TECHNICAL EDUCATION DEPARTMENT (DIPLOMA SECTOR)
UTTAR PRADESH

CURRICULUM FOR FIRST AND SECOND SEMESTER

COMMON FOR ALL ENGINEERING DIPLOMA COURSES^

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Semester System

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EFFECTIVE FROM YEAR 2024-2025

Prepared By

INSTITUTE OF RESEARCH DEVELOPMENT & TRAINING, U.P., KANPUR

^Curriculum of First and Second Semester for the following Engineering Branches

Sr. No.	Name of Diploma Programme	Duration
1	Diploma in Mechanical Engineering	3 Years
2	Diploma in Mechanical Engineering (Repair & Maintenance)	3 Years
3	Diploma in Mechanical Engineering(Computer Aided Design)	3 Years
4	Diploma in Mechanical Engineering (Refrigeration & Air conditioning)	3 Years
5	Diploma in Mechanical Engineering (Automobile)	3 Years
6	Diploma in Mechanical Engineering(Production)	3 Years
7	Diploma in Electronics Engineering	3 Years
8	Diploma in Electronics Engineering (Advanced Microprocessor & Interface)	3 Years
9	Diploma in Electronics Engineering (Modern Consumer Electronics Appliances)	3 Years
10	Diploma in Electronics Engineering (Micro Electronics)	3 Years
11	Diploma in Electrical Engineering	3 Years
12	Diploma in Electrical Engineering (Industrial Control)	3 Years
13	Diploma in Electrical & Electronics Engineering	3 Years
14	Diploma in Electronics & Communication Engineering	3 Years
15	Diploma in Chemical Engineering	3 Years
16	Diploma in Chemical Technology (Rubber & Plastic)	3 Years
17	Diploma in Chemical Technology (Fertilizer)	3 Years
18	Diploma in Chemical Engineering (Petro Chemical)	3 Years
19	Diploma in Paint Technology	3 Years
20	Diploma in Civil Engineering	3 Years
21	Diploma in Computer Science & Engineering	3 Years
22	Diploma in Information Technology	3 Years
23	Diploma in Instrumentation & Control Engineering	3 Years
24	Diploma in Civil Engineering (Environmental Pollution & control)	3 Years

25	Diploma in Agricultural Engineering	3 Years
26	Diploma in Plastic Mould Technology	3 Years
27	Diploma in Glass & Ceramics	3 Years
28	Diploma in Architectural Assistant ship	3 Years
29	Diploma in Dairy Engineering	3 Years
30	Diploma in Leather Technology (Tanning)	3 Years
31	Diploma in Leather Technology Footwear (Computer Aided Shoe Design)	3 Years
32	Diploma in Textile Technology	3 Years
33	Diploma in Textile Chemistry	3 Years
34	Diploma in Textile Engineering	3 Years
35	Diploma in Printing Technology	3 Years
36	Diploma in Food Technology	3 Years
37	Diploma in Paper & Pulp Technology	3 Years
38	Diploma in Carpet Technology	3 Years
39	Diploma in Mining Engineering	3 Years
40	Renewable Energy	3 Years
41	Communication and Computer Networking	3 Years
42	Civil and Environment Engineering	3 Years

CONTENTS

FIRST SEMESTER

SECOND SEMESTER

PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hardto come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology throughfast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and opens economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develophuman resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by the State Board of Technical Education, UP to revise the existing curricula of 42 diploma programmes as per the needs of the industry and making them NEP-2020/AICTE compliant, are laudable.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

Director
Institute of Research Development & Training

ACKNOWLEDGEMENTS

We gratefully acknowledge the guidance and contribution received from the following persons:

1. Sh. M. Devraj, IAS, Principal Secretary Govt. of UP, Technical Education Department, Secretariat Lucknow.
2. Sh. Annavi Dinesh Kumar, IAS, Special Secretary /Director, Technical Education, UP for taking keen interest in the review of this curriculum.
3. Sh. F.R. Khan, Director, I.R.D.T., Kanpur for entrusting this project of Curriculum revision.
4. All the participants from industry/field organizations, engineering colleges, polytechnics, and other technical institutions for their professional inputs during curriculum workshops.
5. Faculty /Subject Experts from U.P. Government polytechnics.

CDC Officer
IRDT Kanpur

1. SALIENT FEATURES OF DIPLOMA PROGRAMME FOR ENGINEERING & TECHNOLOGY BRANCHES

1)	Duration of the Programme	:	Three years (Six Semesters)
2)	Entry Qualification	:	Matriculation or equivalent as Prescribed by State Board of Technical Education, UP
3)	Intake	:	60 (or as prescribed by the Board)
4)	Pattern of the Programme	:	Semester Pattern

5) **Student Centred Activities**:

A provision of 2 hrs per week has been made for organizing Student Centered Activities for overall personality development of students. Such activities will comprise of co–curricular activities such as expert lectures, self-study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS, library and other cultural activities, disaster management and safety etc.

6) **Project work**

A project work has been included in the curriculum to enable the student get familiarize with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

7) **Industrial Training**

Industrial Training (Summer Internship –I) of 4 Weeks duration to be organized after II-semester exam. Evaluation will be completed in III-Semester.

2- STUDY AND EVALUATION SCHEME FOR ALL ENGINEERING AND TECHNOLOGY BRANCHES (Listed in Annexure -1)

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week				Credits (C) (L + T)+P = C	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P	Total		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1	Mathematics-I	3	1	-	4	4+0=4	40	-	**40**	60	3	-	-	**60**	100
1.2	Applied Physics-I	3	1	2	6	4+1=5	40	60	**100**	60	3	40	3	**100**	200
1.3	Applied Chemistry	3	1	2	6	4+1=5	40	60	**100**	60	3	40	3	**100**	200
1.4	Communication Skills in English	3	-	2	5	3+1=4	40	60	**100**	60	3	40	3	**100**	200
1.5	Engineering Graphics	-	-	4	4	0+2=2	-	40	**40**	60	3	-	-	**60**	100
1.6	Engineering Workshop Practice	-	-	4	4	0+2=2	-	60	**60**	-	-	40	3	**40**	100
1.7	Sports & Yoga	-	-	2	2	0+1=1	-	50	**50**	-	-	-	-	-	50
# Student Centered Activities (SCA)		-	-	2	2	-	-	50	**50**	-	-	-	-	-	50
TOTAL		**12**	**3**	**18**	**33**	**23**	**160**	**380**	**540**	**300**		**160**		**460**	**1000**

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visit, Library, N.C.C., NSS, Cultural Activities and self-study etc.

Note -

1) Each period will be 60 minutes duration.
2) Each session will be of 16 weeks.
3) Effective teaching will be at least 14 weeks.

STUDY AND EVALUATION SCHEME FOR ALL ENGINEERING AND TECHNOLOGY BRANCHES (Listed in Annexure -1)

SECOND SEMESTER:

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week				Credits (C) (L + T)+P = C	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P	Total		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1	Mathematics-II	3	1	-	4	4+0=4	40	-	**40**	60	3	-	-	**60**	100
2.2	Applied Physics-II	3	1	2	6	4+1=5	40	60	**100**	60	3	40	3	**100**	200
2.3	Introduction to IT Systems	2	-	4	6	2+2=4	40	60	**100**	60	3	40	3	**100**	200
2.4	Fundamentals of Electrical & Electronics Engineering	3	1	2	6	4+1=5	40	60	**100**	60	3	40	3	**100**	200
2.5	Engineering Mechanics	3	1	2	6	4+1=5	40	60	**100**	60	3	40	3	**100**	200
2.6	*Environmental Sciences	3	-	-	3	-	-	-	**-**	60	3	-	-	**60**	-
# Student Centered Activities (SCA)		-	-	2	2	-	-	50	**50**	-	-	-	-	**-**	50
Total		**17**	**4**	**12**	**33**	**23**	**200**	**290**	**490**	**300**		**160**		**460**	**950**

*Environmental Sciences will be an audit subject and non-credit. It is compulsory to pass the examination, but the marks will not be included in the division and percentage of obtained marks.

