

**COURSE OF STUDY AND SCHEME OF EXAMINATION OF
DIPLOMA VOCATIONAL IN ELECTRICAL EQUIPMENT
MAINTENANCE
LEVEL III**

S No	Subject	Subject Code	Period per week			Scheme of Examination					Total Marks	Credit
						Theory			Practical			
			L	T	P	ELE	CT	TA	EPE	TA		
			(A) Academic Part			General Education						
01	HINDI	900351(46)	4	-	-	100	10	10	-	-	120	08
02	ENGLISH	900352(46)	4	-	-	100	10	10	-	-	120	08
03	MATHEMATICS	991353(14)	4	1	-	100	10	10	-	-	120	10
04	PHYSICS	991354(15)	3	-	-	70	10	10	-	-	90	06
05	CHEMISTRY	991355(11)	3	-	-	70	10	10	-	-	90	06
06	PHYSICS LAB	991361(15)			2	-	-	-	30	10	40	04
07	CHEMISTRY LAB	991362(11)	-	-	2	-	-	-	30	10	40	04
			(B) Vocational Part			Vocational Education						
08	Electrical Equipments Maintenance	991363(24)	-	-	12	-	-	-	350	30	380	24
	.TOTAL		18	1	16	440	50	50	410	50	1000	70

L-Lecture , T-Tutorial, P- Practical, ELE-End Level Exam, EPE-End Practical Exam, CT-Class Test, TA-Teachers Assessment

Assuming Total Duration 30 Weeks
Per Week 35 Periods One hour each

One Credit would mean equivalent of 15 period of 60 minutes each for Theory,Workshop/Labs and Tutorial.

SYLLABUS FOR LANGUAGE I: (HINDI)
DIPLOMA VOCATIONAL IN ELECTRICAL EQUIPMENT MAINTENANCE
LEVEL - III
BRANCH DISCIPLINE : ELECTRICAL EQUIPMENT MAINTENANCE
TEACHING & EXAMINATION SCHEME:

S No	Subject	Subject Code	Period per week			Scheme of Examination					Total Marks	Credit
			L	T	P	Theory			Practical			
			L	T	P	ELE	CT	TA	EPE	TA		
01	Theory	900351(46)	4	-	-	100	10	10	-	-	120	08

DISTRIBUTION OF MARKS & HOURS:

CHAPTER NO.	CHAPTER NAME	HOURS	MARKS
क	अपठित बोध (गद्यांश और काव्यांश-बोध)	25	20
ख	रचनात्मक तथा व्यावहारिक लेखन	20	25
ग	अंतरा भाग - 1 : (काव्य भाग)	25	20
	: (गद्य -भाग)	20	15
घ	अंतराल, भाग - 1	15	20
	मौखिक	15	-
	TOTAL	120	100

Course Content:

क	अपठित बोध : (गद्यांश और काव्यांश-बोध)	20
1.	गद्यांश पर आधारित बोध, प्रयोग, रचानांतरण, शीर्षक आदि पर लघूत्तरात्मक प्रश्न -	15
2.	काव्यांश पर आधारित पाँच लघूत्तरात्मक प्रश्न -	05
ख	रचनात्मक तथा व्यावहारिक लेखन :	25
	अभिव्यक्ति और माध्यम के आधार पर सृजनात्मक लेखन से संबंधित दो प्रश्न :	
3.	निबंध -	10
4.	कार्यालयीन पत्र -	05
5.	व्यावहारिक लेखन (प्रतिवेदन, कार्यसूची, कार्यवृत्ति इत्यादि) पर दो प्रश्न -	(5+5) 10
ग	अंतरा - भाग - 1	(20+15) 35
	काव्य - भाग :	20
6.	सप्रसंग व्याख्या (दो में से एक) -	08
7.	कविताओं के कथ्य पर दो प्रश्न -	(3+3) 06
8.	काव्य - सौंदर्य पर दो प्रश्न -	(3+3) 06
गद्य - भाग :		15
9.	सप्रसंग व्याख्या (दो में से एक)	04
10.	पाठों की विषय वस्तु पर आधारित तीन में से दो प्रश्न -	(3+3) 06
11.	किसी एक लेखन / कवि का साहित्यिक परिचय -	05

- | | | |
|-----|--|----|
| 12. | विषयवस्तु पर आधारित (तीन में से दो प्रश्न) – | 10 |
| 13. | विधि विधाओं पर आधारित दो बोधात्मक प्रश्न – | 10 |

(घ) **मौखिक परीक्षण : (ऐच्छिक) –**

श्रवण (सुनना) : वर्णित या पठित सामग्री को सुनकर अर्थग्रहण करना, वार्तालाप करना, वाद-विवाद, भाषण, कवितापाठ आदि को सुनकर समझना, मूल्यांकन करना और अभिव्यक्ति के ढंग को समझना।

