfection of water by chlorination process
4. Solutions (12 Periods)
- 4.1 Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples
- 4.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molality as applied in relation to a solution with simple numerical problems related to these terms
- 4.3 Definition of pH, and different industrial applications of pH, determination of pH of a solution with the help of pH meter including simple numerical problems.
- 5 Electrolysis (12 Periods)
- 5.1 Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples
- 5.2 Faraday's Laws of Electrolysis with simple numerical problems
- 5.3 Different industrial applications of 'Electrolysis' with special reference to electroplating and electrorefining of metals
- 5.4 Basic concept of Buffer solutions, indicators and solubility product.

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6 Environmental Chemistry

(08 Periods)

- 6.1 General concept of pollution and pollutants
- 6.2 Types and control of pollution like air, water, noise and soil pollution
- 6.3 General idea of ozone depletion, global warming

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. To analyse the inorganic mixture for two acidic and two basic radicals from the following radicals
 - a) Acidic Radicals CO_3^{2-} , SO_4^{2-} , NO_3^- , CH_3COO^- , Cl^- , Br^- , I^-
 - b) Basic Radicals NH_4^+ , Pb^{2+} , Cu^{2+} , Cd^{2+} , As^{3+} , Sb^{3+} , Sn^{2+} , Al^{3+} , Fe^{3+} , Cr^{3+} , Mn^{2+} , Ni^{2+} , Co^{2+} , Zn^{2+} , Ba^{2+} , Sn^{2+} , Ca^{2+} and Mg^{2+} ,
4. Determine the degree of temporary hardness of water by O'Heher's method
5. Estimation of total alkalinity of water volumetrically
6. Determine pH of a given sample by using pH meter
7. Determination of solubility of a solid at room temperature
8. Demonstration – Application of FeCl_3 in etching process for designing circuits on PCB (Printed Circuit Board)

RECOMMENDED BOOKS

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



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DA105 BASICS OF INFORMATION TECHNOLOGY

	L	T	P
Periods/Weeks	3	-	2

RATIONALE

Information technology has great influence on all aspects of life. Almost all work places and living environment are being computerized. In order to prepare diploma holders to work in these 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.

DETAILED CONTENTS

1. Information Technology – its concept and scope (2 Periods)
2. Elements of a computer system, its usefulness and applications, block diagram of a computer, CPU, memory, data – numeric data, alpha numeric data; contents of a program, processing of data (4 Periods)
3. Computer organization, computer hardware and software; primary and secondary memory: RAM, ROM, PROM etc. (4 Periods)
4. Input devices; keyboard, scanner, mouse etc.; output devices; VDU and Printer, Plotter (4 Periods)
5. Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory) (4 Periods)
6. Introduction to Operating Systems such as MS-DOS and Windows (4 Periods)
7. Introduction to internet, browsing using search engine (like google etc.) (5 Periods)
8. Basics of Networking – LAN, WAN, Topologies (5 Periods)

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

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15

4. DOS Commands (internal / external) e.g. TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP
5. Exercises on entering text and data (Typing Practice using any tutor)
6. Features of Windows as an operating system
 - Start
 - Shutdown and restore
 - Creating and operating on the icons
 - Opening closing and sizing the windows
 - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
 - Creating and operating on a folder
 - Changing setting like, date, time color (back ground and fore ground)
 - Using short cuts
 - Using on line help
7. MS-Word
 - File Management:
Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
 - Page Set up:
Setting margins, tab setting, ruler, indenting
 - Editing a document:
Entering text, Cut, copy, paste using tool- bars
 - Formatting a document:
Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
 - Aligning of text in a document, justification of document, Inserting bullets and numbering
 - Formatting paragraph, inserting page breaks and column breaks, line spacing
 - 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, software and MS word

8. MS-Excel

- Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
- Menu commands:
Create, format charts, organize, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS-Excel, getting information while working
- Work books:
Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays
- Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
- Creating a chart:
Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list

9. MS PowerPoint

- a) Introduction to PowerPoint
 - How to start PowerPoint
 - Working environment: concept of toolbars, slide layout, templates etc.
 - Opening a new/existing presentation
 - Different views for viewing slides in a presentation: normal, slide sorter etc.
- b) Addition, deletion and saving of slides
- c) How to view the slide show?
 - Viewing the presentation using slide navigator
 - Slide transition
 - Animation effects etc.

10. 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

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17

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

INSTRUCTIONAL STRATEGY

Since this is an introductory computer related subject, the teacher should demonstrate and explain computer and its peripherals in the laboratory. The theory may be dovetailed with practical exercises for better understanding. The students may be encouraged to work independently on computer to gain confidence.

RECOMMENDED BOOKS

1. Fundamentals of Computer 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., Jungpura, New Delhi
5. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. Mastering Windows 95, BPB Publication, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Learning MS Office XP by Ramesh Bangia, Khanna Book Publishing Co. (P) Ltd., New Delhi.
11. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

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DA106 ENGINEERING DRAWING – I

L T P

Periods/Weeks - - 6

RATIONALE

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

- Note:
1. First angle projection is to be followed
 2. Instruction relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students
 3. S.P. 46.1988 should be followed
 4. Minimum of 15 sheets to be prepared by each student

DETAILED CONTENTS

1. Drawing Office Practice, Lines & Lettering (2 Sheets)
 - 1.1 Drawing instruments
 - 1.2 Sizes and layout of standard drawing sheets and drawing boards
 - 1.3 Different types of lines in engineering drawing as per BIS specifications
 - 1.4 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
2. Dimensioning (2 Sheets)
 - 2.1 Necessity of dimensioning, Types of dimensioning (chain, parallel and progressive dimensioning, size and location dimensioning)
Methods of placing dimensioning (Aligned and unidirectional system), use of leader lines. General principles of dimensioning.
 - 2.2 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.
3. Simple Geometrical Constructions used in Engineering Practice (2 Sheets)
 - 3.1 Construction of regular polygons (triangle, square, pentagon, hexagon) and circles
 - 3.2 Ellipses (concentric circle method and Intersecting Arcs method)
 - 3.3 Parabola (rectangle and tangent method), cycloid

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19

4. Scale (2 sheets)
 - 4.1 Scale – their need and importance, Definition of representative fraction (R.F), find RF of given scale
 - 4.2 Construction of plain and diagonal scales
5. Principle of Projections (7 sheets)
 - 5.1 Principle of orthographic projection and introduction to first angle projection and third angle projection
 - 5.2 Projection of points situated in different quadrants (1 Sheet)
 - 5.3 Projection of lines, Lines inclined to one plane and parallel to the other and vice versa (1st & 3rd quadrants); Line inclined to both reference planes (HP and VP) (1 Sheet)
 - 5.4 Projection of Planes: Planes perpendicular and parallel to either of the planes; planes perpendicular to one plane and inclined to the other or vice versa (1st & 3rd quadrants) (1 Sheet)
 - 5.5 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
 - 5.6 Drawing 3 orthographic views of given objects (3 sheets, at least one sheet in 3rd Angle Projection)
 - 5.7 Identification of surfaces on drawn orthographic views from isometric object drawn (1 Sheet)
6. Sectional Views (1 sheet)
 - 6.1 Need for sectional views –Drawing of different conventions for materials in sections, conventional breaks for shafts, pipes, rectangular, square, angle, channel and rolled sections
7. Isometric Views (2 sheets)
 - 7.1 Fundamentals of isometric projections (theoretical instructions) and isometric scales
 - 7.2 Isometric views of combination of regular solids like cylinder, cone, cube, prism and pyramid
8. Symbols and Conventions (2 sheets)
 - 8.1 Civil engineering sanitary fitting symbols
 - 8.2 Electrical fitting symbols for domestic interior installations and electronics symbols
 - 8.3 Building plan drawing with electrical and civil engineering symbols

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RECOMMENDED BOOKS

1. Engineering Drawing by C M Verma, Takniki Parkashak, Roorkee.
2. Elementary Engineering Drawing (in First Angle Projection) by ND Bhatt, Charotar Publishing House
3. A Text Book of Engineering Drawing by Surjit Singh ; Dhanpat Rai and Co., Delhi
4. Engineering Drawing by PS Gill ; SK Kataria and sons, Delhi
5. Engineering Drawing by RB Gupta ; Satya Prakashan, New Delhi



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DAP107 GENERAL WORKSHOP PRACTICE – I

	L	T	P
Periods/Week	-	-	6

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices. This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS (PRACTICALS)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. Carpentry and Painting Shop-1
2. Fitting Shop
3. Welding Shop-I
4. Electric Shop -I
5. Smithy Shop or Electronic Shop-I
6. Sheet Metal Shop

Note:

1. The branches e.g. Civil Engineering, Electrical Engineering and Automobile Engineering, will do **Smithy Shop** instead of Electronic Shop- I
2. The branches e.g. Electronics and Communication Engineering, Computer Engineering and Information Technology will do **Electronic Shop-I** instead of Smithy Shop.

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1. Carpentry and Painting Shop -I

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Mango, Sheesham, etc. (Demonstration and their identification).
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.
Job I Marking, sawing, planning and chiseling & their practice (size should be mentioned)
- 1.3 Introduction to various types of wooden joints, their relative advantages and uses.
Job II Preparation of half lap joint
Job III Preparation of Mortise and Tenon Joint
- 1.4 Demonstration of various methods of painting wooden items.
Job IV Preparation of wooden surface before painting including primer coating
Job V Painting Practice by brush/spray
Job VI Preparation of surface, before Painting such as cleaning, sanding, putty. Procedure and application of primer code and painting steel items.
- 1.5 Safety precautions in carpentry shop

2. Fitting Shop

- 2.1 Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. Such as Steel, Brass, Copper, Aluminum etc. Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.
- 2.2 Description and demonstration of various types of work benches, holding devices and files. Precautions while filing.
- 2.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.

Job I Marking of job, use of marking tools and measuring instruments.
Job II Filing a dimensioned rectangular or square piece of an accuracy of $\pm 0.5\text{mm}$
Job III Filing practice (production of flat surfaces). Checking by straight edge.
Job IV Making a cutout from a square piece of MS Flat using hand hacksaw.
- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set. Handling of measuring instruments, checking of zero error, finding of least count (all gauges including dial gauge).

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3. Welding Shop – I

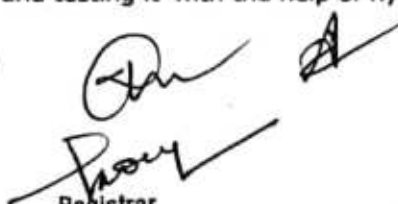
- 3.1 (a) Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, electrode holder, electrodes and their specifications, welding screens and other welding related equipment, accessories and gloves.
- (b) Safety precautions during welding
- (c) Hazards of welding and its remedies
- 3.2 Electric arc welding, (a.c. and d.c.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc. Earthing of welding machine.
- Job I Practice of striking arc bending and tacking while using electric arc welding set.
- Job II Welding practice on electric arc welding for making uniform and straight weld beads
- 3.3 Various types of joints and end preparation.
- Job III Preparation of butt joint by electric arc welding.
- Job IV Preparation of lap joint by electric arc welding.
- Job V Preparation of corner joint by using electric arc welding.
- Job VI Preparation of Tee joint by electric arc welding.

4. Electric Shop – I

- 4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, PVC Conduits, PVC Channels and allied items, tools along with electrical instruments such as voltmeter, ammeter and multimeter.
- 4.2 Study of electrical safety measures and demonstration about use of protective devices such as fuses, MCBs, ELCBs and relays including earthing.
- Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin plugs.
- Job II Preparation of a house wiring circuit on wooden board using fuse, switches, socket, holder, ceiling rose etc. in PVC conduit and PVC casing and capping wiring system.
- 4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan, table fan, electric mixer, electric Geyser, gas geyser, desert cooler, refrigerator, water purifier
- 4.4 Introduction to lead-acid battery, identification of parts and its working.
- Job III Installation of inverter with battery and to connect two or more batteries in series and in parallel (knowledge of a.c. and d.c.)
- Job IV Charging of a battery and testing it with the help of hydrometer and cell tester

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5. Smithy Shop

- 5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in smithy shop. Safety measures to be observed in the smithy shop.
- 5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers etc.
- 5.3 Demonstration and description of tongs, fullers, swages etc.
 - Job I To forge a L-hook.
 - Job II To prepare a job involving upsetting process
 - Job III To forge a chisel
 - Job IV To prepare a cube from a M.S. round by forging method.

OR

5. Electronic Shop – I

- 5.1 Identification and familiarization with the following tools used in electronic shop: Such as Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron, soldering wire, flux. Their demonstration and uses.
- 5.2 Identification and familiarization with Multimeter (analog and digital)
 - Job I Practice in the use of above mentioned tools and instruments. For this a small experimental set up may be done
- 5.3 Various types of protective devices such as : wire fuse, cartridge fuse etc. ,
- 5.4 Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors (audio, video)
- 5.5 Safety precautions to be observed in the electronic shop
- 5.6 Identification and familiarization with soldering and desoldering practice
- 5.7 Introduction to thimbles and crimping tools

NOTE: Demonstration boards for the electronics components such as resistor, capacitor, diodes, transistors, FETs, IFT Coils, ICs should be made.

- Job II Cut, strip, join an insulated wire with the help of soldering iron (repeat with different types of wires)
- Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including co-axial and shielded cable) to different types of power/general purpose/audio video/telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/playback/ antenna/ speaker leads for common electronic products such as Radio, TV, CD players, VCD/DVD players, cassette recorder and players, Hi-Fi equipment, hand- set, microphone



25

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6. Sheet Metal Shop

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material and specifications.

- 6.1 Introduction and demonstration of hand tools used in sheet metal shop.
- 6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. shearing machine, bar folder, burring machine, power press, sheet bending machine.
- 6.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g., M.S. sheet, galvanized-iron plain sheet, galvanized corrugated sheet, aluminum sheets etc.
- 6.4 Study of various types of rivets, steel screw etc.

Job I Shearing practice on a sheet using hand shears.

- a) Practice on making single riveted lap joint/double riveted lap joint.
- b) Practice on making single cover plate chain type, seam joint and riveted butt joint

RECOMMENDED BOOKS

- 1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
- 2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
- 3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
- 4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
- 5. Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
- 6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi.

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SECOND SEMESTER

DA201: ENGLISH AND COMMUNICATION SKILLS – II

	L	T	P
Periods/Week	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 achieve results and create successful organizations. The goal of the Communicating Skills 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. The objectives of this subject are understanding how communication works, gaining active listening and responding skills, understanding the importance of body language, acquiring different strategies of reading texts and increasing confidence by providing opportunities for oral and written expressions

DETAILED CONTENTS

Section A

1. FACETS OF LITERATURE

(22 Periods)

- 1.1 Fiction
 - 1.1.1 The Portrait of a Lady - Khushwant Singh
 - 1.1.2 The Doll's House – Katherine Mansfield
 - 1.1.3 The Refugees – Pearl S. Buck
- 1.2 Prose
 - 1.2.1 Of Truth – Francis Bacon
 - 1.2.2 Praises of Solitude – Samuel Johnson
 - 1.2.3 A Gentleman – John Henry Newman
- 1.3 Poems
 - 1.3.1 All The World's A Stage – W. Shakespeare
 - 1.3.2 A Solitary Reaper – William Wordsworth

2. READING SKILLS

Unseen comprehension passages (at least 3 passages).

(08 Periods)

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Section B

3. WRITING SKILLS

(16 Periods)

Writing Notice Page 31 of 21

Writing Circular
Writing a Memo
Agenda for a Meeting
Minutes of the Meeting
Press release
Telephonic Messages
Paragraph writing:
Simple and Current Topics should be covered.

4. Correspondence

(06 Periods)

Business Letters
Personal Letters

5. Communication

(12 Periods)

Media and Modes of Communication
Channels of Communication
Barriers to Communication
Listening Skills
Body language
Humour in Communication

LIST OF PRACTICALS

(Note: The following contents are only for practice. They should not be included in the final theory examination)

1. LISTENING COMPREHENSION

a. Locating Main Ideas in a Listening Excerpt, Note-taking

2. DEVELOPING ORAL COMMUNICATION SKILLS

a. Offering-Responding to Offers, Requesting-Responding to Requests, Congratulating, Expressing Sympathy and Condolences, Expressing Disappointments, Asking Questions-Polite Responses, Apologizing, Forgiving



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Complaining, Persuading, Warning, asking for and Giving Information, Giving Instructions, Getting and Giving Permission, asking for and Giving Opinions, Group Discussion

TEXTBOOK:

1. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi

LIST OF REFERENCE BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
3. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

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DA202: APPLIED MATHEMATICS - II

	L	T	P
Periods/Week	3	-	-

RATIONALE

Applied Mathematics forms the backbone of engineering students. The curriculum of mathematics has undergone changes from time to time in accordance with growth of subject. Diploma in Engineering is a launching stage where the students learn the basics of engineering. The revised syllabus has been designed keeping in view the emerging needs of all categories of students. Great emphasis has been laid on application of various contents like differential calculus, integral calculus, differential equations and statistics. This course will develop analytical abilities to make exact calculations and provide continuing educational base to the students.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Differential Calculus

(30 Periods)

Definition of function; Concept of limits.

Four standard limits $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$

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

Differentiation by definition of x^n , $\sin x$, $\cos x$, $\tan x$, e^x , $\log x$ only

Differentiation of sum, product and quotient of functions. Differentiation of function of a function.

Differentiation of inverse trigonometrical functions, Logarithmic differentiation, Exponential differentiation, Successive differentiation (up to third order only).

Applications:

(a) Maxima and minima

(b) Equation of tangent and normal to a curve (for explicit functions only) – Simple problems only

2. Integral Calculus

(25 Periods)

Integration as inverse operation of differentiation

Simple standard integrals and related problems

Simple integration by substitution, by parts and by partial fractions (for

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linear factors only)

Properties of definite integrals

Evaluation of definite integrals (simple problems)-

$$\text{Evaluation of } \int_0^{\pi/2} \sin^n x \, dx, \quad \int_0^{\pi/2} \cos^n x \, dx, \quad \int_0^{\pi/2} \sin^m x \cos^n x \, dx$$

using formulae without proof (m and n being positive integers only)

Numerical integration by Simpson's Rule and Trapezoidal Rule (simple problems only)

3 Ordinary Differential Equations (10 Periods)

- 3.1 Definition, order, degree, linear and non-linear differential equations
- 3.2 Formation of differential equations (up to second order)
- 3.3. Solution of first order differential equations (a) Variable Separable (b) Homogeneous (c) Linear and (d) Exact.