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visit, Library, N.C.C., NSS, Cultural Activities and self-study etc.

Note -

1) Each period will be 60 minutes duration.
2) Each session will be of 16 weeks.
3) Effective teaching will be at least 14 weeks.
4) Industrial Training (Summar Internship-I) of 4 Weeks duration to be organized after II-semester exam. Evaluation will be in III-Semester.

1.1 MATHEMATICS - I

L	T	P
3	1	-

COURSE OBJECTIVES

Contents of this course provide fundamental base for understanding elementary mathematics and their uses in solving engineering problems. Contents of this course will enable students to use basic mathematical function like logarithms, partial fractions, matrices and basic 2D curves in solving various engineering problems of all fields.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

- Understand and apply angle measurements, T-Ratios, and graph functions.
- Grasp the concepts of limits, differentiation and apply differentiation rules.
- Resolve proper and improper fractions into partial fractions with various factors.
- Solve problems using permutations and combinations and apply the binomial theorem.
- Understand complex numbers in different forms , perform arithmetic operations and applications of De Moivre's theorem.

COURSE CONTENT

UNIT - I: Trigonometry (10 Periods)

Concept of angles, measurement of angles in degrees, grades and radians and their conversions, 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). Graphs of $|x|$, sin x, cos x, tan x and e^x .

UNIT-II : Differential Calculus (14 Periods)

Definition of function, concept of limits. Four standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$ $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$.

Differentiation of $x^n, \sin x, \cos x, \tan x, e^x, \log_e x$ by definition. Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric and inverse trigonometric functions, logarithmic differentiation, exponential functions.

UNIT - III: Partial fractions: (10 Periods)

Definition of polynomial fraction, proper & improper fractions and definitionof partial fractions. To resolve proper fraction and improper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors.

UNIT- IV : Permutations , Combinations and Binomial theorem (10 Periods)

Value of ${}^nP_r$, ${}^nC_r$ and formula based problems.

Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof); applications of Binomial theorem.

UNIT-V : Complex Numbers: (12 Periods)

Definition, real and imaginary parts of a complex number, polar and Cartesian representation of a complex number and its conversion from one form to other, conjugate of a complex number, modulus and amplitude of a complex number. Addition, subtraction, multiplication and division of complex numbers. De Moivre's theorem and its applications.

INSTRUCTIONAL STRATEGY

The basic instructional strategy to teach basic mathematics, binomial theorem, trigonometry, differential calculus etc. should be conceptual with real world applications of relevant branch. More numerical and theory examples can be used for clear understanding of the content**.**

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

RECOMMENDED BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)
4. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vikas Publishing House.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House,New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	10	15
2.	14	25
3.	10	20
4	10	20
5	12	20
Total	**56**	**100**

1.2 APPLIED PHYSICS – I

L	T	P
3	1	2

COURSE OBJECTIVES

Applied physics includes the study of a diversified topics related to 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 behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this 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 learn and appreciate these concepts and principles. In all contents, SI units should be followed.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

- Identify the use of S.I. system of measurement with accuracy and how it is used in engineering
- Represent physical quantities as scalars and vectors, applying the physical laws and concepts of linear and circular motion in everyday life.
- Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.)
- Analyse and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
- Derive work, power and energy relationship and solve problems about work and power.
- Define work, energy and power and their units.
- Describe conservation of energy and its applications
- Understand the concept of rotational motion of a rigid body and its applications
- Apply the physical laws and concepts of gravity, its variation with longitude and latitude and its uses in space satellite etc. .
- Understand the concept of elasticity, surface tension, pressure and the laws governing movement of fluids.
- Express physical work in term of heat and temperature; Measure temperature in various processes on different scales (Celsius, Kelvin, Fahrenheit etc.)
- Distinguish between conduction, convection and radiation, identify the different methods for reducing heat losses
- Understand the laws of thermodynamics, Carnot cycle and their applications.

COURSE CONTENTS

1. Units and Dimensions (8 Periods)

1.1 Need of Measurement in engineering and science, unit of a physical quantities - fundamental and derived units, systems of units (FPS, CGS and SI units)

1.2 Dimensions and dimensional formulae of physical quantities.

1.3 Principle of homogeneity of dimensions

1.4 Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities

1.5 Limitations of dimensional analysis

1.6 Error in measurement, accuracy and precision of instruments measuring instruments least count, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules for representing significant figures and rounding off in calculation.

2. Force and Motion (10 periods)

2.1 Scalar and vector quantities – examples, representation of vector, types of vectors

2.2 Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product.

2.3 Resolution of Vectors and its application to lawn roller and inclined plane.

2.4 Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.

2.5 Impulse and its Applications

2.6 Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period.

2.7 Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)

2.8 Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist.

2.9 Gravitational force, Kepler's law of planetary motion.

2.10 Acceleration due to gravity and its variation with depth and height from earth surface.

3. Work, Power and Energy (8 periods)

3.1 Work: and its units, examples of zero work, positive work and negative work.

3.2 Friction: modern concept, types, laws of limiting friction, Coefficient of friction, reducing friction and its Engineering Applications.

3.3 Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications

3.4 Energy and its units: Kinetic energy and gravitational potential energy with examples and their derivation.

3.5 Mechanical Energy, Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.

3.6 Power and its units, calculation of power in numerical problems

4 Rotational Motion (8 periods)

4.1 Concept of translatory and rotatory motions with examples

4.2 Definition of torque with examples

4.3 Angular momentum, Conservation of angular momentum (quantitative) and its examples

4.4 Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only).

4.5 Rotational kinetic energy, Rolling of sphere on the slant plane

4.6 Comparison of linear motion and rotational motion.

5. Properties of Matter (12 periods)

5.1 Elasticity: definition of stress and strain, different types of modulii of elasticity, Hooke's law, significance of stress strain curve

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 cohesive and adhesive forces, Capillary action ascent formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension

5.4 Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.

5.5 Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula) and their applications.

6. Heat and Thermometry (10 periods)

6.1 Concept of Heat and Temperature.

6.2 Modes of transfer of heat (Conduction, convection and radiation with examples)

6.3 Different scales of temperature and their relationship and definition of specific heat.

6.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them

6.5 Concept of Co-efficient of thermal conductivity and its engineering application.

6.6 Types of thermometers (Mercury Thermometer And Bimetallic Thermometer And Their Uses)

LIST OF PRACTICALS (To perform any Six Practicals)

1. To measure length, radius of a given cylindrical body like test tube, beaker using a one-year calipers and find volume of each object.
2. To determine diameter of a wire, a solid ball using a screw gauge.
3. To determine the Radius of curvature of (i) convex mirror, (ii) concave mirror by spherometer
4. To verify parallelogram law of forces.
5. To find the coefficient of friction between wood and glass using a horizontal board.
6. To determine the atmospheric pressure at a place using Fortin's Barometer
7. To determine the viscosity of glycerin by Stoke's method
8. To verify law of conservation of mechanical energy (PE to KE).

9. To measure room temperature and temperature of hot bath using mercury thermometer and convert it into different scales.
10. To determine force constant of spring using Hooks law.

INSTRUCTIONAL STRATEGY

Teacher may use various teaching aids like live 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 to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSESSMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva Voice

RECOMMENDED BOOKS

1 Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi
2 Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3 Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
4 B.Sc.Practical Physics by C L Arora, S. Chand Publication..
5 Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6 Engineering Physics by DK Bhhatacharya& Poonam Tandan; Oxford University Press, New Delhi
7 Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications
8 V. Rajendran,physics-I, Tata McGraw-Hill raw Hill publication, New Delhi
9 Arthur Beiser, Applied Physics, Tata McGraw-Hill raw Hill publication, New Delhi
10 Physics Volume 1, 5th edition, Haliday Resnick and Krane, Wiley publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	15
2	10	18
3	08	15
4	08	15
5	12	19
6	10	18
Total	**56**	**100**

1.3 APPLIED CHEMISTRY

L	T	P
3	1	2

COURSE OBJECTIVES:

There are numerous number materials are used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. On successful completion of this course content will enable technicians to understand, ascertain and analyses and properties of natural raw materials require for producing economical and eco-friendly finished products.