बोलना : भाषण, सस्वर, कविता-पाठ, वार्तालाप और उसकी औपचारिकता, कार्यक्रम –प्रस्तुति, कथा-कहानी अथवा घटना सुनना, परिचय देना, भावानुकूल संवाद –वाचन।

वार्तालाप की दक्षताएँ :

टिप्पणी : वार्तालाप की दक्षताओं का मूल्यांकन निरंतरता के आधार पर परीक्षा के समय ही होगा। निर्धारित 10 अंकों में से 5 श्रवण (सुनना) के मूल्यांकन के लिये और 5 (बोलना) के मूल्यांकन के लिए होंगे।

श्रवण (सुनना) का मूल्यांकन :

परीक्षक किसी प्रासंगिक विषय पर एक अनुच्छेद का स्पष्ट वाचन करेगा। अनुच्छेद तथ्यात्मक या सुझावात्मक हो सकता है। अनुच्छेद लगभग 250 शब्दों का होना चाहिए। अध्यापक को सुनते –सुनते परीक्षार्थी /परीक्षक अलग कागज पर दिए हुए श्रवण बोध के अभ्यासों को हल कर सकेंगे।

अभ्यास रिक्तस्थान –पूर्ति, बहुविकल्पी अथवा सत्य/असत्य का चुनाव आदि विधाओं में हो सकते हैं। प्रत्येक आधे अंक के लिये 1-1 परीक्षण प्रश्न होगा।

मौखिक अभिव्यक्ति (बोलना) का मूल्यांकन :

1. चित्रों के कम पर आधारित वर्णन : इस भाग में अपेक्षा की जाएगी कि विद्यार्थी विवरणात्मक भाषा का प्रयोग करें।
2. किसी चित्र का वर्णन : चित्र लोगों या स्थानों के हो सकते हैं।
3. किसी निर्धारित विषय पर बोलना : जिससे विद्यार्थी अपने व्यक्तिगत अनुभव का प्रत्यास्मरण कर सकें।
4. कोई कहानी सुनाना या किसी घटना का वर्णन करना।

टिप्पणी :

- परीक्षण से पूर्व परीक्षार्थी को कुछ तैयारी के लिये दिया जाए।
- विवरणात्मक भाषा में वर्तमान काल का प्रयोग अपेक्षित है।
- निर्धारित विषय परीक्षार्थी के अनुभव –जगत के हों। जैसे :

काई चुटकला या हास्य प्रसंग सुनना।
हाल में पढ़ी पुस्तक या देखे हुए चलचित्र (सिनेमा) की कहानी सुनाना।
जब परीक्षार्थी बोलना आरंभ कर दे तो परीक्षक कम से कम हस्तक्षेप करे।

कौशलों के अंतरण का मूल्यांकन

श्रवण (सुनना)

वाचन (बोलना)

विद्यार्थी में –

विद्यार्थी –

1. परिचित संदर्भों में प्रयुक्त शब्दों और पदों समझने की सामान्य योग्यता है। किन्तु वह सुसंबद्ध आशय को नहीं समझ पाता।
 2. परिचित संदर्भों में से छोटे संबद्धा कथनों को समझने की योग्यता है।
 3. परिचित या अपरिचित दोनों संदर्भों में कथित को स्पष्ट सूचना समझने की योग्यता है।
 4. दीर्घ कथनों की शृंखला को पर्याप्त शुद्धता से समझने और निष्कर्ष निकालने की योग्यता है।
 5. जटिल कथनों के विचार – बिंदुओं को समझने की योग्यता प्रदर्शित करने की क्षमता है। वह उद्देश्य के अनुकूल सुनने की कुशलता प्रदर्शित करता है।
1. केवल अलग-अलग शब्दों और पदों के प्रयोग की योग्यता प्रदर्शित करता है, किन्तु एक सुसंबद्ध स्तर पर नहीं बोल सकता।
 2. परिचित संदर्भों में केवले छोटे संबद्धा कथनों का सीमित शुद्धता से प्रयोग करता है।
 3. अपेक्षाकृत दीर्घ भाषण में अधिक जटिल कथनों के प्रयोग की योग्यता प्रदर्शित करता है, अभी भी कुछ अशुद्धियां करता है जिससे प्रेषण में रुकावट आती है।
 4. अपरिचित स्थितियों में विचारों को तार्किक ढंग से संगठित कर धारा –प्रवाह रूप में प्रस्तुत करता है। वह ऐसी गलतियां करता है, जिनसे प्रेषण में रुकावट नहीं आती।
 5. उद्देश्य और श्रोता के लिए उपयुक्त शैली को अपना सकता है, ऐसा करते समय वह केवल मामूली गलतियां करता है।