4. Statistics (15 Periods)

Measures of Central Tendency: Mean, Median, Mode
Measures of Dispersion: Mean deviation, Standard deviation
Co-efficient of rank correlation

TEXTBOOK:

- 1. Applied Mathematics by Dr. RD Sharma, Dhanpat Rai Publications, Delhi

RECOMMENDED BOOKS

- 1. Applied Mathematics by Dr. RD Sharma, Dhanpat Rai Publications, Delhi
- 2. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
- 3. Applied Mathematics-I (Hindi) by Dr. Kailash Sinha, Nav Bharat Publication, Meerut.
- 4. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
- 5. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar










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DA203: APPLIED PHYSICS – II

	L	T	P
Periods/Week	3	-	2

RATIONALE

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

DETAILED CONTENTS

1. Optics (10 Periods)
Review of basic optics laws: reflection and refraction

Refraction and refractive index, image formation in lenses, image magnification, lens formulae (thin lens only), power of lens, total internal reflection and their applications

Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case), Terrestrial and Galileo's telescope (Concept only) and their applications
2. Electrostatics (12 Periods)

Coulombs law, unit of charge, electric potential and electric potential difference

Electric field, electric field intensity, electric lines of force, electric flux Gauss's Law

Applications of Gauss law in finding electric field of point charge, straight charged conductor, plane charged sheet and between two plane parallel charged sheets

Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, and dielectric break down

Application of electrostatics in electrostatic precipitator

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3. DC Circuits

(12 Periods)

Concept of electricity, current and its units, direct and alternating current, voltage, resistance and resistivity, potential difference and e.m.f., Concept and applications of potentiometer.

Ohm's law and its applications, concept of resistance, conductance, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors, introduction to super conductivity.

Kirchhoff's laws, Wheatstone bridge principle and its applications (Slide Wire Bridge)

Heating effect of current and concept of electric power, energy and their units, related numerical problems

Application of electricity in various equipment, advantages of electrical energy over other forms of energy

4. Electromagnetism

(13 Periods)

Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units, Right hand thumb rule, magnetic lines of force due to straight conductor, circular coil and solenoid

Force on a charge, moving in a uniform magnetic field (Lorentz force). Force on a current carrying straight conductor. Torque on a current carrying rectangular coil.

Moving coil galvanometer conductor, its principle, construction and working, conversion of a galvanometer into ammeter and voltmeter.

Electromagnetic induction, Faradays Laws, Lenz's Law.

Applications of Electromagnetism

5. Semiconductor physics

(07 Periods)

Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics

Diode as rectifier – half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only)

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6. Modern Physics

(10 Periods)

Electromagnetic spectrum, photo electric effect and work function, X rays -properties, production and their applications in medicine and industries.

Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, Helium- Neon and ruby lasers, their engineering and medical applications

Fiber optics: introduction to optical fiber materials, types, light propagation and applications in communication.

LIST OF PRACTICALS (To perform minimum eight experiments)

1. Conversion of Galvanometer into an Ammeter of given range.
2. Conversion of Galvanometer into Voltmeter of given range.
3. To verify ohm's laws by drawing a graph between voltage and current.
4. To verify laws of resistances in series and in parallel connection.
5. To draw characteristics of a pn junction diode and determine knee and break down voltages
6. Verification of Kirchhoff's Laws
7. Determination of resistivity by Wheatstone bridge
8. To determine the resistance of electronic components by multimeter
9. Determination of internal resistance of primary cell by using ammeter and voltmeter
10. To determine emf of primary cell using potentiometer and standard voltage source.

INSTRUCTIONAL STATREGY

Teacher may use various instructional media like models, charts and graphs while imparting instructions. The field application should be made clear before teaching the basics of waves, sound, light, electrostatics, dc circuits, electromagnetism, and semiconductor physics etc to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

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DA204: APPLIED CHEMISTRY-II

	L	T	P
Periods/Week	3	-	2

RATIONALE

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

DETAILED CONTENTS

1. Metallurgy (12 Periods)

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

Metallurgy of (i) Aluminum (ii) Iron

Definition of an alloy, purposes of alloying, composition and uses of alloys like magnalium, duralumin, alnico, invar and stainless steel

2. Fuels (16 Periods)

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

Definition of Calorific value of a fuel and its determination for a solid fuel with the help of Bomb calorimeter with simple numerical problems.

Merits of gaseous fuels over those of other varieties of fuels

Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas (iv) Compressed Natural gas (CNG) Octane Number and Cetane

Number

3 Corrosion (08 Periods)

Meaning of the term 'corrosion' and its definition



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

Prevention of corrosion by

- (a) Alloying
- (b) Providing metallic coatings
- (c). Sacrificial cathodic protections:

4 Lubricants

(08 Periods)

Definition of (i) lubricant (ii) lubrication

Classification of lubricants

Principles of lubrication

- (i) fluid film lubrication
- (ii) boundary lubrication

Characteristics of a lubricant such as viscosity, viscosity index, volatility, oxidation, oiliness, acidity, emulsification, flash point, fire point and pour point.

Importance of additives in lubricants

Dewaxing and solvent refining of liquid lubricants

5 Cement and Glass

(04 Periods)

General introduction to cement and glass

Manufacture of Cement

Manufacture of ordinary glass and lead glass

6. Classification and Nomenclature of Organic Compounds

(16 Periods)

Classification of Organic Compounds, functional group, Homologous Series

Physical and Chemical properties, and industrial use of Organic Compound

IUPAC system of nomenclature of Carboxylic acid, Alcohols, Phenols, Aldehydes, Ketones and Amines (first six members of each series only).

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DA205: ENVIRONMENTAL SCIENCE

L T P
Periods/Week 3 - -

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

DETAILED CONTENTS

1. Basics of ecology, eco system and sustainable development (03 Periods)
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table (04 Periods)
3. Sources of pollution - natural and man-made, their effects on living and non-living organisms, Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms, Pollution of air-causes and effects of man, animal, vegetation and non-living organisms, Sources of noise pollution and its effects
4. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods (06 Periods)
5. Mining, blasting, deforestation and their effects (03 Periods)
6. Legislation to control environment (04 Periods)
7. Environmental Impact Assessment (EIA), Elements for preparing EIA statements (04 Periods)
8. Current issues in environmental pollution and its control, role of non-conventional sources of energy in environmental protection (06 Periods)

TEXTBOOK:

1. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.

RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Engineering and Management by Suresh K Dhamija; SK Kataria and Sons, New Delhi.
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.

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DA206: ENGINEERING DRAWING – II

L T P
Periods/Week - - 6

RATIONALE

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

- Note:**
1. First angle projection is to be followed
 2. Minimum of 15 sheets to be prepared by each student
 3. SP 46 – 1988 should be followed
 4. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

1. Section of Solids by Different Cutting Planes
2. Development of Surfaces (2 sheets)

Development of surfaces – cubes, prisms, (square, pentagonal and hexagonal), cylinders, pyramids (square, pentagonal, hexagonal) and cones
3. Detail and Assembly Drawing (2 sheets)
Principle and utility of detail and assembly drawings
Wooden joints i.e., corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, crossed wooden joint, cogged joint, Dovetail joint, Through Mortise and Tenon joint
4. Threads (2 sheets)
Nomenclature of threads, types of threads (metric), single and multiple start threads
Forms of various external thread sections such as V, square and acme threads, BA, BSW and Knuckle, Metric, Seller Thread, Buttress Threads
Simplified conventions of left hand and right-hand threads, both external and internal threads
5. Locking Devices (1 sheet)

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



6. Nuts and Bolts (3 sheets)
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. Foundations bolts – Rag bolt and Lewis's bolt
7. Screws, Studs and Washers (1 sheet)
Drawing various types of machine screws
Drawing various types of studs and set screws
8. Keys and Cotters (2 sheets)
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
Cotter joints (i) gib and cotter joint (ii) knuckle joint
9. Rivets and Riveted Joints (2 sheets)
Types of structural and general purposes rivet heads
Caulking and fullering of riveted joints
Types of riveted joints – lap, butt (single riveted, double riveted lap joint, single cover plate and double cover plate), chain and zig – zag riveting
10. Welded Joints (1 sheet)
Various conventions and symbols of welded joints (IS 696)
Practical applications of welded joints say joints on steel frames, windows, doors and furniture
11. Couplings (2 sheets)
Muff or Box coupling, half lap muff coupling
Flange coupling (Protected and non-protected)
Flexible coupling
12. AutoCAD (for practical and viva only)

Practice on drawing commands, editing commands
Practice on sectioning and hatching
Practice on preparing simple drawings

TEXTBOOK:

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

RECOMMENDED BOOKS

1. Engineering Drawing by C M Verma, Takniki Parkashak, Roorkee.
2. Elementary Engineering Drawing by ND Bhatt, Charotar Publishing House
3. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai and Co. Delhi
4. Engineering Drawing by PS Gill, SK Kataria and Sons, New Delhi
5. Machine Drawing by RB Gupta, Satya Prakashan, New Delhi.

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Note:

1. A minimum of 15 sheets should be prepared by each student
2. No table is suggested for distribution of marks, instead it is emphasized that the examination paper should contain exercises for evaluation of all necessary skills envisaged in the curriculum.
3. It is also suggested that a comprehensive viva of each student should be conducted by an external examiner during or just after the examinations to ascertain understanding of the subject e.g., reading and interpreting drawings and development of necessary skills etc.

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DAP207: GENERAL WORKSHOP PRACTICE - II

	L	T	P
Periods/Weeks	-	-	6

RATIONALE

Psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

DETAILED CONTENTS (PRACTICALS)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus.

1. Carpentry and Painting shop-II
2. Fitting and Plumbing Shop
3. Welding shop -II
4. Electric shop -II
5. Electronic shop-II or Machine Shop

Note:

1. The branches e.g., Civil Engineering, Mechanical Engineering, Mechanical (Automobile), Chemical Engineering, Chemical (R&P), Agriculture Engineering, Electrical Engineering and Automobile Engineering will do **Machine Shop** instead of electronic shop- II
2. The branches e.g., Electronics and Communication Engineering, Computer Engineering and Information Technology will do **electronic shop-II** instead of Machine shop.
- 3 The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

1. Carpentry and Painting Shop-II

Introduction to joints, their relative advantages and uses.

Job I Preparation of dovetail joint and glued joint.

Job II Preparation of mitre joint

Job III Preparation of a lengthening Joint

Job IV Preparation of at least one utility job with and without lamination.

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Demonstration of job showing use of rip saw, bow saw and tenon saw, method of sharpening various saws.

Demonstration of job on band saw and circular saw, chain and chisel, universal wood working machine, saw re-sharpening machine, saw brazing unit.

Importance and need of polishing wooden items. Introduction to polishing materials.

Job V Polishing on wooden items.

2. Fitting and Plumbing Shop

Introduction to various types of threads (internal and external)-single start, multi-start, left hand and right-hand threads.

Description and demonstration of various types of drills, taps and dies Selection of dies for threading, selection of drills, taps and reamers for tapping operations.

Job, I Making internal and external threads on a job by tapping and dyeing operations (manually)

Precautions while drilling soft metals, e.g., copper, brass, aluminum etc.

Job II Drilling practice on soft metals such as aluminum, brass and copper

Job III Preparation of a job by filing on non-ferrous metal up to an accuracy of $\pm 0.2\text{mm}$

Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbows, tee, union, socket, stopcock, taps etc.

3. Welding Shop – II

3. Introduction to gas welding, spot welding and seam welding and welding techniques. Adjustments of different types of flames in gas welding, demonstration and precautions about handling welding equipment.

Job, I Practice in handling gas welding equipment (Low pressure and Highpressure) and welding and tacking practice on simple jobs.

Common welding joints generally made by gas welding.

Job II Preparation of butt joint by gas welding.

Job III Preparation of small cot frame from conduit pipe by gas welding.

Job IV Preparation of square pyramid from MS rods by welding (type of welding to be decided by students themselves).

Job V Exercise of preparing a job on spot/seam welding machine.

Demonstration and use of TIG and MIG welding equipment

4. Electric Shop – II

Importance and demonstration of three-phase wiring on three-phase panel with the help of a demonstrating panel.

Job, I Laying out 3-phase wiring for an electric motor or any other 3-phase machine.

Job II Connecting single-phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.

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Job III Checking continuity of connection (with tester and series lamp) location of faults with a multimeter) and their rectification in simple machines and/or other electric circuits fitted with earthing.

Job IV Finding fault in simple electric machine and its rectification
Demonstration of dismantling, servicing and reassembling a table fan/ceiling fan/air cooler/mixer/electric iron, electric heater, geyser, electric oven, air conditioner etc.

Job V Testing single phase/three phase electrical motor by using voltmeters, ammeter, clip-on meter, tachometer etc.

Job VI Reversing the rotation of a motor.

5. Electronic Shop- II

Uses of the items mentioned below:

- a) Various types of single, multi-cored insulated screened wire and cables - power, audio video, co-axial, general purpose wires/cables
- b) Various types of plugs, sockets, connectors suitable for general purpose audio and video use, 2 and 3 pin mains plug and sockets, RF plugs and sockets.
Banana-plugs, and sockets, BNG, RCA, DIN, UHF, ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.
- c) Various types of switches such as normal/miniature toggle, slide, push button, piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way master mains switch.
- d) Various types of protective devices such as: wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.
- e) Materials: Conducting, insulating and magnetic materials.
- f) Demonstration and uses of single beam simple crop, signal generator and function-generator
- g) Regulated power supply-fixed and variable voltage, single output as well as dual output.

Identification and familiarization with active and passive components; types and color code of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including diode, LED, transistor, LCD, UJT, FET, coils, relays, reed relays, transformers, linear and digital ICs, thyristors.

Demonstrate the following:

- To make perfect solder joints and soldering on PCBs
- To remove components/wires by unsoldering
- To assemble components on boards, chassis, tape strips
- Various laying methods of cables
- Exposure to modern soldering and de-soldering processes

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- Field visits to relevant work-places
- Identification of active and passive components

Use of multimeter and testing of active and passive components.

Job, I Cut, bend, tin components, leads, inserts and solder components (capacitor, diodes, transistor, IFT, ICs etc.) on a PCB.

Job II Soldering practices

Job III Temperature controlled soldering

station Job IV De-soldering pump

Job V De-soldering strip/wlk

Job VI De-solder, remove and clean all the components, wires from a given equipment, a PCB or a tag strip.

Job VII Wiring of a small circuit on a PCB/tag strip involving lacking, sleeving and use of identifier tags

OR

5 Machine Shop

Introduction to various machines used in machine shop

Job I: Exercise on simple turning

Job II: Exercise on taper turning

Job III: Marking and drilling practice on mild steel piece

Job IV: Marking and drilling practice on aluminum piece

Job V Demonstration of various functions of CNC Machine

TEXTBOOK:

1. Workshop Technology by B.S. Raghuvanshi, Dhan pat Rai and Co., New Delhi

RECOMMENDED BOOKS

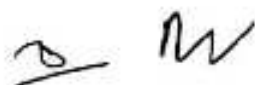
1. Workshop Technology I, II, III, by S K Hajra, Choudhary and A K Choudhary. MediaPromoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I, II, III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technology by B.S. Raghuvanshi, Dhan pat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi

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THIRD SEMESTER

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EE301 FUNDAMENTALS OF ELECTRICAL ENGINEERING

L T P
Periods/week 3 - 2

RATIONALE

For a diploma holder in electrical engineering, it becomes imperative to know the fundamentals of the subject in order to grasp the knowledge of the field. This subject will provide acquaintance with various terms knowledge of fundamental concepts of electricity, magnetism and various principles related to it.

DETAILED CONTENTS

1. (a) Application and Advantages of Electrical Energy (04 Periods)
 - Different forms of energy
 - Advantages of electrical energy
 - Uses of electrical energy

(b) Basic Electrical Quantities

 - Basic concept of charge, current, voltage, resistance, power, energy and their units
 - Conversion of units of work, power and energy from one form to another
2. DC Circuits (12 Periods)
 - 2.1 Ohm's law, resistances in series and parallel
 - 2.2 Kirchhoff's laws and their applications in solving electrical network problems
 - 2.3 Network theorems such as Thevenin's theorem, superposition theorem Maximum power and transfer theorem and Norton's theorem
3. Batteries (15 Periods)
 - 3.1 Basic idea about primary and secondary cells
 - 3.2 Working principle, construction and applications of Lead acid, Nickel Cadmium and Silver Oxide Cells
 - 3.3 Capacity and efficiency of lead acid battery
 - 3.4 Charging methods used for lead acid accumulator
 - 3.5 Care and maintenance of a lead acid battery
 - 3.6 Grouping of cells in series and parallel (simple numerical problems)
 - 3.7 Testing of lead Acid battery for fully charged conditions and their specifications
 - 3.8 Application of lead acid battery
 - 3.9 Idea about batteries used in UPS

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4. Magnetism and Electromagnetism: (08 Periods)
- 4.1 Introduction to electromagnetism, Magnetic field around a straight current carrying conductor and a solenoid and methods to find its direction, force between two parallel current carrying conductors.
 - 4.2 Force on a conductor placed in the magnetic field
 - 4.3 Series magnetic circuits, simple problems
 - 4.4 Concept of hysteresis, loop and hysteresis loss.
5. Electromagnetic Induction: (10 Periods)
- 5.1 Faraday's Laws of electromagnetic induction
 - 5.2 Lenz's law
 - 5.3 Fleming's Right and Left Hand Rule
 - 5.4 Principle of self and mutual induction
 - 5.5 Principle of self and mutually induced e.m.f. and simple problems
 - 5.6 Inductances in series and parallel
 - 5.7 Energy stored in a magnetic field
 - 5.8 Concept of eddy currents, eddy current loss
6. AC Fundamentals (06 Periods)
- 6.1 Concept of a.c. generation (single phase and three phase)
 - 6.2 Difference between a.c and d.c
 - 6.3 Concept of alternating current and voltage, equation of instantaneous values, average value, r.m.s value, form factor, power factor etc.
 - 6.4 Concept of phasor and phase difference
 - 6.5 Representation of alternating sinusoidal quantities by vectors
 - 6.6 Phasor algebra (addition, subtraction, multiplication and division of complex quantities)
7. AC Circuits (15 Periods)
- 7.1 AC through pure resistance, inductance and capacitance
 - 7.2 Alternating voltage applied to RL, RC and RLC series and parallel circuits (impedance triangle, phasor diagram and their solutions)
 - 7.3 Concept of susceptance, conductance and admittance
 - 7.4 J-notation and its application in solving problems in ac circuits

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- 7.5 Power in pure resistance, inductance, capacitance and series RL, RC, RLC circuits
- 7.6 Active and reactive components of current and their significance
- 7.7 Power factor and its practical significance
8. Poly-Phase Systems (10 Periods)
- 8.1 Advantages of 3 phase over single phase system
- 8.2 Star and delta connections (derive relationship between phase and line voltages, phase and line currents in star delta connections
- 8.3 Power in 3 phase circuits and measurement by two wattmeter method
- 8.4 Measurement of power and power factor of a 3-phase load by two wattmeter method using balanced/unbalanced load.