COURSE OUTCOMES

After undergoing this course, the students must be able to:

- Solve various engineering problems applying the basic knowledge of atomic structure andchemical bonding.
- Use relevant water treatment method to solve domestic and industrial problems.
- Solve the engineering problems using knowledge of engineering materials and properties.
- Use relevant fuel and lubricants for domestic and industrial applications
- Solve the engineering problems using concept of Electrochemistry and corrosion.

COURSE CONTENT

Unit 1: Atomic Structure, Chemical Bonding and Solutions (11 periods)

Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertaintyprinciple, Quantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.

Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond (H_2, F_2, HF hybridization in $BeCl_2$, BF_3, CH_4, NH_3, H_2O), coordination bond in NH_4^+, and anomalous properties of NH_3, H_2O due to hydrogen bonding, andmetallic bonding.

Solution – idea of solute, solvent and solution, methods to express the concentration of solution molarity (*M* = mole per liter), Molality, Normality, ppm, mass percentage, volume percentage and mole fraction.

Unit 2: Water (11 periods)

Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness andsimple numerical on water hardness.

Cause of poor lathering of soap in hard water, problems caused by the use of hard water inboiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by ETDA method, total dissolved solids (TDS) alkalinity estimation.

i). Water softening techniques – soda lime process, zeolite process and ion exchange process.

ii). Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization.

iii) Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).

Unit 3: Engineering Materials (11 periods)

Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy.

Extraction of - iron from haematite ore using blast furnace, aluminium from bauxite along with reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous withsuitable examples, properties and applications.

General chemical composition, composition based applications (elementary idea only detailsomitted):

Port land cement and hardening, Glasses Refractory and Composite materials.

Polymers – monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.

Unit 4: Chemistry of Fuels and Lubricants (11 periods)

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula.

Proximate analysis of coal solid fuel

Petrol and diesel - fuel rating (octane and cetane numbers),

Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical properties (viscosity and viscosity index, oiliness, flash and fire point, could and pour point only) and chemical properties (coke number, total acid number saponification value) of lubricants.

Unit 5: Electro Chemistry (12 periods)

Electronic concept of oxidation, reduction and redox reactions.

Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of Electrolysis and simple numerical problems.Industrial Application of Electrolysis –

- Electrometallurgy
- Electroplating
  Electrolytic refining.

Application of redox reactions in electrochemical cells –

- Primary cells – dry cell,
- Secondary cell - commercially used lead storage battery, fuel and Solar cells. Introduction to Corrosion of metals –

- Definition, types of corrosion (chemical and electrochemical), H_2 liberation and O_2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.
  Internal corrosion preventive measures –
- Purification, alloying and heat treatment and External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic Inhibitors.

INSTRUCTIONAL STRATEGY

Unit 1: Atomic Structure, Chemical Bonding and Solutions

Assignments: Writing electronic configuration of elements up to atomic number 30 (Z= 30). Numerical on molarity, ppm, mass percentage, volume percentage and mole fraction of given solution.

Seminar: 1. Quantum numbers,

2. Discuss the metallic properties such as malleability, ductility, hardness, high melting point, conductance of heat and electricity, magnetic properties of metals. Projects: Model of molecules $BeCl_2$, BF_3, CH_4, NH_3, H_2O.

Unit 2: Water

Assignments: Simple problems on hardness calculation.

Seminar: 1. Quality and quantity requirement of water in house and industry.

2. Quality of control measures of effluents (BOD & COD).

Projects: Collect water samples from different water sources and measure of hardness of water.

Unit 3: Engineering Materials

Assignments: Preparation of table showing different ores of iron, copper and aluminium metals along with their chemical compositions and classify in to oxide sulphide halide ores.

Seminar: Discuss the chemical reactions taking place in blast furnace in extraction of Fe, Cu and Al metals.

Projects: Make table showing place of availability of different ores in India and show places on India map.

Unit 4: Chemistry of Fuels and Lubricants

Assignments: Calculation of HCV and LCV of fuel using fuel composition in Dulong's formula.

Seminar: Chemical structure of fuel components influence on fuel rating.

Projects: Mapping of energy recourses in India. Collection of data of various lubricants available in the market.

Unit 5: Electro Chemistry

Assignments: Simple problems on Faradays laws of electrolysis. Seminar:

1. Corrosion rate and units.
2. Corrosion preventions.

Projects: Mapping of area in India prone to corrosion. Collection of data of various electrochemical cells batteries used in equipment and devices and avail- able in market. Visit to sites such as Railway station to watch corrosion area in railways and research establishment in and around the institution.

LIST OF PRACTICALS:

Perform any Ten Laboratory Practicals.

Volumetric and Gravimetric analysis:

1. Preparation of standard solution of oxalic acid or potassium permanganate.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
3. Standardization of KMnO4 solution using standard oxalic acid and determine the percentage of iron present in given Hematite ore by KMnO4 solution.
4. Iodometric estimation of copper in the copper pyrite ore.
5. Volumetric estimation of total acid number (TAN) of given oil.
6. Volumetric estimation of:
   a) Total hardness of given water sample using standard EDTA solution.
   b) Alkalinity of given water sample using 0.01M sulphuric acid.
7. Proximate analysis of coal:
   a) Gravimetric estimation of moisture in given coal sample.
   b) Gravimetric estimation of ash in given coal sample.

Instrumental analysis:

8. Determine the conductivity of given water sample.
9. Determination of the iron content in given cement sample using colorimeter.
10. Determination of calorific value of solid or liquid fuel using bomb calorimeter.
11. Determination of viscosity of lubricating oil using Redwood viscometer.
12. Determination of flash and fire point of lubricating oil using Abel's flash point apparatus.
13. To verify the first law of electrolysis of copper sulfate using copper electrode.
14. Construction and measurement of emf of electrochemical cell (Daniel cell).
15. To study the effect of dissimilar metal combination.

(a) Open source software and website address:

1 www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2 www.visionlearning.com (Atomic structure and chemical bonding)
3 www.chem1.com (Atomic structure and chemical bonding)
4 https://www.wastewaterelearning.com/elearning/ (Water Treatment)
5 www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
6 www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fueland Combustion)
7 www.chemcollective.org (Metals, Alloys)
8 www.wqa.org(Water Treatment)

References/Suggested Learning Resources:

(b) Books :

1. Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
3. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
4. Dara, S. S. & Dr.S.S.Umare, Engineering Chemistry, S.Chand. Publication, New Delhi, New Del-hi, 2015.
5. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
6. Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
7. Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II,NITTTR, Chandigarh, Publications, 2013-14.
8. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	11	20
2	11	20
3	11	20
4	11	20
5	12	20
Total	**56**	**100**

1.4 COMMUNICATION SKILLS IN ENGLISH

L	T	P
3	-	2

COURSE OBJECTIVES

Communication Skills play an important role in career development. This lab course aims at actively involving students in various activities to improve their communication skills with an emphasis on developing personality of the students.

COURSE OUTCOMES

After undergoing this course, the students must be able to:

1. Develop listening skills for enhancing communications.
2. Develop speaking skills with a focus on correct pronunciation and fluency.
3. Introduce the need for personality development - Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc., for that purpose group discussion extempore and other activities should be conducted during lab classes.