निर्धारित पुस्तकें :

1. आरोह भाग –1 एन.सी.ई.आर.टी. द्वारा प्रकाशित
2. वितान भाग –1 एन.सी.ई.आर.टी. द्वारा प्रकाशित
3. अभिव्यक्ति और माध्यम एन.सी.ई.आर.टी. द्वारा प्रकाशित

SYLLABUS FOR LANGUAGE II: (ENGLISH)

DIPLOMA VOCATIONAL IN ELECTRICAL EQUIPMENT MAINTENANCE

LEVEL : III

BRANCH DISCIPLINE : ELECTRICAL EQUIPMENT MAINTENANCE

TEACHING & EXAMINATION SCHEME:

S No	Subject	Subject Code	Period per week			Scheme of Examination					Total Marks	Credit
						Theory			Practical			
			L	T	P	ELE	CT	TA	EPE	TA		
1	Theory	900352(46)	4	-	-	100	10	10	-	-	120	08

DISTRIBUTION OF MARKS & HOURS:

S. No.	Unit	Topic	No. of Hours/ Periods	Marks Allotted
1.	Unit -01	PASSAGE FOR COMPREHENSION	20	30
2.	Unit -02	SHORT STORIES	10	10
3.	Unit -03	GRAMMAR	60	30
4.	Unit -04	BUSINESS CORRESPONDENCE	20	20
5.	Unit -05	READING, WRITING, SPEAKING & LISTENING PRACTICE	10	10
TOTAL			120	100

Course Content:

I. PASSEGES FOR COMPREHENSION:

1. THE LANGUAGE OF SCIENCE
2. MY THOUSANDTH GOAL
3. RIP VAN WINKLE COMES TO TOWN
4. SAFETY PRACTICES
5. ENTREPRENEURSHIP
6. OUR ENVIRONMENT

II. SHORT STORIES:

1. AN ASTROLOGER'S DAY
2. THE LAST LEAF

III. GRAMMAR:

1. DETERMINERS
2. AUXILIARY VERBS
3. TENSES
4. TENSES IN CONDITIONAL SENTENCES
5. SUBJECT-VERB AGREEMENT
6. THE PASSIVE
7. INFINITIVES
8. PREPOSITIONS
9. MODIFIERS
10. CLAUSES & CONNECTORS

11. VOCABULARY: ONE WORD SUBSTITUTION, WORDS OFTEN MISUSED & WRONGLY SPELT

IV. BUSINESS CORRESPONDENCE:

1. PURPOSE OF BUSINESS CORRESPONDENCE
2. PRINCIPLES OF EFFECTIVE BUSINESS CORRESPONDENCE: MECHANICS, STYLES & FORMS
3. APPLICATION FOR JOB, BIODATA & C. V.
4. LETTER OF ENQUIRY
5. LETTER OF ORDER
6. LETTER OF COMPLAINT

V. READING, WRITING, SPEAKING & LISTENING PRACTICE BASED ON PRESCRIBED PASSAGES FOR COMPREHENSION

REFERENCE BOOKS:

1. COMMUNICATION SKILLS FOR TECHNICAL STUDENTS
BOOK-I, TTTI BHOPAL
2. BASIC TECHNICAL COMMUNICATION: PHI LEARNING PRIVATE LIMITED,
NEW DELHI

SYLLABUS FOR MATHEMATICS
DIPLOMA VOCATIONAL IN ELECTRICAL EQUIPMENT MAINTENANCE
LEVEL : III
BRANCH DISCIPLINE : ELECTRICAL EQUIPMENT MAINTENANCE
TEACHING & EXAMINATION SCHEME:

S. No	Subject	Subject Code	Period per week			Scheme of Examination					Total Marks	Credit
						Theory			Practical			
			L	T	P	ELE	CT	TA	EPE	TA		
1	Theory	991353(14)	4	1	-	100	10	10	-	-	120	10

DISTRIBUTION OF MARKS & HOURS:

S. No.	Unit	Topic	No. of Hours/Periods	Marks Allotted
1.	Unit I	SETS AND FUNCTIONS	28	20
2.	Unit II	ALGEBRA	54	25
3.	Unit III	COORDINATE GEOMETRY	28	20
4.	Unit IV	CALCULUS	10	10
5.	Unit V	MATHEMATICAL REASONING	10	10
6.	Unit VI	STATISTICS & PROBABILITY	20	15
TOTAL			150	100

Course Content:

UNIT-I: SETS AND FUNCTIONS

1. Sets :

Sets and their representations. Empty set. Finite & Infinite sets. Equal sets. Subsets. Subsets of the set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement Sets.