LIST OF PRACTICALS

1. (a) Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions (to verify ohm's law)
- (b) Filament lamp
 - Measure the resistance of a cold lamp filament with the help of calculations.
 - Measure the current drawn by the lamp at different voltages from zero to 220 volts and the resistance of lamp at different voltages, plot a graph between current and voltage
2. (a) To verify that $R_t = R_1 + R_2 + \dots$ where R_1, R_2 etc. are resistances connected in series
- (b) To verify

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_m}$$

Where R_1, R_2 etc. are resistances connected in parallel
3. Verification of Kirchhoff's current and voltage laws applied to DC circuits
 - a) To construct a circuit arrangement consisting of resistances in series, parallel combination
 - b) Identification of node points in the circuit
 - c) To see that algebraic sum of currents at node point is zero
 - d) To see that algebraic sum of emfs and voltage drops in a closed loop is zero
4. To observe the a.c and d.c wave shapes on CRO.
5. To find ratio of inductance values of a coil having air /iron core respectively and to see the effect of introduction of a magnetic core on coil inductance
6. To construct an RL and RC circuit and to measure

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- a) Impedance of the circuit
 - b) Phase angle between voltage and current
 - c) Construct impedance triangle
7. Measurement of power and power factor of a single phase RLC circuit. To calculate KVA and KVAR
 8. Measurement of power and power factor of a 3-phase circuit by using 2-wattmeter method using induction motor as a load and to calculate KVA and KVAR
 9. Testing a battery for its charged condition i.e testing of gravity

Note: The results should be verified analytically also.

INSTRUCTIONAL STRATEGY

Basic electrical engineering being a fundamental subject need to be handled very carefully and in a manner such that students develop clear understanding of principles and concepts and develop skill in their application in solving related problems. Teacher may lay emphasis on laboratory experiments and give lot of tutorial work to students in order to given them an opportunity in mastering the basics in solving related problems.

TEXTBOOK:

1. Fundamental of Electrical Engineering by RP Gupta; BBP Publications
2. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill Education Pvt Ltd, New Delhi

RECOMMENDED BOOKS

1. Fundamentals of Electrical Engineering by Sahdev, Uneek Publication, Jalandhar
2. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. Electrical Science by VK Mehta, S Chand and Co., New Delhi
4. Electrical Engineering by DR Arora, Ishan Publications, Ambala
5. Electrical Technology by JB Gupta, SK Kataria and Sons, New Delhi
6. Electrical Technology by BL Theraja, S Chand & Co., New Delhi
7. Electrical Science by S. Chandhni, R Chakrabarti and PK Chattopadhyay. Narosa Publishing House Pvt. Ltd., New Delhi
8. Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd., New Delhi
9. Principles of Electrical Engineering by BR Gupta, S Chand & Co., New Delhi
10. Handbook of Electrical Engineering by SL Bhatia, Khanna Publishers, New Delhi

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EE302 ELECTRICAL AND ELECTRONICS ENGINEERING MATERIALS

L T P

Periods/week 3 - 2

RATIONALE

A diploma holder in Electrical Engineering will be involved in maintenance, repair and production of electrical equipment and systems. In addition, he may be required to procure, inspect and test electrical and electronic engineering materials. Knowledge of various types of materials will be needed in order to execute the above mentioned functions. He may also have to decide for an alternative when a particular material is either not readily available in the market or its cost becomes prohibitive.

DETAILED CONTENTS

1. Classification (04 Periods)

Classification of materials into conducting, semi conducting and insulating materials through a brief reference to their atomic structure and energy bands

2. Conducting Materials (12 Periods)

2.1 Introduction

2.2 Resistance and factors affecting it such as alloying and temperature etc

2.3 Classification of conducting material as low resistivity and high resistivity materials, Low resistance materials

a. Copper- General properties as conductor: Resistivity, temperature coefficient, density, mechanical properties of hard-drawn and annealed copper, corrosion, contact resistance. Application in the field of electrical engineering

b. Aluminium - General properties as conductor: Resistivity, temperature coefficient, density, mechanical properties of hard and annealed aluminium, solderability, contact resistance. Applications of aluminium in the field of electrical engineering

c. Steel - General properties as conductor: Resistivity, corrosion, temperature coefficient, density, mechanical properties, solderability, Applications in the field of electrical engineering

Introduction to bundle conductors and its applications

Low resistivity copper alloys: Brass, Bronze (cadmium and Beryllium), and their practical applications with reasons for the same

2.4 Applications of special metals e.g. Silver, Gold, Platinum etc.

2.5 High resistivity materials and their applications e.g., manganin, constantin, nichrome, mercury, platinum, carbon and tungsten, Tantalum

2.6 Superconductors and their applications

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3. Review of Semi-conducting Materials (05 Periods)

Semi Conducting material such as Germanium, Silicon, Carbon-their atomic structure/application/against , pure and impure semi conductors and their use for making electronic devices. Material used for special purpose semiconductor, diode, contacts, power transistor, substrate, integrated circuits and power handling devices.

4. Insulating materials; General Properties (12 Periods)

4.1 Electrical Properties

Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) dielectric constant

4.2 Physical Properties

Hygroscopicity, tensile and compressive strength, abrasive resistance, brittleness

4.3 Thermal Properties

Heat resistance, classification according to permissible temperature rise. Effect of overloading on the life of an electrical appliance, increase in rating with the use of insulating materials having higher thermal stability, Thermal conductivity, Electro-thermal breakdown in solid dielectrics

4.4 Chemical Properties

Solubility, chemical resistance, weatherability

4.5 Mechanical properties, mechanical structure, tensile structure

5. Insulating Materials and their applications (13 Periods)

5.1 Plastics

a. Definition and classification

b. Thermosetting materials:

Phenol-formaldehyde resins (i.e. Bakelite) (urea formaldehyde and melamine - formaldehyde), their important properties and applications

amino resins
epoxy resins -

c. Procedure of preparation of plastic (PVC)

d. Thermo-plastic materials:

Polyvinyl chloride (PVC), polyethelene, silicones, their important properties and applications

5.2 Natural insulating materials, properties and their applications

a. Mica and Mica products

b. Asbestos and asbestos products

c. Ceramic materials (porcelain and steatite)

d. Glass and glass products

e. Cotton

f. Silk

g. Paper (dry and impregnated)

h. Rubber, Bitumen

- i. Mineral and insulating oil for transformers switchgear capacitors, high voltage insulated cables, insulating varnishes for coating and impregnation
- j. Enamels for winding wires
- k. Glass fibre sleeves

5.3 Gaseous materials; Air, Hydrogen, Nitrogen, SF₆ ^{their} properties and applications

6. Magnetic Materials (11 Periods)

6.1 Introduction - ferromagnetic materials, permeability, B-H curve, magnetic saturation, hysteresis loop including coercive force and residual magnetism, concept of eddy current and hysteresis loss, curie temperature, magnetostriction effect, method of reduction of eddy current loss and hysteresis loss

6.2 Soft Magnetic Materials

- a) Alloyed steels with silicon: High silicon, alloy steel for transformers, low silicon alloy steel for electric rotating machines
- b) Cold rolled grain oriented steels for transformer, Non-oriented steels for rotating machine
- c) Nickel-iron alloys
- d) Soft Ferrites

6.3 Hard magnetic materials - Tungsten steel, chrome steel, hard ferrites and cobalt steel, their applications

7. Special Materials (04 Periods)

Thermocouple, bimetals, leads soldering and fuses material, mention their applications

8. Introduction of various engineering materials necessary for fabrication of electrical machines such as motors, generators, transformers etc

(04 Periods)

LIST OF PRACTICALS

1. A market survey of different Electrical and Electronics materials available in market will be conducted by students. They will submit a report, which will include names, types, specifications, identification, testing of components, manufacturing details and related cost.
2. Case study/data manuals of different wires/cables/fuses/sockets etc.. A report will be Submitted by the students.

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INSTRUCTIONAL STRATEGY

The teacher should bring different materials, electronic components and devices in the class while taking lectures and explain and make students familiar with them. Also he may give emphasis on practical applications of these devices and components in the field. In addition, the students should be given exercises on identification of materials used in various electronic gadgets etc. and be encouraged to do practical work independently and confidently.

TEXTBOOK:

1. Electrical & Electronics Engineering Materials by SC Tiwari; BBP Publications
2. Electrical and Electronics Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi

RECOMMENDED BOOKS

1. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi
2. Electronic Components and Materials by Grover and Jamwal, Dhanpat Rai and Co., New Delhi
3. Electrical Engineering Materials by Sahdev, Uneek International Publications
4. Electronic Components and Materials by SM Dhir, Tata Mc Graw Hill, New Delhi
5. Electrical Engineering Materials by PL Kapoor, Khanna Publishers, New Delhi
6. Electrical and Electronics Engineering Materials BR Sharma and Others, Satya Parkashan, New Delhi
7. Electrical and Electronics Engineering Materials DR Arora, Ishan Publications, Ambala City
8. Electrical Engineering Materials by Rakesh Dogra, SK Kataria and Sons, NEW Delhi

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EE303 ELECTRONICS DEVICES AND CIRCUITS

L T P

Periods/week: 3 - 4

RATIONALE

At present, electronics gadgets are being extensively used in various manufacturing processes in industries, power system operations, communication systems, computers etc. Even for an electrical diploma holder, it is absolutely necessary to have a basic understanding of electronic components, their function and applications. This understanding should facilitate in operation and maintenance equipment, which are electronically controlled.

In this course, topics like semi-conductor theory, semi-conductor Diodes, Bipolar transistors, rectifiers, single stage and multistage amplifiers and field effect transistors have been included.

DETAILED CONTENTS

1. Introduction (04 Periods)
 - 1.1 Brief history of development of electronics
 - 1.2 Active and passive components
2. Semi-conductor Theory (10 Periods)
 - 2.1 Atomic structure, crystalline structure
 - 2.2 Energy band theory of crystals, energy band structure of insulator, semiconductor and conductor, generation and recombination of electron hole pairs. Energy band structure of Silicon and Germanium
 - 2.3 Concept of Doping, intrinsic and extrinsic semiconductors
 - 2.4 Effect of temperature on intrinsic and extrinsic semiconductors
3. Semiconductor Diodes (14 Periods)
 - 3.1 PN Junction, mechanism of current flow in PN junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing in a PN junction. Concept of junction capacitance in forward and reverse biased conditions. Breakdown mechanism
 - 3.2 Ideal diode, Semiconductor diode characteristics, static and dynamic resistance
 - 3.3 Use of diode as half wave and full wave rectifiers (centre tapped and bridge type), ripple factor, rectifier efficiency
 - 3.4 Operation of filter circuits
 - 3.5 Diode ratings/specifications
 - 3.6 Various types of diodes such as zener diode, varactor diode, Schottky diode, light emitting diode, tunnel diode, photo diode; their working characteristics and applications
 - 3.7 Use of zener diode for voltage stabilization
4. Bi-polar Transistors (10 Periods)
 - 4.1 Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flow
 - 4.2 Transistor configurations: common base (CB), common emitter (CE) and common collector (CC), current relation and their input/output characteristics; comparison of the three configurations

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5. Transistor Biasing and Stabilization (12 Periods)
- 5.1 Transistor biasing, its need, operating point, effect of temperature on the operating point of a transistor and need of stabilization of operating point.
- 5.2 Different biasing circuits, limitations
- 5.3 Use of data book to know the parameters of a given transistor
6. Single-Stage Transistor Amplifiers (10 Periods)
- 6.1 Single stage transistor amplifier circuit in CE configuration, function of each component
- 6.2 Working of single stage transistor amplifier, physical and graphical explanation, phase reversal
- 6.3 Frequency response of a single stage transistor amplifier
7. Multi-Stage Transistor Amplifiers (08 Periods)
- 7.1 Need of multi-stage transistor amplifiers – different types of couplings, their purpose and applications.
- 7.2 RC coupled two-stage amplifiers, circuit details, working, frequency response, applications
- 7.3 Loading effect in multistage amplifiers
- 7.4 Elementary idea about direct coupled amplifier, its limitations and applications
- 7.5 Transformer coupled amplifiers, its frequency response.
8. Field Effect Transistor (FET) (06 Periods)
- 8.1 Construction, operation, characteristics and applications of a N channel JFET and P channel JFET
- 8.2 JFET as an amplifier
- 8.3 Types, construction, operation, characteristics and applications of a MOSFET
- 8.4 Comparison between BJT, JFET and MOSFET
9. Operational Amplifiers (08 Periods)
- Characteristics of an ideal operational amplifier and its block diagram
 - Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current
 - Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator

LIST OF PRACTICALS

1. a) Identification and testing of electronic components such as resistor, inductor, capacitor, diode, transistor and different types of switches used in Electronic circuits
- b) Measurement of resistances using multimeter and their comparison with colour code values

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2. V-I characteristics of a Semiconductor diode and to calculate its static and dynamic resistance
3. a) V-I characteristics of a zener diode and finding its reverse breakdown voltage
b) Fabrication of a zener diode voltage stabilizer circuit using PCB
4. Observation of input and output wave shapes of a half-wave rectifier
5. Observation of input and output wave shapes of a full wave rectifier
6. Plotting input and output characteristics of a transistor in CB configuration
7. Plotting input and output characteristics of a transistor in CE configuration
9. To study the effect of coupling capacitor on lower cut off frequency and upper cut off frequency by plotting frequency response curve of a two stage RC coupled amplifier
10. To plot V-I characteristics of a FET
11. To use IC 741 (op-amplifier) as
 - i) Inverter, ii) Adder, iii) Subtractor iv) Integrator

INSTRUCTIONAL STRATEGY

This subject gives the knowledge of fundamental concepts of basic electronics. The teacher should give emphasis on understanding of concepts and various term used in the subject. The students be made familiar with diodes, transistors, resistors, capacitors, inductors etc. and electrical measuring instruments etc. Practical exercises will reinforce various concepts. Application of Semiconductor Diodes, Transistors, Field Effect Transistors etc must be told to students.

TEXTBOOK:

1. Electronic Devices and Circuits; BBP Publications
2. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi

RECOMMENDED BOOKS

3. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi
4. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
5. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
6. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi
7. Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi
8. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill

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7. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill Education Pvt Ltd, New Delhi
8. Basic Electronics – Problems and Solutions by Albert Malvino and David J. Bates; Tata McGraw Hill Education Pvt Ltd, New Delhi
9. Basic Electronics by J.S. Katre, Sandeep Bajaj, Tech. Max. Publications, Pune
10. Analog Electronics by DR Arora, Ishan Publications, Ambala City
11. Analog Electronics by JC Karhara, King India Publication, New Delhi
12. Electrical Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
13. Electronic Devices and Circuits by Dharma Raj Cheruku and Battula Tirumala Krishna: Pearson Education (Singapore) Pvt Ltd., Indian Branch, 482 F.I.E Patparganj, Delhi- 92
14. Basic Electronics by JB Gupta, SK Kataria and Sons, New Delhi
15. Grob's Basic Electronics- A text Lab Manual (Special Indian Edition) by Schultz, Tata McGraw Hill Education Pvt Ltd, New Delhi


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EE304 FUNDAMENTALS OF MECHANICAL AND CIVIL ENGINEERING

Periods/week L T P
3 - 2

RATIONALE

A diploma holder has to assist in activities of installation, operation and maintenance etc of different machines and equipment. These activities are not branch specific and instead require him to know basics of civil and mechanical engineering. The subject of Fundamentals of Mechanical and Civil Engineering has been included to impart basic knowledge of Civil and Mechanical engineering to the students.

DETAILED CONTENTS PART-A

MECHANICAL ENGINEERING

Theory

1. Transmission of Power (20 Periods)
 - 1.1 Transmission of power through belt, rope drives and pulleys, gears and chains
 - 1.2 Different type of pulleys and their application
 - 1.3 Chain drives and its comparison with belt drive
 - 1.1 Gear drives, types of gears, simple gear trains and velocity ratio
2. Air Conditioning System (24 Periods)
 - 2.1 Basic principle of refrigeration and air conditioning
 - 2.2 Working of centralized air conditioner
 - 2.3 Concept of split air conditioner and its applications
3. Pumps - Types and their uses (06 Periods)

PART B

CIVIL ENGINEERING

Theory

4. Construction Materials (12 Periods)

Properties and uses of various construction materials such as stones, bricks, lime, cement and timber along with their properties, physical/ field testing and uses, elements of brick masonry
5. Foundations (08 Periods)
 - i) Bearing capacity of soil and its importance
 - ii) Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines

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6. Concrete (06 Periods)

Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/ field testing of concrete, mixing of concrete

7. RCC (04 Periods)

Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building

LIST OF PRACTICES

1. Observe operation of a centrifugal pump and location of common faults
2. Decide the type of foundation to be used for various types of electrical machinery and installation. Prepare a foundation for installation of a motor/ generator.
3. Identify various types of drives used in an IC engines and describe their function
4. Observe operation of air conditioning system. Identify locations of faults.
5. Trace the various paths of hot gases, cool gases, control system in a split air conditioner model. Identify the possible location of faults/ malfunctioning.