COURSE CONTENTS

Unit -1 Communication: Theory and Practice **(08 Periods)**

1.1 Basics of Communication, Definition Process of Communication
1.2 Types of communication (formal and informal, verbal and non-verbal), 7 C's of Communication
1.3 Barriers to communication and ways to overcome them
1.4 Tools or devices of Communication

Unit – 2 Soft Skills for Professional Excellence **(04 Periods)**

2.1 Introduction to Soft skills and hard skills
2.2 Importance of soft skills
2.3 Applying soft skills across cultures

Unit – 3 Reading Comprehension: English for Communication **(08 Periods)**

On Communication
3.1 Professional Development of Technicians
3.2 Leadership and Supervision
3.3 The Romance of Reading
3.4 Sir C V Raman

Unit: 4 Professional Writing **(14 Periods)**

CV Writing, Covering Letter, Resume, Notices, Precis -Writing, Official Letters (Memo, Circular, Office Orders, Agenda, Minutes of Meeting, Report Wring, E-mail Drafting)

Unit: 5 Vocabulary and Grammar **(08 Periods)**

5.1 Sentence and its Types
5.2 Parts of Speech
5.3 Tenses
5.4 Active and Passive Voice

5.5 Punctuation
5.6 One Word Substitution, Idioms and Phrases

LIST OF PRACTICALS

Unit-1 Listening skills

1.1 Introduction to listening process and practice
1.2 Listening to recorded lectures/speeches/poems/interviews and Dialogues

Unit 2 Introduction to phonetics

2.1 Sounds: consonants, vowels (Monophthongs and Diphthongs)
2.2 Transcription of words (IPA) syllable diversion and word stress

Unit 3 Speaking skills

3.1 Self and Peer introduction
3.2 Extempore-Just a minute session
3.3 Greeting and starting conversation
3.4 Leave taking
3.5 Wishing well
3.6 Talking about likes and dislikes
3.7 Asking questions-polite responses
3.8 Apologizing/forgiving
3.9 Complaining/Warning
4.0 Asking and giving information
4.1 Getting and giving Permission
4.2 Asking for and giving Opinion
4.3 Delivering formal speeches
4.4 Mock Interviews
4.5 Presentation
4.6 Conversation practices in various situations such as -asking address, enquiries at places like retail shop, service center, bank, customer care etc.

Unit 4 Building Vocabulary

4.1 Word Formation
4.2 Phrasal Verbs, Foreign Phrases, Jargons
4.3 Word Games such as crosswords, scrabble, quiz spell it etc. (To enhance self-expression and vocabulary of participants.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria& Sons, New Delhi
6. Q. Skills for success – Level & Margaret Books, Oxford University Press.
7. E-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.
8. English for Communication (text Book Published by IRDT, Kanpur 1998).

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Unit No.	Time Allotted (Periods)	Marks Allotted (%)
1	8	20
2	4	10
3	8	20
4	14	30
5	8	20
Total	**42**	**100**

1.5 Engineering Graphics

L	T	P
-	-	4

COURSE OBJECTIVES

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, shouldbe to develop conceptual skills in the students following BIS SP 46 – 1988.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- Identify and use of different grades of pencils and other drafting instruments whichare used in engineering field
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawingsof objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles(orthographic views)
- Draw and interpret complete inner hidden details of an object which are otherwise notvisible in normal view
- To make projections of Solid
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches.
- Identify conventions for different engineering materials, symbols, sections of regularobjects and general fittings used in Civil and Electrical household appliances
- Use basic commands of AutoCAD.

COURSE CONTENT

Unit – I Basic elements of Drawing (05 Sheets)

Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards.
Different types of lines as per BIS specifications Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.
Common symbols and conventions of materials used in engineering.
Free hand and instrumental lettering (Alphabet and numerals) – Capital Letter, single stroke, vertical and inclined, series of 5,8,12 mm in the ratio of 7:4.

Dimensioning-

Necessity, method and principles, Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches Scales.
Scales –Needs & importance (theory), R.F., type of scales, and length of scale, drawing of plain and diagonal scales.

Unit – II Orthographic projections (05 Sheets)

Introduction, Projection of Points in different quadrant, Projection of Straight Line- parallel to both planes, perpendicular and inclined to reference plane, Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1st angle only, Three views of orthographic projection of different objects. Identification of surfaces.

Unit – III Projection of Solid and Sections (05 Sheets)

Definition and types of Solids, To make projections, sources, Top view, Front view and Side view of various types of Solid, Importance and salient features.
Drawing of full section, half section, partial or broken out sections, Off-set sections, revolved sections and removed sections, Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections.

Unit – IV Isometric Projections (03 Sheets)
Introduction, Isometric scale and Natural scale, Isometric view and isometric projection, Illustrative problems related to objects containing lines, circles and arcs shape only.
Conversion of orthographic views into isometric view /projection.

Unit-V Introduction to Auto CAD

Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.
Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.

INSTRUCTIONAL STRATEGY

Teacher should show model of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings.

Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs forpractice on AutoCAD should be established.

MEANS OF ASSESSMENT

- Sketches
- Drawing
- Use of software

RECOMMENDED BOOKS

1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar
5. Engineering Drawing I by DK Goel, GBD Publication.

1.6 ENGINEERING WORKSHOP PRACTICE

L	T	P
-	-	4

COURSE OBJECTIVES

The course aims to provide hands-on experience and practical skills in various essential workshops, including carpentry, fitting, welding, sheet metal, plumbing, and painting and polishing. Students will gain proficiency in using different tools and machines, understanding and executing various processes and operations, and completing multiple jobs that involve intricate tasks. This practical knowledge will equip students with the necessary skills to handle real-world tasks efficiently, fostering a deeper understanding of the techniques and safety measures required in each shop.

COURSE OUTCOMES

At the end of the course, the student will be able to:

1. Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking, and cutting tools & equipment's and machines
2. Explain job drawing and complete jobs as per specifications in allotted time
3. Inspect the job for the desired dimensions and shape
4. Operate, control different machines and equipment's adopting safety practices

DETAILS OF PRACTICAL CONTENTS

1. CARPENTRY SHOP

1.1. Demonstration of different wood working tools / machines.
1.2. Demonstration of different wood working processes, like plaining, marking, chiselling, grooving, turning of wood etc.
1.3. Three jobs involving joint like mortise and tenon, dovetail, bridle, and half lap.

2. FITTING SHOP

2.1. Demonstration of different fitting tools and drilling machines and power tools
2.2. Demonstration of different operations like filing, drilling, tapping, sawing, cutting etc.
2.3. Three fitting job involving practice of cutting, chipping, filing, marking, hacksawing, drilling, tapping, etc.

3. WELDING SHOP

3.1. Demonstration of different welding tools/machines.
3.2. Demonstration on Arc Welding, Gas Welding, MIG welding, gas cutting and rebuilding of broken parts with welding.
3.3. Two simple job involving butt and lap joint and T. Joint using electric arc welding.

4. SHEET METAL SHOP

4.1. Demonstration of different sheet metal tools/machines.
4.2. Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting.
4.3. Three simple job involving sheet metal operations, soldering, and riveting.
4.4. Jobs
4.4.1. Cutting Practices
4.4.2. Single / Double Seam Joint
4.4.3. Cylinders

5. PLUMBING SHOP

5.1. Demonstration of different plumbing tools, accessories, valves and different pipe fittings and joints (GI and PVC).
5.2. Demonstration of different plumbing operations like cutting, threading, pipe fitting (GI and PVC).
5.3 One simple job involving pipe cutting and external thread cutting on GI pipe.

6. PAINTING AND POLISHING SHOP

6.1. Introduction of paints, Varnishes, Reason for Surface preparation, Advantage of painting, other method of surface coating i.e. Electroplating etc.
6.2. Jobs
6.2.1. To prepare a wooden surface for painting apply primer on side and to paint in the same side.
6.2.2. To prepare metal surface for painting, apply primer and paint on same side.
6.2.3. To Prepare a metal surface for spray painting. First spray primer and paint the same by spray gun and compressor system.

REFERENCES:

1. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015
2. B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014
3. J.P. Bhati, Engineering Workshop, C.B.H. Publication, Jaipur.
4. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
5. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York
6. Roop Lal and Bharadwaj P. K., Prarambhik KaryashalaTakneeki (Hindi), Vayu Education of India, New Delhi

1.7 SPORTS AND YOGA

L	T	P
-	-	2

COURSE OBJECTIVES

To make the students understand the importance of sound health and fitness principles as they relate to better health. To expose the students to a variety of physical and yogic activities aimed at stimulatingtheir continued inquiry about Yoga, physical education, health and fitness. To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury .To develop among students an appreciation of physical activity as a lifetime pursuit anda means to better health.