2. Relations & Functions:

Ordered pairs, Cartesian product of sets. Number of elements in the cartesian product of two finite sets. Cartesian product of the set of reals with itself (upto $R \times R \times R$). Definition of relation, pictorial diagrams, domain, codomain and range of a relation. Function as a special kind of relation from one set to another. Pictorial representation of a function, domain, co-domain & range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions, with their graphs. Sum, difference, product and quotients of functions.

3. Trigonometric Functions:

Positive and negative angles. Measuring angles in radians & in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin^2 x + \cos^2 x = 1$, for all x . Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing $\sin(x \pm y)$ and $\cos(x \pm y)$ in terms of $\sin x$, $\sin y$, $\cos x$ & $\cos y$. Deducing the identities like the following:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \cot(x \pm y) = \frac{\cot x \cot y \mp 1}{\cot y \pm \cot x},$$

$$\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}, \cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2},$$

$$\sin x - \sin y = 2 \cos \frac{x+y}{2} \sin \frac{x-y}{2}, \cos x - \cos y = -2 \sin \frac{x+y}{2} \sin \frac{x-y}{2},$$

Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$ and $\tan 3x$. General solution of trigonometric equations of the type $\sin \theta = \sin \alpha$, $\cos \theta = \cos \alpha$ and $\tan \theta = \tan \alpha$. Proof and simple applications of sine and cosine formulae.

UNIT-II: ALGEBRA

1. Principle of Mathematical Induction:

Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.

2. Complex Numbers and Quadratic Equations:

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve some of the quadratic equations. Algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system. Square root of a complex number.

3. Linear Inequalities:

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Graphical solution of system of linear inequalities in two variables.

4. Permutations & Combinations:

Fundamental principle of counting. Factorial n . ($n!$) Permutations and combinations, derivation of formulae and their connections, simple applications.

5. Binomial Theorem:

History, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, General and middle term in binomial expansion, simple applications.

6. Sequence and Series:

Sequence and Series. Arithmetic progression (A. P.), arithmetic mean (A.M.) Geometric progression (G.P.), general term of a G.P., sum of n terms of a G.P., Arithmetic and Geometric series infinite G.P. and its sum, geometric mean (G.M.), relation between A.M.

and G.M. Sum to n terms of the special series $\sum_{k=1}^n k$, $\sum_{k=1}^n k^2$ and $\sum_{k=1}^n k^3$.

UNIT-III: COORDINATE GEOMETRY

1. Straight Lines:

Brief recall of two dimensional geometry from earlier classes. Shifting of origin. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two-point form, intercept form and normal form. General equation of a line. Equation of family of lines passing through the point of intersection of two lines. Distance of a point from a line.

2. Conic Sections:

Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard of equation of a circle.

3. Introduction to Three -dimensional Geometry

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point.

Distance between two points and section formula.

UNIT-IV: CALCULUS

1. Limits and Derivatives:

Limit of function introduced as rate of change of distance function and its geometric meaning.

$$\lim_{x \rightarrow 0} \frac{\log_e (1+x)}{x}, \lim_{x \rightarrow 0} \frac{e^x - 1}{x}$$

Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

UNIT-V: MATHEMATICAL REASONING

1. Mathematical Reasoning:

Mathematically acceptable statements. Connecting words/ phrases - consolidating the Understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "Implied by", "and", "or", "there exists" and their use through variety of examples related to real life and Mathematics. Validating the statements involving the connecting words difference between contradiction, converse and contrapositive.

UNIT-VI: STATISTICS & PROBABILITY

1. Statistics:

Measures of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

2. Probability:

Random experiments; outcomes, sample spaces (set representation). Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events

Recommended Textbooks.

- 1) Mathematics Part I - Textbook for Class XI, NCERT Publication
- 2) Mathematics Part II - Textbook for Class XII, NCERT Publication

SYLLABUS FOR PHYSICS
DIPLOMA VOCATIONAL IN ELECTRICAL EQUIPMENT MAINTENANCE
LEVEL : III
BRANCH DISCIPLINE : ELECTRICAL EQUIPMENT MAINTENANCE
TEACHING & EXAMINATION SCHEME:

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			L	T	P	Theory			Practical			
						ELE	CT	TA	EPE	TA		
1	Theory	991354(15)	3	-	-	70	10	10			90	06
2	Practical	991361(15)	-	-	2				30	10	40	04
	Total					70	10	10	30	10	130	10
			3	-	2							

DISTRIBUTION OF MARKS & HOURS:

S. No.	Unit	Topic	No. of Hours/ Periods	Marks Allotted
1.	Unit I	Physical World & Measurement	05	03
2.	Unit II	Kinematics	08	10
3.	Unit III	Laws of Motion	08	10
4.	Unit IV	Work, Energy & Power	08	06
5.	Unit V	Motion of System of particles & Rigid Body	10	06
6.	Unit VI	Gravitation	08	05
7.	UnitVII	Properties of Bulk Matter	15	10
8.	UnitVIII	Thermodynamics	08	05
9.	Unit IX	Behaviour of Perfect Gas & Kinetic Theory of gases	10	05
10.	Unit X	Oscillations & Waves	10	10
TOTAL			90	70

Course Content:

UNIT I: PHYSICAL WORLD AND MEASUREMENT

Physics - scope and excitement; nature of physical laws; Physics, technology and society. Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures. Dimensions of physical quantities, dimensional analysis and its applications.