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on basic principles and use charts in class, visits to Labs and industry may be arranged to demonstrate certain materials and practices.

TEXTBOOK:

1. Basic Civil and Mechanical Engineering by Jayagopal; Vikas Publications, New Delhi

RECOMMENDED BOOKS

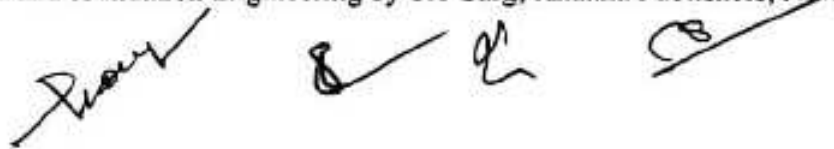
Mechanical Engineering

1. General Mechanical Engineering by M. Adithan; TTTI, Chandigarh
2. Basic Civil and Mechanical Engineering by Jayagopal; Vikas Publications, New Delhi
3. IC Engines and Automobile Engineering by Dr.MP Poonia, Standard Publishers, New Delhi
4. Refrigeration and Air Conditioning by RK Rajput; SK Kataria and sons; Ludhiana
5. Theory of Machines by RS Khurmi and JK Gupta; S. Chand and Company Ltd., New Delhi

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Civil Engineering

1. Textbook of Concrete Technology 2nd Edition by Kulkarni, PD Ghosh RK and Phul, YR; New Age International (P) Ltd., Publishers, New Delhi
2. Materials of Construction by Ghose; Tata McGraw Hill Publishing Co., Ltd., New Delhi
3. Civil Engineering Materials by TTTI, Chandigarh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Concrete Technology by Gambhir; Tata McGraw Hill Publishing Co., Ltd., New Delhi
5. Building Construction by J Jha and Sinha; Khanna Publishers, Delhi
6. Building Construction by Vazirani and Chandola; Khanna Publishers, New Delhi Delhi
7. Civil Engineering Materials by SV Deodhar and Singhai; Khanna Publishers, New Delhi Delhi
8. Soil Mechanics and foundation Engineering by SK Garg; Khanna Publishers, New Delhi Delhi



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EE305 ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS

L T P

Periods/week 3 - 4

RATIONALE

Diploma holders in Electrical Engineering have to work on various jobs in the field as well as in testing laboratories and on control panels, where they perform the duties of installation, operation, maintenance and testing by measuring instruments. Persons working on control panels in power plants, substations and in industries, will come across the use of various types of instruments and have to take measurements.

Instruments used to read and observe the general electrical quantities like current, voltage, power, energy, frequency, resistance etc and their wave shapes, have been incorporated in this subject. So the technician will know the construction and use of various types of electrical instruments.


DETAILED CONTENTS

1. Introduction to Electrical Measuring Instruments (07 Periods)
 - 1.1 Concept of measurement and measuring instruments
 - 1.2 Types of electrical measuring instruments – indicating, integrating and recording type instruments
 - 1.3 Essentials of indicating instruments – deflecting, controlling and damping torque
2. Ammeters and Voltmeters (Moving coil and moving iron type) (15 Periods)
 - 2.1 Concept of ammeters and voltmeters and difference between them
 - 2.2 Extension of range of voltmeters and ammeter
 - 2.3 Construction and working principles of moving Iron and moving coil instruments
 - 2.4 Merits and demerits, sources of error and application of these instruments
3. Wattmeters (Dynamometer Type) (06 Periods)

Construction, working principle, merits and demerits of dynamometer type wattmeter, sources of error
4. Energy meter (Induction type) (08 Periods)

Construction, working principle, merits and demerits of single-phase and three-phase energy meters

 - 4.1 Errors and their compensation
 - 4.2 Simple numerical problems
 - 4.3 Construction and working principle of maximum demand indicators

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5. Miscellaneous Measuring Instruments (22 Periods)

5.1 Construction, working principle and application of Meggar, Earth tester, Multimeter, Frequency meter (dynamometer type) single phase power factor meter (Electrodynamometer type). Working principle of synchroscope and phase sequence indicator, tong tester (Clamp-on meter), signal generator, AC milivoltmeter, tachometer

5.2 Instrument Transformers: Construction, working and applications

- a) CT
- b) PT and their ratio and phase angle error

6. Electronic Instruments (10 Periods)

6.1 Cathode Ray Oscilloscope: Block diagram, working principle of CRO and its various controls. Applications of CRO

6.2 Digital multi-meter, basic principle, constructional brief, display system

7. LCR meters (07 Periods)

Study of LCR meter and its applications
Digital LCR and Q meter

8. Power Measurements in 3-Phase Circuits by (05 Periods)

- (i) 2 wattmeter method in balanced and unbalanced circuits and simple problems
- (ii) Three wattmeter method

LIST OF PRACTICALS

1. Use of analog and digital multimeter for measurement of voltage, current (a.c/d.c) and resistance.
2. To calibrate 1-phase energy meter by direct loading method.
3. To measure the value of earth resistance using earth tester.
4. To measure power, power factor in a single-phase circuit, using wattmeter and power factor meter and to verify results with calculations.
5. Measurement of power and power factor of a three-phase balanced load by two wattmeter method.
6. Measurement of voltage and frequency of a sinusoidal signal using CRO time base as well as Lissagous pattern and draw wave shape of signal.
7. Measurement of power in a 3 phase circuit using CT, PT and 3-phase wattmeter.
8. Use of LCR meter, digital LCR meter for measuring inductance, capacitance and resistance.
9. To record all electrical quantities from the meters installed in the institution premises.
10. To measure Energy at different Loads using Single phase Digital Energy meter.

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INSTRUCTIONAL STRATEGY

After making the students familiar with measuring instruments, they should be made conceptually clear about the constructional features and make them confident in making connection of various measuring instruments. Teacher should demonstrate the application of each measuring instrument in laboratory and encourage students to use them independently.

TEXTBOOK:

1. Electrical Measurements and Measuring Instruments by Golding and Widdis
Wheeler Publishing House, New Delhi

RECOMMENDED BOOKS

1. Electrical Measurements and Measuring Instruments by Golding and Widdis
Wheeler Publishing House, New Delhi
2. Electrical Measurements and Measuring Instruments by SK Sahdev, Unique
International Publications, Jalandhar
3. A Course in Electrical Measurement and Measuring Instruments by AK Sawhney and
PL Bhatia; Dhanpat Rai and Sons, New Delhi
4. Electric Instruments by D. Cooper
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi,
New Age International (P) Ltd., Publishers, New Delhi
6. Electronics Instrumentation by Umesh Sinha, Satya Publication, New Delhi
7. Basic Electrical Measurements by Melville B. Staut
8. Electrical Measurement and Measuring Instruments by JB Gupta, SK Kataria and
Sons, New Delhi
9. Electrical Measurement and Measuring Instruments by ML Anand, SK Kataria and
Sons, New Delhi


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EEP306 ELECTRICAL WORKSHOP PRACTICE

L T P

Periods/week - - 6

RATIONALE

An electrical diploma holder will be required to inspect, test and modify the work done by skilled workers working under him. In addition, many a times, it will become necessary for him to demonstrate the correct method and procedure of doing a job. In order to carry out this function effectively, in addition to conceptual understanding of the method or procedure, he must possess appropriate manual skills. The subject aims at developing special skills required for repairing, fault finding, wiring in electrical appliances and installations.

DETAILED CONTENTS

1. Study of electrical safety measures as mentioned in the Electricity Rules and shock treatment including first aid
2. Types of wiring and to make different light control circuits in the following types of wiring Casing and capping, (PVC) conduct, baten wiring
3. Study of ISI standard for MCBs and ELCBs Conduct one test on MCB on above basis
4. Wiring of main distribution board with four outgoing circuits for light and fan loads including main switch and MCBs Types of wiring and to make different light control circuits in the following types of wiring.
 - 4.1 Casing and Capping (PVC) wiring
 - 4.2 Conduit wiring (surface/concealed)
5. Construction of distribution and extension board with two 5A sockets and two 15A sockets, a fuse and indicator with series test lamp provision controlled by their respective switches.
6. Testing of domestic wiring installation using meggar.
7. Fault finding and repair of a tube light circuit.
8. Carry out pipe/ plate earthing for a small house and 3 phase induction motor. Testing the earthing using earth tester.
9. Connection of single phase and three phase motors through an appropriate starter.
10. Winding/ rewinding of a fan (ceiling and table) and choke.
11. Repair of domestic electric appliances such as electric iron, geyser, fan, heat convactor, desert cooler, room heater, electric kettle, electric oven, electric furnace and weighing machine.

Note: Students may be asked to study control circuit of a passenger lift, automatic milling machine, etc. using relays.

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FOURTH SEMESTER

8 ✓

2 ✓

EE401 ELECTRICAL ENGINEERING DESIGN AND DRAWING

Periods/week L T P
 - - 6

RATIONALE

A polytechnic pass-out in electrical engineering is supposed to have ability to

- i) Read, understand and interpret engineering drawings
- ii) Communicate and co-relate through sketches and drawings
- iii) Prepare working drawings of panels, transmission and distribution

The contents of this subject has been designed to develop requisite knowledge and skills of electrical drawings in the students of diploma in electrical engineering.

DETAILED CONTENTS (To make 25 Sheets)

1. Symbols and Signs Conventions (2 Sheets) (06 Periods)

Various Electrical Symbols used in Domestic and Industrial Installation and Power System as per BIS

2. Panels/Distribution Boards (3 Sheets) (18 Periods)

Design and Drawing of panels/Distribution board using MCBs, ELCB, main switches and change over switches for domestic installation, industrial and commercial installation.

3. Orthographic projections of Simple Electrical Parts (4 Sheets) (12 Periods)

- Pin type and shackle type insulator (Pin Type 11kV/66kV)
- Bobbins of a small transformer / choke
- Stay insulators/Suspension type insulators
- Free hand sketching of M.C.B. and E.L.C.B Placed on Distribution Board.

4. Orthographic Projection of Machine Parts (4 Sheets) (12 Periods)

- Rotor of a squirrel cage induction motor
- Motor body (induction motor) as per IS Specifications (using outside dimensions)
- Slip rings of 3-phase induction Motor.
- Stator of 3 phase Induction motor (Sectional View)

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5. Contactor Control Circuits: Schematic and wiring diagram (3 Sheets) (24 Periods)
 - DOL Starter of 3-phase induction Motor
 - Forwarding/reversing of 3-phase induction motor
 - Limit switch control of a 3-phase induction motor
 - Sequence operation of two motors using T.D.R.
 - Two speed motor control
 - Automatic star-delta starter for 3-phase induction motor
6. Earthing – Layout of earthing of substation, earthing of poles, transformers (3 Sheets) (08 Periods)
7. Key diagram of 33/11 KVA substation (2 Sheets) (06 Periods)
8. Design/Drawing of application circuit used in intelligent building (04 sheets) (10 Periods)
 - a. Security system/intelligent camera/automatic recording/photography system
 - b. Stage lighting
 - c. Safety system
 - d. Centralized air-conditioning system
 - e. Computer Networking

INSTRUCTIONAL STRATEGY

Teacher should identify/prepare more exercises on the pattern shown above. The teacher should make the students confident in making drawing and layouts of electrical wiring installations and doing estimation and costing. This capability will lead the students to become a successful entrepreneur. Take the students to field/laboratory and show the material and equipment.

TEXTBOOKS

1. Electrical Engineering Design and Drawings by Surjeet Singh, Dhanpat Rai and Co, New Delhi

RECOMMENDED BOOKS

1. Electrical Engineering Design and Drawings by Surjeet Singh, Dhanpat Rai and Co, New Delhi
2. Electrical Engineering Design and Drawings by SK Bhattacharya, SK Kataria and Sons, New Delhi
3. Electrical Engineering Design and Drawings by Ubhi & Marwaha, IPH, New Delhi
4. Electrical Design and Drawing by SK Sahdev, Uneek Publications, Jalandhar
5. Electrical Engineering Drawing by Surjit Singh, SK Kataria and Sons, New Delhi

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EE402 D.C. MACHINES AND TRANSFORMERS

L P
Periods/week 3 2

RATIONALE

Electrical machines is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. After studying this subject, an electrical diploma holder must be competent to repair and maintain these machines and give suggestions to improve their performance. Practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications.

DETAILED CONTENTS

1. Introduction to Electrical Machines (08 Periods)
 - 1.1 Definition of motor and generator, concept of torque
 - 1.2 Torque development due to alignment of two fields and the concept of torque angle
 - 1.3 Electro-magnetically induced emf
 - 1.4 Elementary concept of an electrical machine
 - 1.5 Comparison of generator and motor
2. DC Machines (30 Periods)
 - 2.1 Main constructional features, Types of armature winding
 - 2.2 Function of the commutator for motoring and generation action
 - 2.3 Factors determining induced emf
 - 2.4 Factors determining the electromagnetic torque
 - 2.5 Types of dc generation on the basis of excitation, voltage built up in a dc shunt generator
 - 2.6 Significance of back e.m.f., the relation between back emf and Terminal voltage
 - 2.7 Armature Reaction
 - 2.8 Commutation methods to improve commutation
 - 2.9 Performance and characteristics of different types of DC motors
 - 2.10 Speed control of dc shunt/series motors
 - 2.11 Need of starter, three point dc shunt motor starter and 4-point starter
 - 2.12 Applications of DC motors
 - 2.13 Losses in a DC machine
 - 2.14 Determination of losses by Swinburne's test
3. Transformers (single phase) (30 Periods)
 - 3.1 Introduction
 - 3.2 Constructional features of a transformer and parts of transformer
 - 3.3 Working principle of a transformer
 - 3.4 EMF equation

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- 3.5 Transformer on no-load and its phasor diagram
 - 3.6 Transformer – neglecting voltage drop in the windings – Ampere turn balance – its phasor diagram
 - 3.7 Mutual and leakage fluxes, leakage reactance
 - 3.8 Transformer on load, voltage drops and its phasor diagram
 - 3.9 Equivalent circuit
 - 3.10 Relation between induced emf and terminal voltage, regulation of a transformer-mathematical relation
 - 3.11 Losses in a transformer
 - 3.12 Open circuit and short circuit test. Calculation of efficiency, condition for maximum efficiency-maintenance of Transformer, scheduled Maintenance
 - 3.13 Auto transformer construction, saving of copper, working and applications
 - 3.14 Different types of transformers including dry type transformer.
4. Transformers three phase (12 Periods)
- 4.1 Construction of three phase transformers and accessories of transformers such as Conservator, breather, Buchholz Relay, Tap Changer (off load and on load) (Brief idea)
 - 4.2 Types of three phase transformer i.e. delta-delta, delta-star, star-delta and star-star
 - 4.3 Conditions for parallel operation (only conditions are to be studied)
 - 4.4 On load tap changer
 - 4.5 Difference between power and distribution transformer
 - 4.6 Cooling of transformer

LIST OF PRACTICALS

1. Measurement of the angular displacement of the rotor of a slip-ring induction motor on application of DC to stator of motor winding in sequence and simultaneously to each phase of rotor winding
2. Speed control of dc shunt motor (i) Armature control method (ii) Field control method
3. Study and connection of dc series motor with starter (to operate the motor on no load for a moment)
4. Study and connection of 3 point starter for starting D.C. shunt motor and change its direction of rotation. Also draw load characteristics
5. To perform open circuit and short circuit test for determining: (i) equivalent circuit (ii) the regulation and (iii) efficiency of a transformer from the data obtained from open circuit and short circuit test at full load
6. To find the efficiency and regulation of single phase transformer by actually loading it.
7. Checking the polarity of the windings of a three phase transformer and connecting the windings in various configurations
8. Finding the voltage and current relationships of primary and secondary of a three phase transformer under balanced load in various configurations conditions such as
 - (a) Star-star
 - (b) Star delta
 - (c) Delta star
 - (d) Delta - Delta configuring conditions
9. To test primary/ secondary windings of a transformer.

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INSTRUCTIONAL STRATEGY

Electrical machines being a core subject of electrical diploma curriculum, where a student will deal with various types of electrical machines which are employed in industry, power stations, domestic and commercial appliances etc. After studying this subject, an electrical diploma holder must be competent to repair and maintain these machines and give suggestions to improve their performance. Special care has to be taken on conceptual understanding of concepts and principles in the subject. For this purpose exposure to industry, work places, and utilization of various types of electrical machine for different applications may be emphasized. Explanation of practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications.

TEXTBOOKS

1. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, Education Pvt Ltd.
New Delhi

RECOMMENDED BOOKS

1. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, Education Pvt Ltd.
New Delhi
2. Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar
3. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill, New Delhi
4. Electrical Machines by JB Gupta, SK Kataria and Sons, New Delhi
5. Electrical Machines by Fitzgerald
6. Electrical Machines by Smarajit Ghosh-Pearson Publishers, Delhi.


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RATIONALE

The syllabus has been designed to make the students having knowledge about the fundamental principles of digital electronics, microprocessor and to get familiar with the available IC chips. This subject aims to give a background in the broad field of digital systems design and microprocessors.