COURSE OUTCOMES:

On successful completion of the course the students will be able to:

- Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, andrelaxation.
- Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
- Learn breathing exercises and healthy fitness activities
- Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
- Perform yoga movements in various combination and forms.
- Assess current personal fitness levels.
- Identify opportunities for participation in yoga and sports activities.
- Develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition etc.
- Improve personal fitness through participation in sports and yogic activities.
- Develop understanding of psychological problems associated with the age and lifestyle.
- Demonstrate an understanding of sound nutritional practices as related to health andphysical performance.
- Assess yoga activities in terms of fitness value.
- Identify and apply injury prevention principles related to yoga and physical fitness activities.
- Understand and correctly apply biomechanical and physiological principles elated to exercise and training

COURSE CONTENT

1 Introduction to Physical Education

- Meaning & definition of Physical Education
- Aims & Objectives of Physical Education

2 Yoga

- Meaning & Importance of Yoga
- Elements of Yoga- Gyan Yoga, Bhakti Yoga, Karm Yoga, Hathyoga, Astang Yoga .

- Introduction - Asans, Pranayama, Meditation & Bandh , Mudra and shat Karm .
- Meaning of Practice of various Yogic Sukhasan, Vyayams
- Practice of Asans and Benefits – Sidhasana, Padmasana,Vajrasana, Shasakasan, Singhasan, Gomukhasan, Virasan, Dhanurasan, Matsnyendrasan, Gorakhasan, Paschimottansan, Mayurasan, Garunasan, Pawanmuktasan, Kurmasan, Mandukasan, Shalabhasan, Makrasan, Bhujangasan, Naukasan, Shavasan, Sharvangasans, Halasan.
- Practice and Benefits of Pranayamas – Anulom- Vilom, Surya Bhedhi, Ujjayi, Sheetkari, Bhastrika, Bharamri, Murchha, kewali etc .
- Practice of Meditation – Meaning of Meditation, Types , Techniques, Benefits .

3 Olympic Movement

- Olympic Symbols, Ideals, Objectives & Values
- Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award,
- Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

4 Physical Fitness, Wellness & Lifestyle

- Meaning & Importance of Physical Fitness & Wellness
- Components of Physical fitness
- Concept of Positive Lifestyle

5 Yoga & Lifestyle

- Ideal life style
- Asans and pranayams a preventive measures
- Yoga and Immunity
- Concept of Yogic diet.
- **Life Style Diseases-** Yoga management of Diseases, Yoga management of Stress, Yoga management of Obesity, Yoga management of High Blood Pressure, Yoga management of Insomia, Yoga management of Asthma, Yoga management of Joints Pains, Yoga management of Digestive Disorders .

6 Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga

- Define Anatomy, Physiology & Its Importance
- Effect of exercise on the functioning of Various Body Systems.
- Circulatory System,
- Respiratory System,

7 Postures

- Meaning and Concept of Postures.
- Causes of Bad Posture.
- Advantages & disadvantages of weight training.

8 Training and Planning in Sports

- Meaning of Training
- Warming up and limbering down

9 Psychology & Sports

- Definition & Importance of Psychology in Physical Edu. & Sports
- Define & Differentiate Between Growth & Development

10 Doping

- Meaning and Concept of Doping

11 Sports Medicine

- First Aid – Definition, Aims & Objectives.
- Sports injuries: Classification, Causes & Prevention.

12 Sports / Games

Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

- History of the Game/Sport.
- Specifications of Play Fields and Related Sports Equipment.
- Important Tournaments and Venues.

References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga By B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

2.1 MATHEMATICS –II

L	T	P
3	1	-

COURSE OBJECTIVES

This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, integral calculus, coordinate geometry, basic elements of vector algebra and first order differential equations.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

- Solve linear equations using determinants and matrix algebra.
- Perform integration techniques, solve area and volume problems.
- Solve first order differential equations and apply numerical methods.
- Form and interpret equations of lines, circles and conics.
- Perform vector operations and solve related engineering problems of relevant branch.

COURSE CONTENTS

UNIT - I: Determinants and Matrices (10 periods)

Elementary properties of determinants upto 3rd order, consistency of equations, Crammer's rule. Algebra of matrices, inverse of a matrix, matrix inverse method to solve a system of linear equations in three variables.

UNIT - II: Integral Calculus (12 periods)

Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Introduction to definite integration. Use of formulae $\int_0^{\frac{\pi}{2}} \sin^n x dx, \int_0^{\frac{\pi}{2}} \cos^n x dx, \int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$ for solving problems ,where m and n are positive integers. Applications of integration for (i). Simple problems on evaluation of area bounded by a curve and axes. (ii). calculation of volume of a solid formed by revolution of an area about axes. (Simple problems).

UNIT-III: Differential Equations & Numerical Methods (15 periods)

Definition of differential Equations, order and degree of a differential equation, formation of differential equations, solution of first order and first degree differential equations by variable separable method (simple problems). Trapezoidal rule, Simpson's 1/3 and Simpson's 3/8 rule and their applications in simple cases. MATLAB – Simple Introduction.

UNIT - IV: Two dimensional Co-Ordinate Geometry (10 periods)

Equation of straight line in various standard forms (without proof), intersection of two straightlines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula.

General equation of a circle and its characteristics. To find the equation of a circle, given:

i. Centre and radius,

ii. Three points lying on it and

iii. Co-ordinates of end points of a diameter;

Definition of conics (Parabola, Ellipse, Hyperbola), their standard equations without proof. Problems on conics when their foci, directories or vertices are given.

UNIT - V: Vector Algebra (9 periods)

Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector product of two vectors. Simple problems related to work, moment and angular velocity.

INSTRUCTIONAL STRATEGY

The content of this course is to be taught on conceptual basis with plenty of real world examples. Differential equations and applications of differential equations can be taught with engineering applications of relevant branch.

MEANS OF ASSESSMENT

– Assignments and Quiz/Class Tests
– Mid-term and End-term Written Tests
– Model/Prototype Making

RECOMMENDED BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.
4. Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	10	20
2.	12	20
3.	15	25
4	10	20
5	9	15
Total	**56**	**100**

2.2 APPLIED PHYSICS – II

L	T	P
3	1	2

COURSE OBJECTIVES

Applied physics includes the study of a diversified topics related to 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 behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this 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 learn and appreciate these concepts and principles. In all contents, SI units should be followed.

COURSE OUTCOMES

After undergoing this subject, the student will be able to;

- Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.
- Define the terms: frequency, amplitude, wavelength, velocity of a wave.
- Explain various Engineering, Medical and Industrial applications of Ultrasonics.
- Apply acoustics principles to various types of buildings to get best sound effect
- Explain diffraction, interference, polarization.
- Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using C=Q/V
- Explain the role of free electrons in insulators, conductors and semiconductors, qualitatively the terms: potential, potential difference, electromotive force.
- Explain the concept of electric current, resistance and its measurement.
- List the effects of an electric current and their common applications, State and apply Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, distinguish between AC and DC electricity
- Explain Bio-Savart Law, Ampere's law, Lorenz Force.
- State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field
- Explain operation of moving coil galvanometer, simple DC motor
- Apply the knowledge of diodes in rectifiers, adapters IC's and various electronic circuits. Apply the concept of light amplification in designing of various LASER based instruments and optical sources.
- Explain total internal reflection and apply this concept for optical fiber and its uses in Medical field and Communication.

COURSE CONTENTS

1. **Wave motion and its applications** **(8 periods)**

1.1 Wave motion, transverse and longitudinal wave motion with examples. Sound and light waves and their properties. Definition of wave velocity, frequency and wave length and their relationship.