UNIT II: KINEMATICS

Frame of reference, Motion in a straight line: Position-time graph, speed and velocity. Elementary concepts of differentiation and integration for describing motion. Uniform and nonuniform motion, average speed and instantaneous velocity. Uniformly accelerated motion, velocity-time, position-time graphs. Relation for uniformly accelerated motion (graphical treatment). Scalar and vector quantities; Position and displacement vectors, general vectors and notation; equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative velocity. Unit vector; Resolution of a vector in a plane -

rectangular components. Scalar and Vector product of vectors. Motion in a plane. Cases of uniform velocity and uniform acceleration projectile motion. Uniform circular motion.

UNIT III: LAWS OF MOTION

Intuitive Concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces. Static and kinetic friction, laws of friction, rolling friction, lubrication. Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

UNIT IV: WORK, ENERGY AND POWER

Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power. Notion of potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-conservative forces: motion in a vertical circle; elastic and inelastic collisions in one and two dimensions.

UNIT V: MOTION OF SYSTEM OF PARTICLES AND RIGID BODY

Centre of mass of a two-particle system, momentum conservation and centre of mass motion. Centre of mass of a rigid body; centre of mass of uniform rod. Moment of a force, torque, angular momentum, conservation of angular momentum with some examples. Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration. Values of moments of inertia, for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications.

UNIT VI: GRAVITATION

Kepler's laws of planetary motion. The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Gravitational potential energy; gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.

UNIT VII: PROPERTIES OF BULK MATTER

Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus, modulus of rigidity, Poisson's ratio; elastic energy. Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes). Effect of gravity on fluid pressure. Viscosity, Stokes' law, terminal velocity, Reynold's number, streamline and turbulent flow. Critical velocity. Bernoulli's theorem and its applications. Surface energy and surface tension, angle of contact, excess of pressure, application of surface tension ideas to drops, bubbles and capillary rise. Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion; specific heat capacity; C_p , C_v - calorimetry; change of state - latent heat capacity. Heat transfer - conduction, convection and radiation, Qualitative ideas of Blackbody radiation green house effect, thermal conductivity, Newton's law of cooling, Wein's displacement Law, Stefan's law.

UNIT VIII: THERMODYNAMICS

Thermal equilibrium and definition of temperature (zeroth law of thermodynamics). Heat, work and internal energy. First law of thermodynamics. Isothermal and adiabatic processes. Second law of thermodynamics: reversible and irreversible processes. Heat engines and refrigerators.

UNIT IX: BEHAVIOUR OF PERFECT GAS AND KINETIC THEORY

Equation of state of a perfect gas, work done in compressing a gas. Kinetic theory of gases - assumptions, concept of pressure. Kinetic energy and temperature; rms speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro's number.

UNIT X: OSCILLATIONS AND WAVES

Periodic motion - period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a spring-restoring force and force constant; energy in S.H.M. Kinetic and potential energies; simple pendulum-derivation of expression for its time period; free and forced and damped oscillations (qualitative ideas only), resonance. Wave motion. Transverse and longitudinal waves, speed of wave motion. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect.

PRACTICALS

Note: Every student will perform 15 experiments (8 from Section A and 7 from Section B). The activities mentioned are for the purpose of demonstration by the teachers only. These are not to be evaluated during the academic year. For evaluation in examination, students would be required to perform two experiments - One from each Section.

SECTION A

30 hours

Experiments

(Any 8 experiments out of the following to be performed by the Students)

1. To measure diameter of a small spherical/cylindrical body using Vernier Callipers.
2. To measure internal diameter and depth of a given beaker/calorimeter using Vernier Callipers and hence find its volume.
3. To measure diameter of a given wire using screw gauge.
4. To measure thickness of a given sheet using screw gauge.
5. To measure volume of an irregular lamina using screw gauge.
6. To determine radius of curvature of a given spherical surface by a spherometer.
7. To determine the mass of two different objects using a beam balance.
8. To find the weight of a given body using parallelogram law of vectors.
9. Using a simple pendulum, plot L-T and L-T² graphs. Hence find the effective length of second's pendulum using appropriate graph.
10. To study the relationship between force of limiting friction and normal reaction and to find the co-efficient of friction between a block and a horizontal surface.
11. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination (θ) by plotting graph between force and $\sin\theta$.