DETAILED CONTENTS**(A) Digital Electronics**

1. **Introduction** (02 Periods)
Distinction between analog and digital signal, Applications and advantages of digital signals.
2. **Number System** (06 Periods)
Binary, Octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa, binary addition, subtraction, multiplication and division including binary points. 1's and 2's complement method of addition/subtraction.
3. **Codes and Parity** (06 Periods)
Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code, Concept of parity, single and double entry and error detection, Alpha numeric codes : ASCII and EBCDIC
4. **Logic Gates and Families** (05 Periods)
Concept of negative and positive logic, Definition, Symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates, Logic family classification: Definition of SSI, MSI,LSI, VLSI,TTL and CMOS families.
5. **Logic Simplification** (08 Periods)
Postulates of Boolean algebra, De Morgan's Theorems . Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates. Karnaugh map (upto 4variables) and simple applications in developing combinational logic circuits.
6. **Arithmetic Circuits** (06 Periods)
Half adder and Full adder circuit, design and implementation, Half and Full subtractor circuit, design and implementation, 4 bit adder/subtractor, Adder and Subtractor IC
7. **Decoders, Multiplexers and De Multiplexers** (06 Periods)

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Four bit decoder circuits for 7 segment display and decoder/driver ICs, Multiplexers and De-Multiplexers, Basic function and block diagram of MUX and DEMUX. Different types and ICs.

8. Latches and flip flops

(06 Periods)

Concept and types of latch with their working and applications, Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops, Difference between a latch and a flip flop.

9. Counters

(06 Periods)

Introduction to Asynchronous and Synchronous counters, Binary counters, Divide by N ripple counters, Decade counter, Up/Down counter, Ring counter.

10. Shift Register

(06 Periods)

Introduction and basic concepts including shift left and shift right : Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.

11. A/D and D/A Converters

(02 Periods)

Working principle of A/D and D/A converters.

(B) MICROPROCESSORS

12. Evolution and Architecture of a Microprocessor

(With reference to 8085 microprocessor)

(08 Periods)

Typical organization of a microcomputer system and functions of its various blocks. Concept of Bus, bus organization of 8085, Function block diagram of 8085, Pin details of 8085, Steps to execute a stored program.

13. Programming (With respect to 8085 microprocessor)

(12 Periods)

Brief idea of machine and assembly languages, Machines and Mnemonic codes. Instruction format and Addressing mode. Identification of instruction as to which addressing mode they belong. Concept of instruction set. Explanation of the instructions of the following groups of instruction set. Data transfer group, Arithmetic Group, Logic Group, Stack, I/O and Machine Control Group. Programming exercises in assembly language.(Examples can be taken from the list of experiments)

LIST OF PRACTICALS

1. Verification & interpretation of truth tables for AND, OR, NOT NAND, NOR and Exclusive OR (EXOR) gates.
2. To design a half adder & full adder using gates and verification of their operation construction of a full adder circuit using XOR and NAND gates and verify its operations.
3. To design a half subtractor & full subtractor circuit with the help of gates & verify their operation.
4. 4 bit adder /subtractor circuit using an IC verify the operation.
5. Verify of truth table for decoder ICs.

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6. Verification of truth table of JK & JK Master slave flip flops.
7. To design a 4bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flop and verification of their operation.
8. Design decode counter and it's verification.
9. Design Analog to Digital & Digital to Analog converters and their verification.
10. To design a 4 bit binary counter & verify its truth table.
11. Steps to enter, modify data/program and to execute a program on 8085 kit.
12. Writing and execution of ALP for addition and subtractions of two 8 bit numbers.
13. Writing and execution of ALP for multiplication and division of two 8 bit numbers.
14. Writing and execution of ALP for arranging 10 numbers in ascending/descending order

Section 1.01 INSTRUCTIONAL STRATEGY

The digital systems and microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing), A/D, D/A Converters and other topics. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the tested in circulation may be given to the students.

TEXTBOOKS

1. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi

RECOMMENDED BOOKS

1. Digital Electronics: Principles and Integrated Circuits by A.K Maini, Wiley-India Pvt Ltd. Daryaganj, New Delhi
2. Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
4. Digital Electronics by Soumitra Kumar Mandal, Tata McGraw Hill Education Pvt Ltd,
5. Digital Electronics by V K Sangar , Raj Publishers, Jalandhar
6. Digital Electronics by Tokheim, Tata McGraw Hill Education Pvt Ltd,
7. Digital Electronics by RP Jain, Tata McGraw Hill Education Pvt Ltd, New Delhi
8. Digital Electronics by KS Jamwal, Dhanpat Rai and Co., New Delhi
9. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
10. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi

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11. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
12. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi
13. Fundamentals of Digital Electronics by Naresh Gupta, Jain Brothers, New Delhi
14. Introduction to Microprocessor by Mathur, Tata McGraw Hill Education Pvt Ltd, New Delhi
15. Microprocessor and Applications by Badri Ram: Tata McGraw Hill Education Pvt Ltd, New Delhi
16. Microprocessor 8086/88 by B.B. Brey

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EE404 GENERATION, TRANSMISSION AND DISTRIBUTION OF ELECTRICAL POWER

L P
Periods/week 3 2

RATIONALE

The majority of the polytechnic passouts who get employment in State Electricity Boards have to perform various activities in the field of Generation, Transmission and Distribution of Electrical power. The range of these activities vary from simple operation and maintenance of equipment, lines, fault location, planning and designing of simple distribution schemes, executive and supervisory control in power stations, transmission and distribution networks in addition to administrative jobs including public relations. They should also be made aware of recent developments, current practices in the electricity departments, corporations and boards to keep them abreast with modern techniques in Transmission and Distribution of Electrical Power.

DETAILED CONTENTS

1. Power Generation (15 Periods)
 - 1.1 Main resources of energy, conventional and non-conventional
 - 1.2 Different types of power stations, thermal, hydro, gas, diesel and nuclear power stations. Flow diagrams and brief details of their operation, comparison of the generating stations on the basis of running cost, site, starting, maintenance etc.
 - 1.3 Importance of non-conventional sources of energy in the present scenario. Brief details of solar energy, bio-energy, wind energy
2. Economics of Generation (10 Periods)
 - 2.1 Fixed and running cost, load estimation, load curves, demand factor, load factor, diversity factor, power factor and their effect on cost of generation, simple problems there on
 - 2.2 Base load and peak load power stations, inter-connection of power stations and its advantages, concept of regional and national grid
 - 2.3 Plant capacity factor, plant use factor, Daily load curve.
3. Transmission Systems (25 Periods)
 - 3.1 Layout of transmission system, selection of voltage for H.T and L.T lines, advantages of high voltage for Transmission of power in both AC and DC
 - 3.2 Comparison of different systems: AC versus DC for power transmission, conductor material and sizes from standard tables
 - 3.3 Constructional features of transmission lines: Types of supports, types of insulators, Types of conductors, Selection of insulators, conductors, earth wire and their accessories, Transposition of conductors and string efficiency of suspension type insulators, Bundle Conductors.
 - 3.4 Mechanical features of line: Importance of sag, calculation of sag, effects of wind and ice related problems; Indian electricity rules pertaining to clearance

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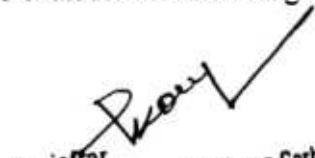
- 3.5 Electrical features of line: Calculation of resistance, inductance and capacitance without derivation in a.c. transmission line, voltage regulation, and concept of corona. Effects of corona and remedial measures
- 3.6 Transmission Losses
4. Distribution System (16 Periods)
- 4.1 Lay out of HT and LT distribution system, constructional feature of distribution lines and their erection. LT feeders and service mains; Simple problems on AC radial distribution system, determination of size of conductor
- 4.2 Preparation of estimates of HT and LT lines (OH and Cables)
- 4.3 Constructional features of LT (400 V), HT (11 kV) underground cables, advantages and disadvantages of underground system with respect to overhead system.
- 4.4 Calculation of losses in distribution system
- 4.5 Faults in underground cables-determine fault location by Murray Loop Test, Varley Loop Test
5. Power Factor (04 Periods)
- 5.1 Concept of power factor
- 5.2 Reasons and disadvantages of low power factor
- 5.3 Methods for improvement of power factor using capacitor banks, VAR Static Compensator (SVC)
6. Various types of Tariffs (10 Periods)
- 6.1 Concept of Tariffs
- 6.2 Block rate, flat rate, maximum demand and two part tariffs simple problems

LIST OF PRACTICALS

Structured visit to the substations, power stations, and LT/HT lines, student will prepare report and present in a seminar. Evaluation will be based on report as well as presentation.

INSTRUCTIONAL STRATEGY

Since this is a descriptive and practice oriented subject, it is suggested that visits to different types of power generating stations and substations including grid stations be arranged and various equipment, accessories and components explained to the students before the actual class room teaching and make them familiar with the equipment and accessories installed over there. There should be at least 3 visits during the semester. The students may be asked to prepare notes while on visit and submit the report and give seminar. In addition, viva-voce be conducted to evaluate the knowledge gained during the field visit.

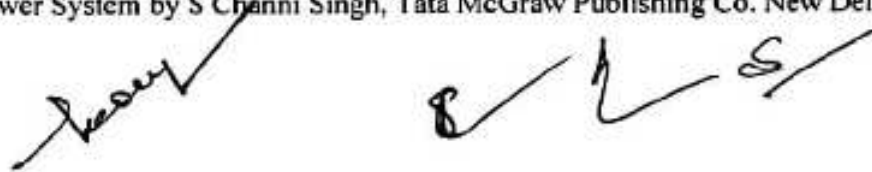

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TEXTBOOKS:

1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition, New Age International Publishers, New Delhi

RECOMMENDED BOOKS

1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition, New Age International Publishers, New Delhi
2. Substation Design and Equipment by Satnam and PV Gupta, Dhanpat Rai & Sons, New Delhi
3. Electrical Power –I by SK Sahdev, Uneek Publications, Jalandhar
4. Electrical Power System by VK Mehta, S Chand and Co., New Delhi
5. Electrical Power System by JB Gupta, SK Kataria and Sons, New Delhi
6. Sub-Station Design by Satnam, Dhanpat Rai and Co., New Delhi
7. Electrical Power Distribution System by AS Pabla, Tata McGraw Hill, New Delhi
8. Electrical Power System by S Channi Singh, Tata McGraw Publishing Co. New Delhi

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EE405 INDUSTRIAL INSTRUMENTATION AND CONTROL

L P
Periods/week 3 4

RATIONALE

This subject deals with the various instruments, their construction and working which control the various parameters and operations in any industry. Electrical supervisor employed for maintenance of electrical equipment/ machinery is required to diagnose faults, rectify them and test the total system for good performance. Thus there is a need of introducing diploma holders to the basics of Instrumentation. Basics of instrumentation has been dealt with in this subject

DETAILED CONTENTS

1. Measurements (05 Periods)
Importance of measurement, Basic measuring systems, advantages and limitations of each measuring systems, generalized measurement system, process and process variables
2. Transducers (08 Periods)
Theory, types of transducers construction and use of various transducers like resistance, inductance, capacitance, electromagnetic, piezoelectric type
3. Measurement of Displacement and Strain (10 Periods)
Displacement Measuring Devices: wire wound potentiometer, LVDT, strain gauges and their different types such as inductance type, resistive type, wire and foil type etc. Gauge factor, gauge materials, and their selections, sources of errors and its compensations. Use of electrical strain gauges, strain gauge bridges and amplifiers.
4. Force and Torque Measurement (10 Periods)
Different types of force measuring devices and their principles, load measurements by using elastic Transducers and electrical strain gauges. Load cells, proving rings. Measurements of torque by brake, dynamometer, electrical strain gauges, speed measurements; different methods, devices.
5. Pressure Measurement- Manometers, diaphragms (08 Periods)
Bourdon, bellows, manometer, diaphragm pressure gauges, basic principles, constructional brief and use, pickups, their principle, construction and applications. Use of pressure cells, Dead weight tester
6. Flow Measurement (06 Periods)
Basic principles of magnetic and ultrasonic flow meters, flow coefficient, Reynolds number and rotameter.

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7. Measurement of Temperature (10 Periods)
- Bimetallic thermometer, pressure thermometers, thermoelectric thermometers, resistance thermometers, thermocouple, thermistors and pyrometer, errors in temperature measurements in rapidly moving fluids, industrial thermocouple
8. Measurement of other non electrical quantities such as humidity, pH level and vibrations, light measurement, speed measurement using Tachometer and Stroboscope (08 Periods)
9. Signal conditioning and telemetry with small simple examples (05 Periods)
10. Recorder and display system brief idea (04 Periods)
11. Control System – Types of control system, open loop and close loop system, components and the circuit, brief description and application in industry, idea about automation (06 Periods)

INSTRUCTIONAL STRATEGY


The teacher should explain the scope of various measuring devices and their practical applications in the field. The transducers and measuring devices must be shown to the students and they should be trained in the reaction, operation, maintenance and calibrations. Frequent visits to nearby process industries will be of immense help to the students.


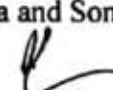

TEXTBOOKS

1. Electrical and Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Co., New Delhi

RECOMMENDED BOOKS

1. Electronic Measurement and Instrumentation by Dr Rajendra Prasad
2. Electronic Measurement and Instrumentation by JB Gupta, SK Kataria and Sons, New Delhi
3. Electrical and Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Co., New Delhi
4. Electronic Instrumentation and Measurement Techniques by WD Cooper, AD Helfrick Prentice Hall of India Pvt. Ltd. New Delhi
5. Industrial Instrumentation by Umesh Rathore, SK Kataria and Sons, New Delhi


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EE406 ESTIMATING AND COSTING IN ELECTRICAL ENGINEERING

L P

Periods/week 4 -

RATIONALE

A diploma holder in electrical engineering should be familiar to Indian Standards and relevant Electricity Rules. Preparation of good estimates is a professional's job, which requires knowledge of materials and methods to deal with economics. The contents of this subject have been designed keeping in view developing requisite knowledge and skills of estimation and costing in students of diploma in electrical engineering.

DETAILED CONTENTS

1. Introduction (12 Periods)

Purpose of estimating and costing, proforma for making estimates, preparation of materials schedule, costing, price list, preparation of tender document (with 2-3 exercises), net price list, market survey, overhead charges, labour charges, electrical point method and fixed percentage method, contingency, profit, purchase system, enquiries, comparative statements, orders for supply, payment of bills. Tenders – its constituents, finalization, specimen tender.

2. Types of wiring (18 Periods)

IE rules and safety codes, Cleat, batten, casing capping and conduit wiring, comparison of different wiring systems, selection and design of wiring schemes for particular situation (domestic and Industrial). Selection of wires and cables, wiring accessories and use of protective devices i.e. MCB, ELCB etc. Use of wire-gauge and tables (to be prepared/arranged)

3. Estimating and Costing (42 Periods)

3.1 Domestic installations; standard practice as per IS and IE rules. Planning of circuits, sub-circuits and position of different accessories, electrical layout, preparing estimates including cost as per schedule rate pattern and actual market rate (for house of two room set along with layout sketch), single storey building, auditorium hospital, cinema hall, computer networking, schools and others

3.2 Industrial installations; relevant IE rules and IS standard practices, planning, designing and estimation of installation for single phase motors of different ratings, electrical circuit diagram, starters, preparation of list of materials, estimating and costing exercises on workshop with single-phase, 3-phase motor load and the light load (3-phase supply system)

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- 3.3 Service line connections estimate for domestic upto 10 KW and Industrial loads upto 20 KW (over-head and underground connections) commercial load upto 100 KW, agriculture load 10 hp motor from pole to energy meter.

4. Estimating the material required for

(24 Periods)

- a) Transmission and distribution lines (overhead and underground) planning and designing of lines with different fixtures, earthing etc. based on unit cost calculations. Estimating of stay and poles, crossing of telephone lines, railway lines and bridge
- b) Substation - Types of substations, substation schemes and components, estimate of 11/0.4 KV pole mounted substation up to 200 KVA rating, methods of earthing of substations, Key Diagram of 66 KV/11KV and 11 KV/0.4 KV Substation and foundation preparation.
Single line diagram, layout sketching of outdoor, indoor 11kV sub-station or 33kV sub-station

INSTRUCTIONAL STRATEGY

Teacher should identify/prepare more exercises on the pattern shown above. The teacher should make the students confident in making drawing and layouts of electrical wiring installations and doing estimation and costing leading to preparation of small tender document.. This capability will lead the students to become a successful entrepreneur. Take the students to field/laboratory and show the material and equipment.

TEXTBOOKS

1. Estimating and Costing by Surjeet Singh, Dhanpat Rai & Co., New Delhi

RECOMMENDED BOOKS

1. Electrical Installation, Estimating and Costing by JB Gupta, SK Kataria and Sons, New Delhi
2. Estimating and Costing by SK Bhattacharya, Tata McGraw Hill, New Delhi
3. Estimating and Costing by Surjeet Singh, Dhanpat Rai & Co., New Delhi
4. Estimating and Costing by Qurashi
5. Estimating and Costing by SL Uppal, Khanna Publishers, New Delhi
6. Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH, New Delhi

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INDUSTRIAL TRAINING

Industrial training provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice.



For this purpose, students at the end of fourth semester need to be sent for industrial training for a minimum of 4 weeks duration to be organised during the semester break starting after IV Semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A teacher may guide a group of 4-5 students. A minimum of one visit by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

Internal assessment and external assessment have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry, if any. The components of evaluation will include the following.