1.2 Wave equation y = r sin wt, phase, phase difference, principle of superposition of waves and amplitude

1.3 Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy of a body executing S. H. M., study of vibration of cantilever and determination of its time period, concept of simple harmonic progressive wave.

1.4 Free, Damped and forced oscillations, Resonance with examples.

1.5 Echo and reverberation, Sabine formula for reverberation time(without derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Acoustics of building.

1.6 Ultrasonic – Introduction properties and applications in engineering and medical applications.

2 Optics **(8 periods)**

2.1 Basic optical laws - Reflection And Refraction, Refractive Index.

2.2 Images and image formation by mirrors, lenses (concept only), lens formula (without derivation), power of lens, magnification.

2.3 Total internal reflection, critical angle and conditions for total internal reflection, application of total internal reflection in optical fiber.

2.4 Optical instruments - Simple And Compound Microscope, astronomical telescope in normal adjustment, magnifying power, resolving power, use of microscope and telescope.

3 Electrostatics **(8 periods)**

3.1 Concept of charge, Coulombs law, Electric field of point charges, Electric lines of force and their properties, Electric flux, Electric potential and potential difference.

3.2 Gauss law of electrostatics: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

3.3 Capacitor and its working principle, Types of capacitors.Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numerical).

3.4 Dielectric and its effect on capacitance, dielectric break down.

4. **Current Electricity** **(8 periods)**

4.1 Electric Current and its unit, direct and alternating current Resistance and its units, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance of a wire, Colour coding of carbon Resistances, Ohm's law.

4.2 Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge)

4.3 Concept of terminal potential difference and Electromotive force (EMF).

4.4 Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy

5. Electromagnetism (8 periods)

5.1 Types of magnetic materials. Dia, para and ferromagnetic materials with their properties.

5.2 Magnetic field and it units, magnetic intensity, magnetic lines of force, magnetic flux and its units, magnetization.

5.3 Concept of electromagnetic induction, Faraday's Laws, Lorentz force (Force on moving charge in magnetic field). Force on current carrying conductor.

5.4 Moving coil galvanometer – Principle of construction and working.

5.5 Conversion of galvanometer into ammeter and voltmeter.

6. Semiconductor physics (8 periods)

6.1 Energy bands in solids (Definition only)Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction and P N junction diode and its V-I characteristics

6.2 Diode as rectifier – half wave and full wave rectifier (center taped),

6.3 Semiconductor transistor, PNP and NPN (concepts only) and some electronic application (list only)

6.4 Application of semiconductor diodes (Zener, LED).

7. Modern Physics (8 Periods)

7.1 Lasers: Energy levels, ionization and excitation potential, spontaneous and stimulated emission, population inversion, pumping methods.

7.2 Types of lasers: Ruby, He- Ne lasers, Laser characteristic, Engineering and medical applications of lasers.

7.3 Fiber optics- introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, application in telecommunication, medical and sensors.

7.4 Nano Science and Nano technology: Introduction, nano particles and nano materials, properties at Nano scale, Nano technology, nano technology based devices and applications.

LIST OF PRACTICALS (To perform minimum six experiments)

1. To determine the velocity of sound with the help of resonance tube.
2. To determine the time period of a cantilever.
3. To verify the laws of reflection from a plane mirror / interface.
4. To verify the laws of refraction (Snell's law) using a glass slab.
5. To determine the focal length and magnifying power of a convex lens.
6. To verify laws of resistances in series and parallel combination.
7. To verify ohm's laws by drawing a graph between voltage and current.
8. To measure very low resistance and very high resistances using Slide Wire bridge
9. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
10. To draw characteristics of a PN junction diode and determine knee and break down voltages.
11. To verify the Kirchhoff's Law using electric circuit.
12. To find numerical aperture of an optical fiber.

INSTRUCTIONAL STRATEGY

Teacher may use various teaching aids like live 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 to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSESSMENT

- Assignment & Quiz
- Mid-Term and End-Term written test
- Model Making
- Actual Lab & Practical Work
- Viva-Voice

RECOMMENDED BOOKS

1. Text Book of Physics (Part-I, Part-II); N.C.E.R.T., Delhi
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
4. Practical Physics, by C. L. Arora, S Chand publications
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications.
7. Physics Volume 2, 5th edition, Haliday Resnick and Krane, Wiley publication
8. Fundamentals of Physics by Haliday, Resnick & Walker 7th edition, Wiley publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	8	15
2	8	15
3	8	15
4	8	15
5	8	15
6	8	15
7	8	10
Total	**56**	**100**

2.3 INTRODUCTION TO IT SYSTEMS

L	T	P
2	-	4

COURSE OBJECTIVES

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. 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 using MS Office/Open Office/Libre Office using internet etc., form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

Explanation of Introductory part should be demonstrated with practical work. Following topics may be explained in the laboratory along with the practical exercises.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- Identify Computer Hardware Components, Network Components and Peripherals.
- Explain the role of an Operating System.
- Install System and Application Software.
- Explain the function of the system components including Processor, Motherboard and Input-output devices.
- Use Word Processing Software to prepare document.
- Use Spreadsheet Software to create workbooks and automate calculation.
- Use Presentation Software to create interactive presentation.
- Perform fundamental tasks common to most application software including print, scan, save, edit, cut, copy, paste, format, spell and grammar check.
- Find and evaluate information on the Web.
- Install Antivirus.
- Safeguard against Online Frauds, threats and crimes.
- Use online office tools (Google suits)

COURSE CONTENTS

1. Introduction to Computers and Peripherals. (05 Periods)

Introduction, Computer Generations, Components of Computer, Types of Computer, CPU, RAM, ROM, Hard disk, USB, Flash drive, Keyboard, Mouse, display devices, Printer, Scanner, Modem, Sound Cards, Speakers, CMOS battery, Sharing of Printers.

1. Operating System and Application Software (06 Periods)

System Software, Application Software, Virtualization Software, Utility Software, MS Office/Open Office/LibreOffice, Working with windows OS, Desktop components, Menu bars, creating shortcut of program. Installation of Application software's, Antivirus and Drivers.

2. Office Tools: MS Office/Open Office/ Libre Office (06 Periods)

Creation of document, spreadsheets and presentation, Google Suits (Google drive, google sheet, google doc, google presentation)

3. Internet (06 Periods)

Network topologies, Basics of Networking,– LAN,MAN, WAN, Connecting Devices(Bridge, Switch, Router, Gateway),Wi-Fi technologies, Concept of IP Address, DNS, Search Engines, e-mail, Web Browsing.

4. Basics of Information Security (05 Periods)

Introduction to security, Security threats: detection and prevention, Indian Cyber laws.

LIST OF PRACTICAL EXERCISES

1. Identify various components, peripherals of computer and list their functions.
2. Installation of operating system. (windows/linux/others)
3. Installation of various application software and peripheral drivers.
4. Creation and Management of files and folders (Rename, delete, search)
5. Installation of Antivirus and remove virus.
6. Scanning and printing documents.
7. Browsing, Downloading, Information using Internet.
8. E-Mail ID creation, composing, sending and receiving e-mail. Attaching a file with e- mail message.
9. Word Processing (MS Office/Open Office) File Management, Editing documents, Mail Merge, Security etc.

10. Spread Sheet Processing (MS Office/Open Office/Libre Office)Addition, deletion, formulation,Securityetc.
11. PowerPoint Presentation (MS Office/Open Office/Libre Office)Preparing Slides, customization, animation, Security etc.
12. Google Suite.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office/Libre office/Google Suit in addition to working on internet. The student should be made capable of working on computers independently.