Experiments

SECTION B

30 hours

(Any 7 experiments out of the following to be performed by the students)

1. To determine Young's modulus of elasticity of the material of a given wire.
2. To find the force constant of a helical spring by plotting a graph between load and extension.
3. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between P and V, and between P and $1/V$.
4. To determine the surface tension of water by capillary rise method.
5. To determine the coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.
6. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
7. To determine specific heat capacity of a given (i) solid (ii) liquid, by method of mixtures.
8. (i) To study the relation between frequency and length of a given wire under constant tension using sonometer.
(ii) To study the relation between the length of a given wire and tension for constant frequency using sonometer.
9. To find the speed of sound in air at room temperature using a resonance tube by two- resonance positions.

Recommended Textbooks.

1. Physics Part-I, Textbook for Class XI, Published by NCERT
2. Physics Part-II, Textbook for Class XI, Published by NCERT

SYLLABUS FOR CHEMISTRY
DIPLOMA VOCATIONAL IN ELECTRICAL EQUIPMENT MAINTENANCE
LEVEL : III
BRANCH DISCIPLINE : ELECTRICAL EQUIPMENT MAINTENANCE
TEACHING & EXAMINATION SCHEME:

S No	Subject	Subject Code	Period per week			Scheme of Examination					Total Marks	Credit
						Theory			Practical			
			L	T	P	ELE	CT	TA	EPE	TA		
1	Theory	991355(11)	3	-	-	70	10	10	-	-	90	06
2	Practical	991361(11)	-	-	2	-	-	-	30	10	40	04
	Total		3	-	2	70	10	10	30	10	130	10

DISTRIBUTION OF MARKS & HOURS:

S. No	Unit	Topic	No. of Hours/Periods	Marks Allotted
1.	Unit I	Some Basic Concepts of Chemistry	05	05
2.	Unit II	Structure of Atom	07	06
3.	Unit III	Classification of Elements and Periodicity in Properties	07	04
4.	Unit IV	Chemical Bonding and Molecular Structure	07	05
5.	Unit V	States of Matter: Gases and Liquids	07	04
6	Unit VI	Chemical Thermodynamics	07	06
7	Unit VII	Equilibrium	06	06
8	Unit VIII	Redox Reactions	04	03
9	Unit IX	Hydrogen	06	03
10	Unit X	s -Block Elements	07	05
11	Unit XI	Some p -Block Elements	07	05
12	Unit XII	Organic Chemistry: Some basic Principles and Techniques	04	07
13	Unit XII	Hydrocarbons	10	08
14	Unit XIV	Environmental Chemistry	06	03
TOTAL			90	70

COURSE CONTENT:

UNIT I: SOME BASIC CONCEPTS OF CHEMISTRY

General Introduction: Importance and scope of chemistry.

Historical approach to particulate nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules. Atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

UNIT II: STRUCTURE OF ATOM

Discovery of Electron, Proton and Neutron, atomic number, isotopes and isobars. Thompson's model and its limitations. Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, De Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shape of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

UNIT III: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements – atomic radii, ionic radii, inert gas radii Ionization enthalpy, electron gain enthalpy, electronegativity, valency. Nomenclature of elements with atomic number greater than 100.

UNIT IV: CHEMICAL BONDING AND MOLECULAR STRUCTURE

Valence electrons, ionic bond, covalent bond; bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), hydrogen bond.

UNIT V: STATES OF MATTER: GASES AND LIQUIDS

Three states of matter, intermolecular interactions, types of bonding, melting and boiling points, role of gas laws in elucidating the concept of the molecule, Boyle's law, Charles law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro's number, ideal gas equation. Deviation from ideal behaviour, liquefaction of gases, critical temperature, kinetic energy and molecular speeds (elementary idea) Liquid State- vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations)

UNIT VI: CHEMICAL THERMODYNAMICS

Concepts of System and types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions. First law of thermodynamics - internal energy and enthalpy, heat capacity and specific heat, measurement of ΔU and ΔH , Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution. Introduction of entropy as a state function, Gibbs energy change for spontaneous and non-spontaneous processes, criteria for equilibrium. Second law of thermodynamics (brief introduction).

UNIT VII: EQUILIBRIUM

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium - Le Chatelier's principle, ionic equilibrium- ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of poly basic acids, acid strength, concept of pH, Henderson Equation, hydrolysis of salts (elementary idea), buffer solution, solubility product, common ion effect (with illustrative examples).

UNIT VIII: REDOX REACTIONS

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number, applications of redox reactions

UNIT IX: HYDROGEN

Position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen, hydrides-ionic covalent and interstitial; physical and chemical properties of water, heavy water, hydrogen peroxide -preparation, reactions and structure and use; hydrogen as a fuel.