- | | |
|--------------------------------------|-----|
| a) Punctuality and regularity | 15% |
| b) Initiative in learning new things | 15% |
| c) Relationship with workers | 15% |
| d) Industrial training report | 55% |


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FIFTH SEMESTER


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RATIONALE

Electrical machines is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. After studying this subject, an electrical diploma holder must be competent to repair and maintain these machines and give suggestions to improve their performance. Explanation of practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications

DETAILED CONTENTS

1. Synchronous Machines (30 Periods)
 - 1.1 Main constructional features of synchronous machine including commutator and brushless excitation system
 - 1.2 Generation of three phase emf
 - 1.3 Production of rotating magnetic field in a three phase winding
 - 1.4 Concept of distribution factor and coil span factor and emf equation
Armature reaction at unity, lag and lead power factor
 - 1.5 Operation of single synchronous machine independently supplying a load - Voltage regulation by synchronous impedance method
 - 1.6 Need and necessary conditions of parallel operation of alternators
Synchronizing an alternator (Synchroscope method) with the bus bars
 - 1.7 Operation of synchronous machine as a motor –its starting methods
 - 1.8 Effect of change in excitation of a synchronous motor
 - 1.9 Concept and Cause of hunting and its prevention
 - 1.10 Rating and cooling of synchronous machines
 - 1.11 Applications of synchronous machines (as an alternator, as a synchronous condenser)
2. Induction Motors (20 Periods)
 - 2.1 Salient constructional features of squirrel cage and slip ring 3-phase induction motors
 - 2.2 Principle of operation, slip and its significance
 - 2.3 Locking of rotor and stator fields
 - 2.4 Rotor resistance, inductance, emf and current
 - 2.5 Relationship between copper loss and the motor slip
 - 2.6 Power flow diagram of an induction motor
 - 2.7 Factors determining the torque

- 2.8 Torque-slip curve, stable and unstable zones
- 2.9 Effect of rotor resistance upon the torque slip relationship
- 2.10 Double cage rotor motor and its applications
- 2.11 Starting of 3-phase induction motors, DOL, star-delta, auto transformer
- 2.12 Causes of low power factor of induction motors
- 2.13 Testing of 3-phase motor on no load and blocked rotor test and to find efficiency
- 2.14 Speed control of induction motor
- 2.15 Harmonics and its effects, cogging and crawling in Induction Motors

3. Fractional Kilo Watt (FKW) Motors (18 Periods)

- 3.1 Single phase induction motors; Construction characteristics and applications
- 3.2 Nature of field produced in single phase induction motor
- 3.3 Split phase induction motor
 - 3.3.1 Capacitors start and run motor
 - 3.3.2 Shaded pole motor
 - 3.3.3 Reluctance start motor
- 3.4 Alternating current series motor and universal motors
- 3.5 Single phase synchronous motor
 - 3.5.1 Reluctance motor
 - 3.5.2 Hysteresis motor
- 3.6 Comparison of 3 phase and Single phase Induction motor
- 3.7 Application of 3 phase and Single phase Induction motor

4. Special Purpose Machines (12 Periods)

Construction and working principle, characteristics and applications of linear induction motor, stepper motor, Servomotor, Submersible Motor, Introduction to Energy efficient Motors.

LIST OF PRACTICALS

- 1. Demonstration of revolving field set up by a 3-phase wound stator
- 2. To plot relationship between no load terminal voltage and excitation current in a synchronous generator at constant speed
- 3. Determination of the relationship between the voltage and load current of an alternator, keeping excitation and speed constant
- 4. Determination of the regulation and efficiency of alternator from the open circuit and short circuit test
- 5. Synchronization of poly phase alternators and load sharing
- 6. Determination of the effect of variation of excitation on performance of a synchronous motor
- 7. Study of ISI/BIS code for 3-phase induction motors
- 8. Perform at least two tests on a 3- phase induction motor as per BIS code

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9. Determination of efficiency by (a) no load test and blocked rotor test on an induction motor (b) direct loading of an induction motor (refer BIS code)
10. Determination of effect of rotor resistance on torque speed curve of an induction motor
11. To study the effect of a capacitor on the starting and running of a single-phase induction motor by changing value of capacitor and also to reverse the direction of rotation of a single phase induction motor
12. Slip and slip measurement of three phased induction motor

INSTRUCTIONAL STRATEGY

Teacher should lay-emphasis on development of understanding amongst students about basic principles of operation and control of electrical machines. This may be achieved by conducting quiz tests and by giving home assignments. The teachers should also conduct laboratories classes themselves encouraging each student to perform with his/her own hands and draw conclusions.

TEXTBOOKS:

1. Electrical Machines by Samarjit Ghosh, Pearson Education (Singapore) Pvt., Ltd. 482, FIE Patparganj, Delhi 110092

RECOMMENDED BOOKS

1. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, New Delhi
2. Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar
3. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill, New Delhi
Electrical Engineering by JB Gupta, SK Kataria and sons, New Delhi
4. Electrical Machines by Samarjit Ghosh, Pearson Education (Singapore) Pvt., Ltd. 482, FIE Patparganj, Delhi 110092
5. Electrical Machines by DR Arora, Ishan Publications, Ambala City


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EE503 SUBSTATION, SWITCHGEAR AND PROTECTION

L P
Periods/week: 3 2

RATIONALE

In view of the complexities associated with the modern interconnected power stations, the responsibilities and the job requirements of a diploma pass out have become more complex than what they used to be earlier. He is required to work with modern electrical equipment and maintain reliability of supply. The course is designed to understand the concepts, principles involved in the construction and working of generating stations and protective switch gear system so that one can handle, install, maintain them and also take decisions at his/her level in different situations. The teaching of this subject requires reinforcement in the form of visits to substations, power stations and well designed laboratory experiences. A practice-oriented approach to the teaching of this subject is suggested.

DETAILED CONTENTS

1. Substations (08 Periods)
 - 1.1 Brief idea about substations - outdoor grid sub-station 400, 220, 132 KV, and 66 and 33 KV; 11 KV, outdoor pole and plinth mounted substations
 - 1.2 Layout of 33/11 KV and 11KV/400V distribution substation and various auxiliaries and equipment associated with these
2. Faults (06 Periods)

Common type of faults in both overhead and underground systems, symmetrical/ unsymmetrical faults. Single line to ground fault, double line to ground fault, 3-phase to ground fault and open circuit. Simple problems relating to fault finding.
3. Switch Gears (15 Periods)
 - 3.1 Purpose of protective gear. Difference between switch, isolator and circuit breakers. Function of isolator and circuit breaker. Making capacity and breaking capacity of circuit breaker (only definition)
 - 3.2 Circuit breakers. Types of circuit breakers, construction and working of bulk and minimum oil circuit breakers, air blast circuit breakers, vacuum circuit breaker, SF6 circuit breaker and circuit breaker rating
 - 3.3 Principles of Arc extinction blast circuit breakers in OCB and ACB. Constructional features of OCB, ACB, and their working, Method of arc extinction
 - 3.4 Portable circuit breakers - MCB, MCCB, ELCB, for distribution and transmission system description only

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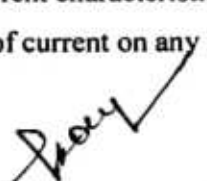
4. Protection Devices (15 Periods)
- 4.1 Fuses; function of fuse. Types of fuses, HV and LV fuses, rewire-able, cartridge, HRC
 - 4.2 Earthing: purpose of earthing, method of earthing, Equipment earthing, Substation earthing, system earthing as per Indian Electricity rules. Methods of reducing earth resistance
 - 4.3 Relays
 - a) Introduction - types of relays. Electromagnetic and thermal relays, their construction and working
 - b) Induction type over-current, earth fault relays, instantaneous over current relay
 - c) Directional over-current, differential relays, their functions
 - d) Distance relays their functions
 - e) Idea of static relays and their applications
5. Protection Scheme (10 Periods)
- 5.1 Relays for generator protection
 - 5.2 Relays for transformer, protection including Buchholtz relay protection
 - 5.3 Protection of feeders and bus bars, over current and earth fault protection.
 - 5.4 Distance protection for transmission system
 - 5.5 Relays for motor protection
6. Over-voltage Protection (10 Periods)
- 6.1 Protection of system against over voltages, causes of over voltages, utility of ground wire, surge absorber
 - 6.2 Lightning arrestors, rod gap, horn gap, metal oxide type.
 - 6.3 Transmission Line and substation protection against over-voltages and lightning
 - 6.4 Transient over voltage protection

Note: Students may be taken to various Sub-stations/ Grid Stations. Students must be familiarized with present tariff system employed by State Electricity Boards.

LIST OF PRACTICALS

Visit to power station/substation for the conduct of following practical work:

1. Testing of the dielectric strength of transformer oil and air
2. Study of different types of circuit breakers and isolators
3. Plot the time current characteristics of over current relay
4. Perform the overload and short circuit test of MCB as per IS specifications
5. Plot the time-current characteristics of Kit-Kat fuse wire
6. Taking reading of current on any LT line with clip on meter


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INSTRUCTIONAL STRATEGY

Since this is a descriptive and practice oriented subject, it is suggested that visits to different types of generating stations and substations be arranged and various equipment, accessories and components explained to the students. The protection schemes should be shown at the site and engineers from field may be invited for delivering expert lectures on these topics. Help of Video Films may be taken to explain the layout, construction and working of different power equipment.

TEXTBOOKS:

1. Testing, Commissioning , Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi

RECOMMENDED BOOKS

1. Testing, Commissioning , Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi
2. Electrical Power – II by SK Sahdev, Uneek Publications, Jalandhar (Pb)
3. Electrical Power Systems by CL Wadhwa, Wiley Eastern Ltd., New Delhi
4. Textbook of Electrical Technology by BL Theraja, S Chand and Co., New Delhi
5. Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
6. A Course in Electrical Power by ML Soni, PV Gupta and Bhatnagar, Dhanpat Rai & Sons, New Delhi
7. Principles of Power Systems by VK Mehta, S Chand and Co., New Delhi
8. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson Publishing House, Ludhiana

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EE504 INSTALLATION AND MAINTENANCE OF ELECTRICAL EQUIPMENTS

	L	P
Periods	3	4

RATIONALE

In his career as a supervisor, an electrical engineering technician will be called upon to inspect, test and modify the work done by skilled workers or artisans working under him. Many a times it will become necessary for him to demonstrate the correct method and procedure of doing certain operations. Normally manufacturers of heavy electrical equipment provide service manuals, instructions for installation, maintenance and fault location. Indian Electricity Rules and Indian Standard Specifications also provide enough guidelines.

This syllabus has been designed to provide certain guidelines and broad principles regarding the above activities. Appropriate field trips will reinforce the learning by students.

DETAILED CONTENTS

1. Tools and Accessories (11 Periods)

Tools, accessories and instruments required for installation, maintenance and repair work Knowledge of Indian Electricity rules, safety codes, causes and prevention of accidents, artificial respiration of an electrocuted person, workmen's safety devices

2. Installation (35 Periods)

2.1 Domestic Installation

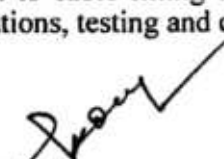
Introduction, testing of electrical installation of a building, testing of insulation resistance to earth, testing of insulation and resistance between conductors continuity or open circuit test, short circuit test, testing of earthing, continuity, location of faults

2.2 Installation of transmission and Distribution Line

- Erection of steel structures, connecting jumpers, tee-off points, joints and dead ends; crossing of roads, streets, power/telecommunication lines and railway line, clearances; earthing of transmission lines and guarding, spacing and configuration of conductors: Types of arrangement for suspension and strain insulators, bird guards, anti-climbing devices and danger plates; sizes of conductor, earthwire and guy wires, Testing and Commissioning.
- Laying of service lines, earthing, provision of service fuses, installation of energy meters

2.3 Laying of Underground Cables

Inspection, storage, transportation and handling of cables, cable handling equipment, cable laying depths and clearances from other services such as: water pipes, sewerage, gas pipes, power and telecommunication cables and coordination with these services, excavation of trenches, direct cable laying, laying of cable from the drum, laying of cable in the trenches, back filling of trenches with earth or sand, laying protective layer of bricks etc, laying of cables into pipes and conduits and within buildings, introduction to cable filling compounds, epoxy resins and hardeners, cable jointing and terminations, testing and commissioning.


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- 2.4 Elementary idea regarding, inspection and handling of transformers; pole mounted substations, plinth mounted substations and grid substation, busbars, isolators, voltage and current transformers, lightning arrestors, control and relay panels, HT/LT circuit breakers, LT switches, installation of power/distribution transformers, dehydration. Earthing system, fencing of yard, equipment foundations and trenches etc..
- 2.5 Handling and inspection of electric motors and generators (AC and DC), drying out medium voltage distribution panels, testing and commissioning
3. Maintenance Preventive, Predictive, Breakdown maintenance (50 Periods)
- 3.1 Types of maintenance, maintenance schedules, procedures
- 3.2 Maintenance of Transmission and Distribution System
- Authorized persons, danger notice, caution notice, permit to work, arranging of shutdowns personally and temporary earths, cancellation of permit and restoration of supply
 - Patrolling and visual inspection of lines - points to be noted during patrolling from ground; special inspections and night inspections
 - Location of faults using Megger, effect of open or loose neutral connections, provision of proper fuses on service lines and their effect on system, causes of dim and flickering lights
- 3.3 Maintenance of Distribution Transformers
- Transformer maintenance and points to be attended to in respect of various items of equipment
 - Checking of insulation resistance, transformer oil level BDV test of oil and measurement of earth resistance, maintenance of breathers and oil level indicators
- 3.4 Maintenance of Grid Substations
- Checking and maintenance of busbars, isolating switches, HT/LT circuit breakers, LT switches. Power transformers
- 3.5 Maintenance of Motors
- Over hauling of motors, preventive maintenance, trouble shooting of electric motors

LIST OF PRACTICALS

1. Preventive maintenance of different electrical equipments available in electrical laboratories
2. Corrective maintenance of different equipments which may occur faulty during experiments/use
3. Trouble shooting of
 - Water Boiler
 - Geyser
 - Generator set
 - Pumping set
 - Heating ovens

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4. Patrolling inspection and fault finding of lines
5. Open circuit/Short circuit/earth fault finding of machines
6. Installation of motors, Diesel Generating set
7. Laying of underground cables
8. Detecting of faults in underground cables
9. Case study of maintenance department of industry/electricity board

INSTRUCTIONAL STRATEGY


This subject needs theoretical and practical inputs. Demonstration at actual site may be arranged for conceptual understanding. The subject teacher should plan in advance about the visits to the actual sites and establish liaison with the appropriate authorities/ persons with the help of HOD and Principal of the institution. The students be taken to actual workplace and explained various test procedures.

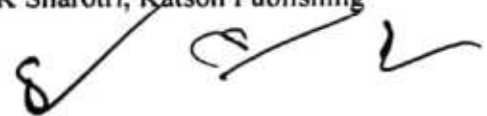
TEXTBOOKS:

1. Testing, Commissioning, Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi

RECOMMENDED BOOKS

1. Testing, Commissioning, Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi
2. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson Publishing House, Ludhiana


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EE505 ENERGY MANAGEMENT

L P
Periods 3 -

RATIONALE

One of the reasons for India not been able to catch up with the desired extent of modernization of industrial processes in light of challenges posed by multinationals is the non-availability of required energy supply. The solution primarily lies in tapping all possible energy generation sources and efficient use of available energy important. Energy management focuses on these aspects. This course will develop awareness amongst the diploma engineers and will enable them to practice the energy management techniques in whatever field they are engaged in.

DETAILED CONTENTS

1. Energy Management (10 Periods)
 - 1.1 Overview of energy management, need for energy conservation, Environmental Aspects
 - 1.2 Need for energy conservation with brief description of oil and coal crisis
 - 1.3 Alternative sources of energy
 - 1.4 Energy efficiency- its significance
2. Energy Conservation (20 Periods)
 - 2.1 Energy conservation opportunity and measures
 - 2.2 Energy conservation in Domestic sector- Lighting, Home appliances
 - 2.3 Energy conservation in Industrial sector-Industrial lighting, Distribution system, Motor Pumps, Fans, Blowers etc
 - 2.4 Energy conservation in Agriculture sector Tubewell pumps, Diesel-generating sets, Standby energy sources
 - 2.5 Macro Level approach for energy conservation at design stage
3. Energy Efficient Devices (25 Periods)
 - 3.1 Energy efficient technology an overview
 - 3.2 Need for energy efficient devices
 - 3.2 Initial cost versus life cycle, cost analysis on life cycle basis
 - 3.3 Energy efficient motors as compared to standard motors.
 - 3.4 BIS standards for energy efficient motors, BIS salient design features,
 - 3.5 Efficiency as a function of load, safety margins
 - 3.6 Energy efficient lighting system different sources, lumens/watt, LEDs, role of voltage on efficiency
 - 3.7 Distribution system- Optimum cable size, amorphous core transformer, role of power factor, use of compensating capacitors-manual and automatic, location of capacitors
4. Energy Audit (21 Periods)
 - 4.1 Energy audit methodology
 - 4.2 Efficiency of energy conversion processes, monitoring system

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- 4.3 Specific energy consumption –three pronged approach, fine tuning, technical up gradation, avoidable losses.
- 4.4 Case studies of energy audit of distribution system, AC motors, Industries, audit activities.

5. Environmental Impact Assessment (10 Periods)

- 5.1 Need for environmental impact assessment
- 5.2 Standard format for assessment and its completion
- 5.3 Evaluation of the assessment

6. Case study of energy management (10 Periods)

INSTRUCTIONAL STRATEGY

While explaining the need and energy management, the teacher should give students home assignments based on energy conservation. The students should be made familiar with the energy efficient devices, various approaches to conserve energy and energy auditing procedure etc. Best learning will take place if students are given real life problems on energy audit.

TEXTBOOKS:

- 1. Energy Conservation-case studies in ceramic industry, sugar industry, fertilizer industry, cement industry. CII, Energy Management Cell etc
- 2. Sources: Internet Notes

RECOMMENDED BOOKS

- 1. Manual on Energy Efficiency at Design Stage, CII Energy Management Cell
- 2. Manual on Energy Efficiency in Pumping System, CII Energy Management Cell
- 3. Manual on Variable Speed Drives for Energy Efficiency CII Energy Management Cell
- 4. Energy Conservation-case studies in ceramic industry, sugar industry, fertilizer industry, cement industry. CII, Energy Management Cell etc.

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EE506 INDUSTRIAL ELECTRONICS AND CONTROL OF DRIVES

L P
Periods 3 3

RATIONALE

Industrial electronics plays a very vital role in the field of control engineering specifically in the modern industries as they mostly use electronic controls, which are more efficient, effective and precise as compared to the conventional methods. The old magnetic and electrical control schemes have all become obsolete. Electrical diploma holder many times has to maintain the panels used in the modern control process. Therefore, the knowledge of components like thyristors and other semiconductor devices used in such control panels is must for them in order to supervise the work efficiently and effectively. Looking in to usefulness and importance of the subject this has been incorporated in the curriculum.