MEANS OF ASSESSMENT

- Class Tests/Quiz
- Software Installation and Use
- Viva-Voce
- Presentation

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi.
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, 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 AnushkaWirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

Reference websites

1. www. tutorialspoint..com
2. www.sf.net
3. Gsuite.google.com
4. Spoken-tutorial.org
5. Swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	5	18
2	6	21
3	6	22
4	6	21
5	5	18
Total	**28**	**100**

2.4 FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P
3	1	2

COURSE OBJECTIVES

To learn basic concepts of various active and passive electronic components, signals, measuring instruments, digital electronics, electric and magnetic circuits, ac circuits, transformer, motors and their applications. To help the students deal with the electrical and electronics engineering principles and applications in industrial processes of different fields.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- Understand and identify key electronic components and their applications.
- Use and understand basic electrical measuring instruments.
- Grasp the fundamentals of logic gates, Boolean algebra, and digital circuits.
- Understand basic concepts of electric and magnetic circuits.
- Analyze A.C. circuits and understand phase relationships and power calculations.
- Understand the principles and applications of transformers and electrical machines.
-

COURSE CONTENTS

UNIT- I Overview of electronic components: (12 Periods)

Active and Passive components, Resistor, Capacitor, Inductor and their types. Introduction to semi-conductor, Intrinsic and Extrinsic semi-conductors, P-N Junction diode - forward and reverse bias, V-I characteristics, Zener diode, LED. Bipolar Junction Transistor - PNP and NPN Transistor and their characteristics. Basics of FET, MOSFET.

UNIT- II Basic measuring instruments: **(06 Periods)**

Basic concept of Ideal and non-ideal voltage and current sources, sinusoidal and non sinusoidal waveforms, ammeter, voltmeter, wattmeter and digital multimeter, CRO (Block diagram, working and its uses).

UNIT –III Overview of Digital Electronics: **(10 Periods)**

Analog and digital signal, advantages of digital system. Introduction to Logic levels and Boolean Algebra, Basics of number system, Logic Gates-Truth Table and Symbol of AND, OR, NOT, NAND, NOR, ExOR, ExNOR Gates. Introduction to Latch, Flip Flops, Combinational Circuit and Sequential Circuit.

Unit -IV Electric and Magnetic Circuits: (8 Periods)

Definitions of basic terms, such as Current, Resistance, EMF, Potential Difference, Power and Energy, Ohm's Law and its limitation, Kirchhoff's laws; M.M.F, magnetic force, flux, permeability, hysteresis loop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations of self and mutual inductance; Analogy between electric and magnetic circuits.

Unit -V A.C. Circuits: (10 Periods)

Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and current; A.C in resistors, inductors and capacitors; A.C in R-L series, R-C series, R-L-C series circuits; Power in A. C. Circuits, power triangle; Relationship between line and phase voltage and line and phase current in Star and Delta connections.

Unit -VI Transformers and Machines: (10 Periods)

Single phase transformer: Construction, working principle, types, EMF equation, transformation ratio of transformers. Brief idea of Auto transformer.

Machines: DC machines: Types, EMF equation of generator and motor.

Single Phase Induction Motor: Principle of operation and introduction to methods of starting.

Three Phase Induction Motor: Construction and Principle of operation.

INSTRUCTIONAL STRATEGY

The instructional strategy combines lectures, demonstrations, and hands-on labs. Lectures will cover key concepts, while demonstrations will illustrate component functions and instrument operations. Hands-on labs will provide practical experience with electronic components and measuring instruments. Interactive quizzes and problem-solving sessions will reinforce and assess understanding, ensuring practical application of theoretical knowledge.

MEANS OF ASSESSMENT

- Assignment & Quiz
- Lab & Practical Work
- Viva-Voice

List of Practicals

1. Identify various passive and active electronic components in the given circuit.
2. Determine the value of given resistor using digital multi-meter to confirm with color code.
3. Exercise of soldering and de-soldering of components in circuits.
4. To study performance of PN-junction diodes and draw its V-I characteristics.
5. To measure frequency, time period and amplitude of a sinusoidal signal using CRO.
6. To measure voltage and current using digital multi-meter.
7. To verify the truth tables for all logic gates – NOT, OR, AND, NAND, NOR, XOR, XNOR.
8. Implement and realize Boolean Expressions with Logic Gates
9. Verify the Kirchhoff's laws.
10. Measure voltage, current and power in 1-phase circuit with resistive load.
11. Measure voltage, current and power in R-L series circuit.
12. Verify the ohms law.
13. Use of voltmeter, ammeter, and watt-meter.
14. Connect resistors in series and parallel combination on bread board and measure its value using digital multi-meter.
15. Connect capacitors in series and parallel combination on bread board and measure its value using multi-meter.

REFERENCE BOOKS –

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House.
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN: 978-0-07-0088572-5.
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition, ISBN: 9781107464353.
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405.
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375.
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN: 97881236529513.
7. Sedha, R.S., A Textbook of Applied Electronics, S. Chand, New Delhi, 2008, ISBN-13: 978-8121927833.
8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi, 2015, ISBN-13: 0070634244-978.
9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13: 9788121924504.
10. Bell, David, Fundamentals of Electronic Devices and Circuits, Oxford University Press, New Delhi, 2015, ISBN: 9780195425239.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	13	20
2	05	10
3	10	15
4	8	15
5	10	20
6	10	20
Total	**56**	**100**

2.5 ENGINEERING MECHANICS

L	T	P
3	1	2

COURSE OBJECTIVES

The course provides a foundational understanding of mechanics, covering force systems, equilibrium, and beam analysis under different loads. It explores friction and its applications, centroids and moments of inertia for various shapes, and the principles and applications of simple lifting machines.

COURSE OUTCOMES

After completing this course, student will be able to:

1. Identify the force systems for given conditions by applying the basics of mechanics.
2. Determine unknown force(s) of different engineering systems.
3. Apply the principles of friction in various conditions for useful purposes.
4. Find the centroid and centre of gravity of various components in engineering systems.
5. Select the relevant simple lifting machine(s) for given purposes.

COURSE CONTENTS

Unit – I Basics of Mechanics and Force System : (12 Periods)

Significance and relevance of mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.

Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification. Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

Unit– II Equilibrium : (11 Periods)

Equilibrium and Equilibrant, Free body and free body diagram, Analytical and graphical methods of analysing equilibrium. Lami's Theorem – statement and explanation, Application for various engineering problems.

Beam- Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple), Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load.

Unit– III Friction : (11 Periods)

Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. Equilibrium of bodies on level surface subjected to force parallel and inclined to plane. Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.

Unit– IV Centroid and Moment of Inertia : (11 Periods)

Concept, definition and determination of Centroid of plain figures (square, rectangle, triangle, circle, semi-circle, quarter circle) and Centre of gravity of symmetrical solid bodies (Cube, cuboid, cone, cylinder, sphere, hemisphere).

Concept of moment of inertia, Radius of Gyration, Theorem of perpendicular and parallel axis theorem. Concept of Second moment of area of standard areas (Rectangle, Triangle and circle) and composite area (L,T,I section).

Unit – V Simple Lifting Machine : (11 Periods)

Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines, law of machine. Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility.

System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency. Working principle and application of wheel and axle, Weston's Differential Pulley Block , simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application [Simple problems on the above topics]

List of practical to be performed:

1. To study various equipment related to Engineering Mechanics.
2. To find the M.A.,V.R., Efficiency and law of machine for differential Axel and Wheel.
3. To find the M.A.,V.R., Efficiency and law of machine for Simple Screw Jack.
4. Derive Law of machine using Worm and worm wheel.
5. Determine resultant of concurrent force system applying law of Polygon of forces using force table.
6. Determine resultant of concurrent force system graphically.
7. Determine resultant of parallel force system graphically.
8. Verify Lami's theorem.
9. Study forces in various members of Jib crane.
10. Determine force reaction's for simply supported beam.
11. Determine Coefficient of friction for motion on horizontal and inclined plane.
12. Determine centroid of geometrical plane figures.

INSTRUCTIONAL STRATEGY

The instructional strategy includes lectures, visual aids, and interactive examples for key mechanics concepts and force systems, along with problem-solving sessions. Equilibrium concepts are taught with practical demonstrations and hands-on beam analysis. Friction is explored through case studies and practical demonstrations, followed by exercises. Centroid and moment of inertia are covered with visual aids and practical tasks. Simple lifting machines are introduced through lectures and demonstrations, with problem-solving on mechanical advantage and efficiency.