UNIT X: S -BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)

Group 1 and Group 2 Elements

General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens, uses.

Preparation and Properties of Some Important Compounds:

Sodium carbonate, sodium chloride, sodium hydroxide and Sodium hydrogen carbonate, biological importance of sodium and potassium. Calcium oxide and Calcium carbonate and industrial uses of lime and limestone, biological importance of Magnesium and Calcium.

UNIT XI: SOME P -BLOCK ELEMENTS (Periods 14)

General Introduction to p -Block Elements

Group 13 Elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group, Boron - physical and chemical properties, some important compounds, borax, boric acid, boron hydrides, Aluminium: Reactions with acids and alkalies, uses.

Group 14 Elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first elements Carbon -catenation, allotropic forms, physical and chemical properties; uses of some important compounds: oxides. Important compounds of silicon and a few uses: silicon tetrachloride, silicones, silicates and Zeolites, their uses.

UNIT XII: ORGANIC CHEMISTRY -SOME BASIC PRINCIPLES AND TECHNIQUE

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions.

UNIT XIII: HYDROCARBONS

Classification of Hydrocarbons

Aliphatic Hydrocarbons:

Alkanes- Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis. Alkenes - Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markonikov's addition and peroxide effect), ozonolysis,

oxidation, mechanism of electrophilic addition. Alkynes - Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of - hydrogen, halogens, hydrogen halides and water. Aromatic Hydrocarbons: Introduction, IUPAC nomenclature, benzene: resonance, aromaticity, chemical properties: mechanism of electrophilic substitution. Nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation, directive influence of functional group in monosubstituted benzene. Carcinogenicity and toxicity.

UNIT XIV: ENVIRONMENTAL CHEMISTRY

Environmental pollution - air, water and soil pollution, chemical reactions in atmosphere, smog, major atmospheric pollutants, acid rain, ozone and its reactions, effects of depletion of ozone layer, greenhouse effect and global warming- pollution due to industrial wastes, green chemistry as an alternative tool for reducing pollution, strategies for control of environment pollution.

PRACTICALS SYLLABUS

60 Hours

Micro-chemical methods are available for several of the practical experiments.

Wherever possible such techniques should be used:

A. Basic Laboratory Techniques

- 1 Cutting glass tube and glass rod
- 2 Bending a glass tube
- 3 Drawing out a glass jet
- 4 Boring a cork

B. Characterization and Purification of Chemical Substances

1. Determination of melting point of an organic compound.
2. Determination of boiling point of an organic compound.
3. Crystallization of impure sample of any one of the following: Alum, copper sulphate, Benzoic acid.

C. Experiments based on pH

(a) Any one of the following experiments:

- Determination of pH of some solutions obtained from fruit juices, solution of known and varied concentrations of acids, bases and salts using pH paper or universal indicator.
- Comparing the pH of solutions of strong and weak acids of same concentration.
- Study the pH change in the titration of a strong base using universal indicator.

(b) Study the pH change by common-ion in case of weak acids and weak bases.

D. Chemical Equilibrium

One of the following experiments:

- (a) Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either ions.
- (b) Study the shift in equilibrium between $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ and chloride ions by changing the concentration of either of the ions.

E. Quantitative Estimation

- i) Using a chemical balance.
- ii) Preparation of standard solution of oxalic acid.
- iii) Determination of strength of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.
- iv) Preparation of standard solution of sodium carbonate.
- v) Determination of strength of a given solution of hydrochloric acid by titrating it against standard sodium carbonate solution.

F. Qualitative Analysis

(a) Determination of one anion and one cation in a given salt

Cations - Pb^{2+} , Cu^{2+} , As^{3+} , Al^{3+} , Fe^{3+} , Mn^{2+} , Ni^{2+} , Zn^{2+} , Co^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Mg^{2+} , NH_4^+

Anions - CO_3^{2-} , S^{2-} , SO_3^{2-} , SO_4^{2-} , NO_2^- , NO_3^- , Cl^- , Br^- , I^- , PO_4^{3-} , $\text{C}_2\text{O}_4^{2-}$, CH_3COO^-

(Note: Insoluble salts excluded)

(b) Detection of -nitrogen, sulphur, chlorine in organic compounds.

PROJECT

Scientific investigations involving laboratory testing and collecting information from other sources. A Few suggested Projects

- Checking the bacterial contamination in drinking water by testing sulphide ion.
- Study of the methods of purification of water.
- Testing the hardness, presence of iron, fluoride, chloride etc. Depending upon the regional variation in drinking water and study of causes of presence of these ions above permissible limit (if any).
- Investigation of the foaming capacity of different washing soaps and the effect of addition of sodium carbonate on it.
- Study the acidity of different samples of tea leaves.
- Determination of the rate of evaporation of different liquids.
- Study the effect of acids and bases on the tensile strength of fibers.
- Study of acidity of fruit and vegetable juices.