DETAILED CONTENTS

1. Introduction to SCR (20 Periods)
 - 1.1 Construction and working principles of an SCR, two transistor analogy and characteristics of SCR
 - 1.2 SCR specifications and rating
 - 1.3 Construction, working principles and V-I characteristics of DIAC, TRIAC
 - 1.4 Basic idea about the selection of heat sinks for SCR and TRIACS
 - 1.5 Methods of triggering a Thyristor. Study of triggering circuits
 - 1.6 UJT, its Construction, working principles and V-I characteristics, UJT relaxation oscillator
 - 1.7 Commutation of Thyristors (Concept)
 - 1.8 Series and parallel operation of Thyristors
 - 1.9 Applications of SCR, TRIACS such as light intensity control, speed control of DC and universal motor, fan regulator, battery charger, temperature control
 - 1.10 Protection of SCR
 - 1.11 Snubber Circuit
2. Controlled Rectifiers (13 Periods)
 - 2.1 Single phase half wave controlled rectifier with resistive load and inductive load, concept of freewheeling diode.
 - 2.2 Single phase half controlled full wave rectifier (No mathematical derivation)
 - 2.3 Single phase fully controlled full wave rectifier bridge
 - 2.4 Single phase full wave centre tapped rectifier
 - 2.5 Three phase full wave half controlled bridge rectifier
 - 2.6 Three phase full wave fully controlled bridge rectifier
3. Inverters, Choppers, Dual Converters and Cyclo Converters (21 Periods)
 - 3.1 Inverter-introduction, working principles, voltage and current driven series and parallel inverters and applications
 - 3.2 Choppers-introduction, types of choppers and their working principles and applications
 - 3.3 Dual converters-introduction, working principles and applications
 - 3.4 Cyclo-converters- introduction, types, working principles and applications

4. Thyristor Control of Electric Drives (18 Periods)
- 4.1 DC drives control (Basic Concept)
 - 4.2 Half wave drives
 - 4.3 Full wave drives
 - 4.4 Chopper drives
 - 4.5 AC drives control
 - 4.6 Phase control
 - 4.7 Variable frequency a.c. drives
 - 4.8 Constant V/F application
 - 4.9 Voltage controlled inverter drives
 - 4.10 Constant current inverter drives
 - 4.11 Cyclo convertors controlled AC drives
 - 4.12 Slip control AC drives
5. Uninterrupted Power Supplies (08 Periods)
- 5.1 UPS, Stabilizers, SMPS
 - 5.2 UPS online, off line
 - 5.3 Storage devices (batteries)

LIST OF PRACTICALS

1. To draw V-I characteristics of an SCR
2. To draw V-I characteristics of a TRIAC
3. To draw V-I characteristics of a DIAC
4. To draw uni-junction transistor characteristics
5. Observe the output wave of an UJT relaxation oscillator
6. Observe the wave shape across SCR and load of an illumination control circuit
7. Fan speed regulator using TRIAC
8. Speed-control of a DC shunt motor or universal motor
9. To observe the output wave shape on CRO of a Single phase half controlled full wave rectifier
10. Single phase controlled rectifier
11. Use of Variable Frequency Drive for running a 3 phase Induction motor

INSTRUCTIONAL STRATEGY

The teachers may encourage students to perform practical simultaneously for better understanding of the subjects and verification of theoretical concepts. The various components must be shown to the students for identification and also tested. Practical applications of the various circuits and devices should be discussed in the class. The available video films on the subject must be shown to the students.

TEXTBOOKS:

1. Industrial Electronics and Control of Drives by SK Sahdev, Uneek Publication, Jalandhar

RECOMMENDED BOOKS

1. Industrial Control Electronics. John Webb, Kevin Greshock, Maxwell, Macmillan International editions
2. Fundamentals of Power Electronics by S Rama Reddi, Narosa Publishing House Pvt. Ltd, New Delhi
3. Power Electronics, Circuits Devices and Applications by Mohammad H. Rashid
4. Power Electronics by PC Sen
5. Power Electronics by Dr. PS Bhimbra, Khanna Publishers, New Delhi

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6. Industrial Electronics & Control by SK Bhattacharya & S Chatterji, New Age international Publications(P) Ltd, New Delhi
7. Industrial Electronics and Control of Drives by SK Sahdev, Uneek Publication, Jalandhar
8. Industrial Power Electronics by JC Karhava, King India Publication,
9. Fundamentals of Electrical Drives by Gopal K Dubey, Narosa Publishing House Pvt. Ltd, New Delhi
10. Power Electronics and Controls by Samir K Datta, Prentice Hall of India, New Delhi



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EE507 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

	L	T	P
Periods	3	-	-

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

DETAILED CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction (23 Periods)
 - Concept /Meaning and its need
 - Qualities and functions of entrepreneur and barriers in entrepreneurship
 - Sole proprietorship and partnership forms of business organisations
 - Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP)
2. Market Survey and Opportunity Identification (17 Periods)
 - Scanning of business environment
 - Salient features of National and State industrial policies and resultant business opportunities
 - Types and conduct of market survey
 - Assessment of demand and supply in potential areas of growth
 - Identifying business opportunity
 - Considerations in product selection
3. Project report Preparation (14 Periods)
 - Preliminary project report
 - Detailed project report including technical, economic and market feasibility
 - Common errors in project report preparations
 - Exercises on preparation of project report

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4. Introduction to Management (06 Periods)

(06 Periods)

- Line organisation
- Line and staff organisation
- Functional Organisation

(05 Periods)

- Definition and Need
- Qualities and functions of a leader
- Manager Vs leader
- Types of leadership

(10 Periods)

- Introduction and objective
- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

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d) Financial Management

- Introductions, importance and its functions
- Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT

7. Miscellaneous Topics (05 Periods)

a) Customer Relation Management (CRM)

- Definition and need
- Types of CRM

b) Total Quality Management (TQM)

- Statistical process control
- Total employees Involvement
- Just in time (JIT)

c) Intellectual Property Right (IPR)

- Introductions, definition and its importance
- Infringement related to patents, copy right, trade mark

Note: In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

TEXTBOOK:


1. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi


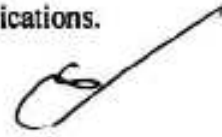

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
4. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi

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5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.
8. Entrepreneurship by Alpina Trehan; Dream Tech. Press
9. Entrepreneurship by Manimali; Viz Tantra Publications
10. Patterns of Entrepreneurship by Kalpana; Wiley India Publications.


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SIXTH SEMESTER

8/2

EE601 UTILIZATION OF ELECTRICAL ENERGY

LP
Periods 32

RATIONALE

This subject assumes importance in view of the fact that an electrical technician has to work in a wide spectrum of activities wherein he has to make selection from alternative schemes making technical and economical considerations; e.g. to plan and design an electrical layout using basic principles and handbooks, to select equipment, processes and components in different situations. The contents have been designed keeping the above objectives in view. Besides giving him basic knowledge in the topics concerned, attempts have been made to ensure that the knowledge acquired is applied in various fields as per his job requirements. To orient the subject matter in the proper direction, visits to industrial establishments are recommended in order to familiarize the students with the new developments in different areas

DETAILED CONTENTS

1. Illumination: (12 Periods)
 - 1.1 Nature of light, visibility spectrum curve of relative sensitivity of human eye and wave length of light
 - 1.2 Definition: Luminous flux, solid angle, luminous intensity, illumination, luminous efficiency, depreciation factor, coefficient of utilization, space to height ratio, reflection factor, glare, shadow, lux.
 - 1.3 Laws of illumination – simple numerical
 - 1.4 Different type of lamps, construction and working of incandescent and discharge lamps – their characteristics, fittings required for filament lamp, mercury vapour sodium lamp, fluorescent lamp, halogen lamp, neon lamp, compact fluorescent lamp(CFL), LED Lamp, comparison of incandescent, fluorescent, CFL LED
 - 1.5 Calculation of number of light points for interior illumination, calculation of illumination at different points, considerations involved in simple design problems. Illumination schemes; indoor and outdoor illumination levels
 - 1.6 Main requirements of proper lighting; absence of glare, contrast and shadow
 - 1.7 Awareness about time switches, street lighting, flood lighting, monument lighting and decorative lighting, light characteristics etc.

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2. Electric Heating

(10 Periods)

2.1 Advantages of electrical heating

2.2 Heating methods:

2.2.1 Resistance heating – direct and indirect resistance heating, electric ovens, their temperature range, properties of resistance heating elements, domestic water heaters and other heating appliances, thermostat control circuit

2.2.2 Induction heating; principle of core type and coreless induction furnace, their construction and applications

2.2.3 Electric arc heating; direct and indirect arc heating, construction, working and applications of arc furnace

2.2.4 Dielectric heating, applications in various industrial fields

2.2.5 Infra-red heating and its applications (construction and working of two appliances)

2.2.6 Microwave heating and its applications (construction and working of two appliances)

2.2.7 Solar Heating

2.3 Calculation of resistance heating elements (simple problems)

3. Electric Welding

(10 Periods)

3.1 Advantages of electric welding

3.2 Welding method

3.2.1 Principles of resistance welding, types – spot, projection, seam and butt welding, welding equipment

3.2.2 Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method and their applications. Power supply requirement. Advantages of using coated electrodes, comparison between AC and DC arc welding, welding control circuits, welding of aluminum and copper

4. Electrolytic Processes (20 Periods)

4.1 Need of electro-deposition

4.2 Laws of electrolysis, process of electro-deposition - clearing, operation, deposition of metals, polishing and buffing

4.3 Equipment and accessories for electroplating

4.4 Factors affecting electro-deposition

4.5 Principle of galvanizing and its applications

4.6 Principles of anodizing and its applications

4.7 Electroplating of non-conducting materials

4.8 Manufacture of chemicals by electrolytic process

4.9 Power supplies for electroplating

5. Electrical Circuits used in Refrigeration, Air Conditioning and Water Coolers (10 Periods)

5.1 Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly refrigerants

5.2 Description of Electrical circuit used in

- a) Refrigerator,
- b) Air-conditioner, and
- c) Water cooler

6. Electric Drive (20 Periods)

6.1 Advantages of electric drives

6.2 Characteristics of different mechanical loads

6.3 Types of motors used as electric drive

6.4 Electric braking

6.4.1 Plugging

6.4.2 Rheostatic braking

6.4.3 Regenerative braking

6.5 General idea about the methods of power transfer by direct coupling by using devices like belt drive, gears, chain drives etc.

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- 6.6 Examples of selection of motors for different types of domestic loads
- 6.7 Selection of drive for applications such as general workshop, textile mill, paper mill, steel mill, printing press, crane and lift etc. Application of flywheel.
- 6.8 Specifications of commonly used motors e.g. squirrel cage motors, slip ring induction motors, AC series motors, Fractional kilo Watt(FKW) motors
- 6.9 Selection of motors for Domestic Appliances
- 7. Electric Traction: (10 Periods)
 - 7.1 Advantages of electric traction over other types of traction.
 - 7.2 Different systems of electric traction, DC and AC systems, diesel electric system, types of services – urban, sub-urban, and main line and their speed-time curves
 - 7.3 Different accessories for track electrification; such as overhead catenary wire, conductor rail system, current collector-pentagraph
 - 7.4 Factors affecting scheduled speed
 - 7.5 Electrical block diagram of an electric locomotive with description of various equipment and accessories used.
 - 7.6 Types of motors used for electric traction
 - 7.7 Power supply arrangements
 - 7.8 Starting and braking of electric locomotives
 - 7.9 Introduction to EMU and metro railways
 - 7.10 Train Lighting Scheme

LISIT OF PRACTICALS

Students should be taken for (1) visit to nearest electrified railway track and railway station (2) visit to study the electric traction system (3) industrial visit to study the electric installation in a building, (4) visit to electrolysis process. They have to prepare report prepare a report. The evaluation of practical work will be made on the basis of report and presentation.

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INSTRUCTIONAL STRATEGY


It is desired to give ample practical examples in the class while teaching this subject. Teacher must supplement his/her classroom teaching with aids such as models, charts, and video films from time to time. This subject requires demonstrations and exposure to actual workplace/industry/field. For this purpose, the subject teacher should do advance planning for visits/studies related to each topic in consultation with HOD and Principal of the polytechnic/institution.

TEXTBOOKS:

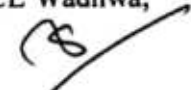
1. Utilization of Electrical Energy by JB Gupta, Kataria Publications, Ludhiana

RECOMMENDED BOOKS

1. Art and Science of Utilization of Electrical Energy by H Partap, Dhanpat Rai & Sons, Delhi
2. Utilization of Electrical Energy by JB Gupta, Kataria Publications, Ludhiana
3. Utilization of Electrical Energy by Sahdev, Uneek Publication, Jalandhar
4. A Text Book. of Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
5. Modern Electric Traction by H Partap, Dhanpat Rai & Sons, Delhi
6. Utilization of Electrical Energy by OS Taylor, Pitman Publications
7. Generation, Distribution and Utilization if Electrical Power by CL Wadhwa, Wiley Eastern Ltd., New Delhi


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EE602 MICRO HYDEL AND NON CONVENTIONAL ENERGY SOURCE

L T P

Periods/ week: 3 - 2

RATIONALE

Energy is a crucial input in the process of economic, social and industrial development. High energy consumption has traditionally been associated with higher quality of life, which in turn is related to Gross National Product (GNP). Since the conventional energy resources are under depletion, it is high time to tap the non conventional energy sources like solar and bio-energy. Uttarakhand is rich in hydro energy and lot of potential for self employment exists in setting up Micro Hydro plant. This subject is included to take care of special need of the state.

DETAILED CONTENTS

1. Micro Hydel Plants (20 Periods)
 - Small and Micro Hydro Electric Power Plants: An Overview
 - Advantages and Disadvantages of Small and Micro Hydro Schemes
 - Layout of a Micro Hydro Scheme
 - Main Elements of a Micro Hydro Plant
 - Water turbines
 - Turbine Classifications, Characteristics and Selection
 - Generators
 - Specifications of Turbine, Generator and Governor System used in Small and Micro Hydro Electric Power Plants
2. Micro Hydro Electric Power Plants: Automation, Control and Case Studies (08 Periods)
 - Power Generation in Micro Hydro Electric Power Plants
 - Automation, Control and Monitoring of Micro Hydro Electric Power Plants
 - Efficiency and Limitations
 - Case Studies
3. Micro Hydro Electric Power Plants: Erection and Commissioning, Operation and Maintenance (08 Periods)
 - Erection
 - Commissioning

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- Operation
- Maintenance

4. Non-Conventional Sources of Energy (06 Periods)

Importance of Non conventional sources of energy, Present Scenario, Future Prospects, Economic Criteria

5. Solar Energy (08 Periods)

Physical Principal of the conversion of Solar radiation into heat, Photo-voltaic cell, Electricity generation, Solar water heaters, Solar Furnaces, Solar cookers, Solar Stills solar pumping.

6. Bio-energy (07 Periods)

Bio-mass Conversion Technologies- wet and dry processes. Methods for obtaining energy from Biomass. Power Generation by using gassifiers

7. Wind Energy (07 Periods)

Wind Energy Conversion, Wind mills, Electricity generation from wind- Types of wind mills, local control, energy storage


8. Geo-thermal and Tidal Energy (08 Periods)

Geo-thermal sources, Ocean thermal electric conversion, open and closed cycles, hybrid cycles. Prime movers for geo-thermal energy conversion. Steam Generation and electricity generation.

9. Chemical Energy Sources (08 Periods)

Design and operating principles of a fuel cell, conversion efficiency, work output and emf of fuel cells, applications storage battery characteristics, types, applications, maintenance of batteries.

Practical: Students should be taken to site of Micro Hydro Plant and Non They
Conventional Energy Sources units. may be asked to prepare report of the
visits and make presentation in the class




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TEXTBOOKS:

1. Energy Technology (non-conventional, renewable and conventional) by S Rao and BB Parulekar, Khanna Publishers, New Delhi

RECOMMENDED BOOKS

1. Solar Energy – Principles of thermal collection and Storage SP Sukhatme, Tata McGraw Hill Publication, New Delhi.
2. Solar Energy Utilization; GD Rai; Khanna Publishers, New Delhi.
3. Reviews of Renewable Energy Sources, Vol. 3, Edited by MS. Sodha, S.S. Mathur, MAS Malik, TC Kandpal ; Wiley Eastern Limited, New Delhi.
4. Renewable Energy Sources and Conversion Technology by NK Bansal, Manfred Kleemann, Michael Meliss, Tata McGraw Hill Publishing Co. Ltd New Delhi.
5. Energy Today and Tomorrow; Maheshwar Dayal; Publications Division, Ministry of Information and Broadcasting, Govt. of India, New Delhi.
6. Energy Technology (non-conventional, renewable and conventional) by S Rao and BB Parulekar, Khanna Publishers, New Delhi
7. Non Conventional Energy Sources by B.H Khan, A tata McGraw Hill Publication New Delhi
8. Micro Hydel Design Manual by Adam Harvey, Intermediate technology Publications



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EE603 PLC & MICROCONTROLLERS

	L	P
Period 3	3	2

RATIONALE

A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. 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 cams. 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.

Microcontrollers have also assumed great significance in the field of electronics and common goods industry, and thus considered to be an important field of engineering. This subject aims to expose the students to both of these and give them adequate knowledge of these topics.

DETAILED CONTENTS

1. Introduction to PLC (07 Periods)

What is PLC, concept of PLC, Building blocks of PLC, Functions of various blocks, limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc.

2. Working of PLC (09 Periods)

- Basic operation and principles of PLC
- Architectural details processor
- Memory structures, I/O structure
- Programming terminal, power supply

3. Instruction Set (09 Periods)

- Basic instructions like latch, master control self holding relays.
- Timer instruction like retentive timers, resetting of timers.
- Counter instructions like up counter, down counter, resetting of counters.