Note: Any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.

Recommended Textbooks.

1. Chemistry Part -I, Published by NCERT.
2. Chemistry Part -II, Published by NCERT.

SYLLABUS FOR VOCATIONAL TRAINING
DIPLOMA VOCATIONAL IN ELECTRICAL EQUIPMENT MAINTENANCE
LEVEL : III
BRANCH DISCIPLINE : ELECTRICAL EQUIPMENT MAINTENANCE
TEACHING & EXAMINATION SCHEME:

S No	Subject	Subject Code	Period per week			Scheme of Examination						Total Marks	Credit
						Theory			Practical				
			L	T	P	ELE	CT	TA	EPE	TA			
1	Practical	991363(24)	-	-	12	-	-	-	350	30	380	24	
	Total		-	-	12	-	-	-	350	30	380	24	

DISTRIBUTION OF MARKS & HOURS

CHAPTER NO.	CHAPTER NAME	HOURS
01	Electrical Safety & Safety Measures	50
02	Fundamentals of Electricity	50
03	Familiarization with electronics equipments	30
04	Basic concept of AC & DC Currents	35
05	Rules for Wiring & Installation	35
06	Earthing	40
07	Domestic Wiring	60
08	Designing & Assembling in PCB	60
	TOTAL	360

Course Content:

Chapter 1 Electrical Safety & Safety Measures

Safety Precautions,
 General safety tools & equipments
 Safety Practice –
 Lifting & Handling loads
 Heavy Equipments
 Fire Extinguishers & its Types
 Electrical Safety –
 Rescue a person who is in contact with live wires
 Treat a person for electric shock/injury.
 Safety equipments available with electrician while working on live electrical installation

Chapter 2 Fundamentals of Electricity

Introduction to electricity, Insulators & Types of Insulators
 Conductors & Types of Conductors, Joints in Electrical Conductors
 Crimping & Crimping Tools, Soldering
 Define electrical terms like voltage, current, resistance & their units
 Colour Code of Carbon Resistors
 Simple Series & Parallel Circuits

Chapter 3 Familiarization with Electronics Equipments

Introduction with electronic components
 Capacitors, Transistors, Diode, Choke Coil
 Study the components symbol as per diagram

Chapter 4 Basic concept of AC & DC Currents

Direct Current & Testing the Polarity

Alternating Current & Identifying Phase, Neutral & earth terminals

Chapter 5 Rules for Wiring & Installation

ISI rules Related to Wiring

IE rule for energy meter installation

Chapter 6 Earthing

Introduction of Earthing

Purpose of Earthing

Types of Earthing

 Pipe Earthing

 Plate Earthing

Chapter 7 Domestic Wiring

Diagram & Systems used in domestic wiring installation

Simple house wiring Circuit

Chapter 8 Designing & Assembling in PCB

Introduction of PCB

Interpret components as per circuits & laying the components on PCB

Testing of assembled PCB

PRACTICAL EXPERIENCES

1. Safety Precaution
2. Nature of working of tools & equipments
3. Safety practices – lifting & handling
4. Safety practices – Fire Fighting
5. Rescue a person who is in contact with live wires
6. Treat a person for electric shock/injury.
7. Common hand tools, their uses, care & maintenance
8. Prepare terminations – Skinning different types of cable ends
9. Making various joints in cable
10. Crimping cable ends & soldering the cable lugs
11. Making simple joints & married joints & tee joints in stranded conductor
12. Simple electrical connection using resistance, voltmeter, ammeter & multimeter
13. Practicing the colour coded resistor value then verifying with the multimeter
14. Connections number of lamps in series & parallel connections
15. Testing of different types of electronic components & practicing components as per diagram/ circuits
16. Testing the polarity of Dc supply
17. Identification of phase & neutral in single phase supply
18. Identify the wiring accessories as per symbols
19. Carry out of pipe earthing as per IE rule
20. Carry out of plate earthing as per IE rule
21. Prepare and mount energy meter board

22. Carry out domestic installation testing
23. Prepare T.W Board for fixing Flush type accessories
24. Make the wiring layout for a bed room of a house with 6 points
25. Carryout the wiring in OVC casing & capping as per layout
26. Repairing of house wiring faults
27. Lay the components as per layout then soldering on PCB
28. Trouble shooting if any on assembled circuit

SUGGESTED REFERENCES

1. Electrical Appliances Anwani, J.M. R.B. Publications, New Delhi
2. Basic Electrical Engineering Mittal, V.N. Tata McGraw-HillNew Delhi
3. Electrical Installation Maintenance & Testing Qureshi M.F, Deepak pbs.