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- Arithmetic Instructions (ADD, SUB, DIV, MUL etc.)
- MOV instruction
- RTC(Real Time Clock Function)
- Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal

4. Ladder Diagram Programming (07 Periods)

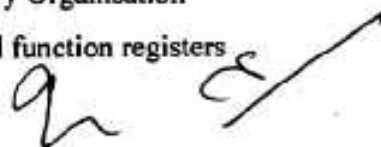
Programming based on basic instructions, timer, counter, sequencer, and comparison instructions using ladder program.

5. Applications of PLCs (05 Periods)

- Assembly
- Packaging
- Process controls
- Car parking
- Doorbell operation
- Traffic light control
- Microwave Oven
- Washing machine
- Motor in forward and reverse direction
- Star-Delta, DOL Starters
- Paint Industry
- Filling of Bottles
- Room Automation

6. Micro Controller Series (MCS)-51 Over View (11 Periods)

- Pin details
- I/o Port structure
- Memory Organisation
- Special function registers



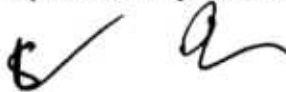
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7. Instruction Set Addressing Modes (07 Periods)
- Timer operation
 - Serial Port operation
 - Interrupts
8. Assembly language programming (07 Periods)
- Assemblers and Compilers
 - Assembler Directives
9. Design and Interface (05 Periods)
- Examples like: keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface
10. Introduction of PIC Micro controllers (06 Periods)
11. Application of Micro controllers like in relays, buzzer working machine, oven (07 Periods)

LIST OF PRACTICALS

PLCs

1. Components/sub-components of a PLC, Learning functions of different modules of a PLC system
2. Practical steps in programming a PLC (a) using a Hand held programmer (b) using computer interface
3. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT functions
5. Logic control systems with time response as applied to clamping operation
6. Sequence control system e.g. in lifting a device for packaging and counting
7. Use of PLC for an application(teacher may decide)


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Micro Controllers

1. Familiarization of Micro Controllers (8051) kit
2. Testing of general input/output on Micro controller board
3. Development of Electrical , Instrumentation applications using 8051 micro-controller
4. Use of Microcontroller

INSTRUCTIONAL STRATEGY

Introduce the subject and make the students familiar with applications of PLCs and Microcontrollers. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming. Small projects may be identified, be designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

TEXTBOOKS:

1. Introduction to PLCs by Gary Dunning. McGraw Hill

RECOMMENDED BOOKS

1. Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
2. Introduction to PLCs by Gary Dunning. McGraw Hill
3. Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
4. Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar
5. Module on "Allen Bradlag PIC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
6. Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh
7. The 8051 Micro controller by I Scot Mackenzie, Prentice Hall International, London
8. The 8051 Micro controllers Architecture, programming and Applications by Ayala; Penram International
9. Process Control Instrumentation Technology by Johnson, Curits; EE Edition, Prentice Hall of India, New Delhi
10. Microcontrollers by Ayala
11. Microcontrollers by Mazidi
12. Microcontrollers by Neil Makanzie
13. Microcontrollers by Deshmukh

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EE604 ELECTRICAL INSTALLATION IN BUILDINGS

L P
Periods 3 -

RATIONALE

The electrical installation plays vital role in the utilization of building, constructed for different use, e.g. residences, offices, hotels, shopping complexes, theatres, sport stadiums, auditoriums, especially multi-storied building and intelligent building.

The basic electrical installations are lighting. The other electrical installations like air conditioning, various sound systems, protection against lightning and fire, lift, diesel generating sets, computer networking are various optional installation in various buildings. Protection against lightning and fire are mandatory in buildings as per building manual. The earthing is essential in electrical installations and therefore it has to be mastered by diploma holders. Stage lighting, sound systems are essential in building used for various purpose like conference hall, auditorium, places of worship, studios and audio video broadcasting stations. Telecommunication and networking has become very useful electrical installation now-a-days. All these electrical installations have been discussed completely in this subject. The contents will help architects, and engineers associated with building projects, in their construction, maintenance, design and estimating and costing.

DETAIL CONTENTS

1. Introduction (02 Periods)
2. Electrical Wiring (06 Periods)
 - 2.1 Introduction
 - 2.2 System of Wiring
 - Selection of wiring System
 - 2.3 Wiring Network
 - 2.4 Rising Main
 - Main board & distribution board
 - Types, design with example
 - 2.5 Estimating and Costing
3. Lighting (08 Periods)
 - 3.1 Consideration planning and design of lighting
 - 3.2 Design of lighting scheme
 - Residential Building
 - Non-Residential Building
 - 3.3 Factory Lighting

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- 3.4 Industrial Fitting
- 3.5 Flood Lighting
- 3.6 Street Lighting
- 3.7 Stage Lighting
- 3.8 Various Kind of Lights
 - Profile Light
 - Plano Convex Light
 - Fresnel light
 - Par Light
 - Effect Light
 - Sound Active Light
 - Cone Light
 - H.M.I light
 - Solar Light
 - F.O.H. light
- 3.9 Fitting of light
 - Wiring & Operation
 - Precaution, Estimating & Costing

4. Air Conditioning

(09 Periods)

4.1 Introduction

4.2 Refrigeration

- Refrigerant
- Classification of refrigerant

4.3 Air Conditioning

- Air Conditioning
- Air Conditioning Cycle
- Heat & moisture transfer
- Unit of Air Conditioner or Refrigeration Plant\

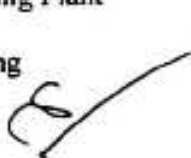

4.4 Mixing process in Air Conditioning


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- Components of Refrigeration or Air Conditioning Unit
- Evaporator
- Compressor
- Condenser
- Refrigerant Control Valve
- Air Outlet
- Thermostatic switch/controls
- Equipment used in Air conditioning System

- According to Purpose
- According to Season of year
- According to Arrangement of equipment
- Unitary Air Conditioner
- Window Air Conditioner
- Split Air Conditioner
- Central Air Conditioner
- Design of Air Outlet
- VRF air conditioning
- Design of capacity of Air Conditioner
- Design of Heating Plant

4.8 Estimating & Costing



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5. Sound System

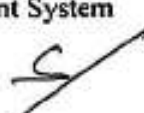


(09 Periods)

- Loudness & Intensity
- Ambient Noise Level (ANL)
- Requisite Loudness
- Echo & Reverberation
- Acoustic of Building
- Conference System
- Communication System
- Recording
- Broadcasting
- Film or Video Production

5.3 Musical Performance

- Public Address System
- PA system for a school
- System for places of worship
- Conference system
- Musical system
- Fore Ground Musical Sound System
- Paging Background Music System
- Auditorium Sound Reinforcement System

5.5 Estimating & Costing




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6. Diesel Generating Set

(09 Periods)

6.1 Classification

6.2 Brushless Alternator

- A C Generators

6.3 Prime Movers

- Control Panel
- Selection of Site
- Foundation
- Earthing System

6.5 Exhaust Piping

- Fuel Piping
- Cable Connection
- Change over Switch

6.6 Design of D.G. Set

6.7 Battery

6.8 Commissioning of D.G. Set

6.9 Estimating & Costing

7. Lift

(09 Periods)

7.1 Terminology

- Codes & Standard
- Rules & Act
- Lift Layout

7.5 Inverter or Converter

- Design of Lift


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7.9 Estimating & Costing

8. Fire Protection & Protection System

(09 Periods)

- Related Terminology
- Fire Protection System
- Fire Detection & Alarm System
- Conventional Fire Alarm System
- Sector Indicates Panel
- Analogue and Addressable Fire Alarm
- Design Heat Detector
- Design of Fire Alarm
- Fire Fighting System
- Estimating & Costing

9. Computer Networking

(09 Periods)

9.1 Classification

9.2 Network Topology

9.3 Internet work

9.4 Basic Hardware Component

- Open System

9.5 Inter Connecting Modes

9.6 Installation of Computer Network

9.7 Design Of Computer Network

9.8 Estimating & Costing

10. Rope & Roping System

(05 Periods)

10.1 Introduction

- Types

10.2 Design

10.3 Installation

10.4 Estimating & Costing


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11. Earthing

(05 Periods)

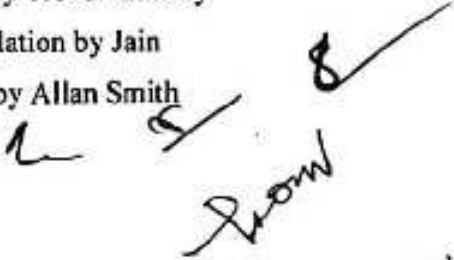
- Special Feature of Earthing
- Type of Earthing
- Effect of Electrocutation
- Earth Leakage Protection
- Testing of Earthing
- Estimating and Costing

TEXTBOOKS:

1. Electrical Installation in Building by Hari Mohan Johari; KW Publishers Pvt Ltd

RECOMMENDED BOOKS

1. Electrical Installation in Building by Hari Mohan Johari; KW Publishers Pvt Ltd
2. Electrical Installation in Building Vol.1 By H.M.Johari
3. Basic Electrical Installation Work by Trevor-Linsely
4. BWK of Design of Electrical Installation by Jain
5. Electrical Installation and Practice by Allan Smith


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605 APPLICATION OF COMPUTER SOFTWARES IN ELECTRICAL ENGINEERING

L P
Periods 3 2

RATIONALE

In the present time electrical power system and service sector uses different type of software for different functions viz. planning and design, management, operation, quality control and optimization etc. Multi story building and special building designs are executed by using specialized computer software. It saves a lot of time and is cost effective. Many times alternative designs are also developed using softwares like AUTO CAD and CAD (Computer Aided Design) etc.

Most of the work of estimating and costing of big installations is done by using software. Software for electrical system are available for low voltage Electrical Installation, Maintenance Training, Electrical Trouble Shooting, Simulation, Planning the Electrical Power Distribution etc. It is desirable that the present diploma holders should be well versed with the potential and use of commonly used software in the field. Hence this subject.

DETAILED CONTENTS

Computer application over view through following software students will use at least three software for solving different electrical problems.

- PSIM
- Multi SIM
- PSPICE
- MAT LAB
- MI Power
- ETAP

INSTRUCTIONAL STRATEGY

Teacher will select at least three softwares out of mention above and available in the market. Students will be given problems related to the functional areas of design and drawing of electrical control system, design of electrical distribution system, estimating and costing of the project etc. They will be asked to work on these problems manually. Then they will be asked to study the operational manuals of software for basic concepts and applications. Once they have understood, they will be asked to use the software for problem solving and comparing with the results done by the manual approach. Teachers will be required to prepare simple problems relating to the various software for developing competency in the diploma students. In addition the students must be exposed to different software and their capabilities demonstration

by

experts.

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TEXTBOOK:

1. MAT LAB by Rudra Pratap

RECOMMENDED BOOKS

1. PSPICE for circuit theory and Electronic Devices by Paul Tobin
2. MAT LAB by Rudra Pratap
3. Lab Manuals of various softwares like PSPICE, MULTI SIM/ MAT LAB etc. Supplied by Companies



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EE606 EMPLOYABLE SKILLS

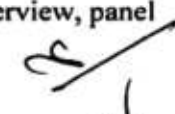


L T P
Periods per week - - 3

RATIONALE

Diploma holders are required to not only possess subject related knowledge but also soft skills to get good jobs and to rise steadily at their workplace. This subject is included to develop employability skills amongst the students.

DETAILED CONTENTS

1. Industrial Scenario Engineering Education and expectations of competences from an engineer by employer (04 Periods)
2. Personality types, characteristic and features for a successful engineer (04 Periods)
3. Professional Engineer desirable values and ethics and their development. Relation between engineering profession, society and environment (04 Periods)
4. Managing project (16 Periods)
 - Leadership
 - Motivation
 - Time management
 - Resource management
 - Computer Software
 - Interpersonal relationship
 - Engineer economics and fundamentals
5. Effective Communication (08 Periods)
 - Listening
 - Speaking
 - Writing
 - Presentation Technique/Seminar
 - Group discussion
6. Preparing for Employment (08 Periods)
 - Searching for job/job hunting
 - Resume Writing
 - Interview technique in personal interview telephonic interview, panel interview, group interview, video conference


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7. Managing Self (06 Periods)
- Managers body, mind, emotion and spirit
 - Stress Management
 - Conflict resolution
8. Continuing professional development (04 Periods)
- Organising learning and knowledge
 - Use of computer for organising knowledge resource
9. Creativity, Innovation and Intellectual property right (06 Periods)
- Concept and need in present time for an engineer
10. Basic rules, laws and norms to be adhered by engineers during their working (04 Periods)

TEXTBOOKS:

1. SOURCE: Internet Notes


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EEPR607 PROJECT WORK

	L	P
Periods	-	2

Project work aims at developing skills in the students whereby they apply in totality the knowledge and skills gained through the course in the solution of a practical problem undertaken as a project work. The students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective departments may have a brainstorming session to identify suitable

project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The students should identify themselves or be given project assignment at least two to three months in advance. The project work identified in collaboration with industry/field organization should be preferred.

Each teacher is expected to guide the project work of 5-6 students at a time. The project assignments may consist of:

- a) Projects related with repair and maintenance of machine parts
- b) Estimating and costing projects
- c) Design of components/ parts/ jigs / fixtures
- d) Projects related to quality control
- e) Project work related to increasing productivity
- f) Project connected with work study
- g) Projects relating to erection, installation, calibration and testing
- h) Projects related to wastage reduction
- i) Projects related to energy audit

For Students of Electrical Engineering Diploma Programme the project work can be grouped under the following four groups. A number of projects have been mentioned under each section. A student should take at least two projects both of which should not be from the same group. If more than two projects are taken to make up a total of 256 hours, then more than 1 may be taken from the same group as long as at least two groups are covered. A student is read to choose one project from each section.

Report for all the four project should be prepared and will give a seminar. The same will be assessed for internal and external assessment.

NOTE: (Two, only one from one group)

SECTION A

1.1 Electrical Machines and Equipment:

- 1.1.1 Design and Construction of a small transformer (100 VA to 1 kVA)
- 1.1.2 Construction of hot air blower




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- 1.1.3 Design and Fabrication of Automatic curtain operator
- 1.1.4 Fabrication of Automatic Star-Delta starter
- 1.1.5 Construction of Automatic Water level controller
- 1.1.6 Construction of Choke for fluorescent tubes
- 1.1.7 Design and construction of loading rheostats minimum 5kw
- 1.1.8 Design and construction of Geyser
- 1.1.9 Erection/installation and commissioning of rotating electrical machine
- 1.1.10 Design and assembly of contactor control circuit for various applications

SECTION B

1.2 Electrical Power:

- 1.2.1 Drawing, estimating and costing of electrical installation of the institution from supplier's pole to the institution distribution board.
- 1.2.2 Drawing, estimating and costing of electrical installation of a workshop having a given number of electrically operated appliances/machines.
- 1.2.3 To study the laying of underground distribution cable for a small colony starting from main distribution pole
- 1.2.4 To study the erection erect a 5 pole span overhead line for a small distance for distribution of electrical energy. To energize it and prepare list of material and cost estimates.
- 1.2.5 Energy audit for the workshop of your institution and to suggest remedies to have low Electricity Bill
- 1.2.6 Case study of Electrical fire detection and protection system provided in a building
- 1.2.7 To survey the load of given area in a village, small colony, calculate the effective load and find out the sizes of the cables/conductors for the proposed distribution system
- 1.2.8 Designing of light and fan scheme for a institutional or commercial building
- 1.2.9 To prepare a plan for augmentation of a nearby pole mounted sub station
- 1.2.10 To prepare a proposal for substation of your institution, calculating the total load (estimating and costing)
- 1.2.11 Power factor improvement in a industry


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Special Project: If a group of student develops a small entrepreneurial product, then other project is not to be done by them.

Note: The quality of end-product and process adopted by the students in its execution should be taken into consideration along with other parameters while evaluating the students

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	15	15	12	10	07	04
2.	Planning and execution of considerations	15	15	12	10	07	03
3.	Quality of performance	25	25	16	12	08	04
4.	Providing solution of the problems or production of final product	25	25	16	12	08	04
5.	Sense of responsibility	15	15	12	10	07	03
6.	Self expression/communication skills	10	10	08	06	04	02
7.	Interpersonal skills/human relations	10	10	08	06	04	02
8.	Report writing skills	15	15	12	10	07	04
9.	Viva voce	20	20	16	14	08	04
Total marks		150	150	112	90	60	30

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

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve 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.

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	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

Important Notes

1. The internal and external examiner must follow these criteria 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 student's 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 nearby industries are approached for instituting such awards.

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project items prepared by the students and invite leading Industrial organisations 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 the institute. It would be better if specific industries are approached for instituting such awards.

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TEXTBOOK:

1. Applied Physics Vol II by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar

RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi
5. Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series
6. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
7. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers
8. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
9. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
10. Applied Physics Vol II by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
11. Basic Electronics and Linear Circuits by NN Bhargava et al Tata Mc Graw Hill Publishers, New Delhi
12. Principles of Electronics by SK Sahdev, Dhanpat Rai and Co, New Delhi
13. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi

   
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LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used there in
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substance
3. Estimate the amount of moisture in the given sample of coal
4. Esterification and ceric ammonium tests of alcohol
5. Sodium carbonate and Ester test of carboxylic acids
6. To determination the amount of copper in the given sample of copper sulphate with the help of N/20 sodium thiosulphate solution.
7. Detection of metal iron in the rust (solution of rust in concentrated HCL may be given)
8. Demonstration to determine calorific value of a solid fuel with the help of Bomb Calorimeter

TEXTBOOK:

1. Applied Chemistry-II by Dr. J K Sharma, Abhishek Publications, Sector 17-C, Chandigarh

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. A Text Book of Applied Chemistry-II by SS Kumar; Tata McGraw Hill, Delhi
4. A Text Book of Applied Chemistry-II by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M,
6. Chemistry of Engineering by Aggarwal CV,
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar
9. Applied Chemistry-II by Dr. J K Sharma, Abhishek Publications, Sector 17-C, Chandigarh.

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