MEANS OF ASSESSMENT

- Assignment & Quiz
- Lab & Practical Work
- Viva-Voice

RECOMMENDED BOOKS :

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
3. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.
5. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
6. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cambridge University Press.
7. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.
8. Bhavikatti S.S., Engineering Mechanics, New Age International Publishers

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	20
2	11	20
3	11	20
4	11	20
5	11	20
Total	**56**	**100**

2.6 ENVIRONMENTAL SCIENCE

L	T	P
3	-	-

COURSE OBJECTIVES:

A diploma holder must have knowledge of different types of pollution caused due to industriesand constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. He should know the concept of hazards and disaster management.

COURSE OUTCOMES:

After undergoing the subject, the student will be able to:

- Comprehend the importance of ecosystem and sustainable development.
- Demonstrate interdisciplinary nature of environmental issues
- Identify different types of environmental pollution and control measures.
- Explain environmental legislation acts.
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Analyze the impact of human activities on the environment
- Understand the basic concept of disaster and hazards.
- Analyze the impact of disaster on various social components.

COURSE CONTENT

1. Introduction (06 Periods)

Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non-renewable. Global Warming, Climate change and its impact ,Green House Effect, Acid Rain, Concept of Green Building, Ground water management.

2. Air Pollution and Noise pollution (08 Periods)

Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air Pollution Control Methods. Introduction to Air Pollution and its Prevention and Control Act 1981 & Environmental Protection Act 1986 and Function of State pollution control board and National Green Tribunal (NGT).
Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

3. Water Pollution and Soil Pollution (11 Periods)

Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollutionon human health, Turbidity, pH, total suspended solids, total dissolved solids, Concept of dissolved O_2, BOD, COD. Prevention of water pollution. Introduction to Water (Prevention and Control of Pollution) Act 1974.Concept of rain water harvesting system.
Sources of soil pollution, Types of Solid waste- House hold, Hospital, From Agriculture,

Biomedical, Animal waste and human waste, sediments and E-waste, Plastic Waste .
Effect of Solid waste, Disposal of Solid Waste- Solid Waste Management.

4. Disaster Causes and Hazards (6 Periods)

4.1 Introduction
4.2 Classification of Natural Disasters
4.3 Classification of Natural Disasters in India

- Earthquake
- Tsunami
- Flood
- Drought
- Land Slide
- Thunderstorm and Lightening

5 Disaster Management (11 Periods)

5.1 Framework

- Yokohama Strategy for a Safer World (1999)
- The Hyogo Framework for Action (HFA) (2005-2015)
- Sendai Framework for Action (SDGS) (2015-2030)

5.2 Disaster Management, Preparedness and Response in India

- National Disaster Management Authority (NDMA) Guidelines
- National Policy on Disaster Management (2009)
- National Disaster Management Act (2005)
- NDRF (National Disaster Response Force), SDRF (State Disaster Response Force), DDRF (District Disaster Response Force), and Aapda Mitra.
- Case studies of disaster management efforts: COVID-19 Pandemic, Earthquakes, Firefighting, Thunder Storm, and Lightning.

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies like expert lectures, seminars, visits to green house, effluent treatment plant of any industry, rain water harvesting plant etc. may also be organized.

MEANS OF ASSESSMENT

– Assignments and quiz/class tests,
– Mid-term and end-term written tests

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 DeepPublications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; DhanpatRai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by ErachBharucha; University Press (India) Private Ltd., Hyderabad.
7. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons,New Delhi.
8. E-books/e-tools/relevant software to be used as recommended by AICTE/BTE/NITTTR,Chandigarh.
9. Disaster Management Second Edition AICTE Recommended by S C Sharma, Khanna Publishers
10. Bharat Bhautik Paryavaran Class 11, By NCERT.
11. Apda Avem Apda Prabhandhan | आपदा और आपदा प्रबंधन | Mahesh Kumar Barnwal | CosmosPublication.
12. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna publishing House, New Delhi

Websites for Reference:

- http://swayam.gov.in
- https://www.amazon.in/Prabhandhan
- https://ncert.nic.in/textbook.php?khgy1=0-6
- https://rb.gy/yergl

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	6	15
2	8	20
3	11	25
4	6	15
5	11	25
Total	**42**	**100**

4- Recourse Requirement

A- LIST OF EQUIPMENT

APPLIED PHYSICS LABORATORY			
Sr. No.	**Description**	**Qty**	**Approx. Total Price (Rs)**
1.	Vernier calipers Working length 160 mm, Internal and external dia with locking arrangement	12	2,000
2.	Screw Gauges Working length 15 mm, pitch 0.5 mm, least count .005 mm	12	2,000
3.	Spherometers Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm.	12	2,000
4.	Mirrors (convex, concave)	5 Each	1,500
5.	Pendulum Setup	02	4,000
6.	Gravesand's Apparatus	02	3,000
7.	Double Inclined Plane Setup	02	2,000
8.	DC Ammeters Moving coil weston-type ammeter with ebonite stand	10	3,500
9.	DC Milliammeters	2	1,000
10.	DC Microammeters	2	700
11.	DC voltmeters	10	700
12.	DC Millivoltmeters	10	2,000
13.	Sensitivity Galvanometer	2	800
14.	Student Galvanometers	10	4,000
15.	Demonstration type DC Ammeters Range; 0 to 1 Amp.	2	1,000
16.	D type DC Voltmeter Range: 0 to 1 Volt	2	1,000
17.	D type Galvanometers Sensitivity: 20 microamperes per scale division,	8	8,000
18.	Resistance boxes (dial type) assorted	8	8,000

19.	Rheostats	10	4.000
20.	Miscellaneous items (Spring, Pan, Glycerine, Optic fibre,	LS	2,000
21.	Fortin's Barometer (Wall type)	2	20,000
22.	Stoke's Apparatus	2	10,000
23.	Resonance Tube Apparatus with accessories and Tuning fork set	2	14,000
24.	Ohmic resistance coil	10	5,00
25.	Slide wire bridge	2	8,000
26.	PN Junction diode Apparatus	2	10,000
27.	Numerical aperture setup	1	25,000
28.	Ohms law setup	1	1500
29.	Cantilever setup	1	11000
30.	Series and parallel resistance combination kit	1	1500
31.	Hooks law setup with pan and weights	2	2000
32.	Optical bench with all accessories (setup)	2	5000
33.	Mercury Thermometer measuring room temperature	5	2000
34.	Coefficient of friction apparatus setup with pan and weights	2	4400
35.	Kirchhoffs law setup	1	2200
36.	Miscellaneous	LS	3,000

APPLIED CHEMISTRY LABORATORY

Sr. No.	Description	Qty	Approx. Per Unit Price (Rs)
1.	Digital Balance	1	85,000
2.	Burette 50ml	30	250
3.	Pipette 25ml	60	200
4.	Beakers 100ml	60	200
5.	Burette stand	30	1,000
6.	Glazed tile	30	30
7.	Conical flask 50ml (Titration flask)	60	200
8.	Standard measuring flask 250/100ml	30	300
9.	Able's Flash Point apparatus	2	8,000
10.	(1/10)°C thermometer	06	1,000
11.	Candles	20	5
12.	Crucible with lid	06	700
13.	Muffle furnace	1	25,000
14.	Desiccator	06	3,000
15.	Pair of tongue (small and big)	24 (small) 2 (big)	150 200
16.	Digital hot plate with magnetic stirrer	2	17,000
17.	Conductivity meter with electrode	1	5,000
18.	Photo colorimeter	1	10,000
19.	Bomb calorimeter	1	1,30,000

20.	Ammeter (0-500mA)	5	800
21.	Rheostat (200ohm, 1A)	1	1,000
22.	Cuvette	20	800
23.	Copper electrode	1	6,500
24.	Salt bridge tube	5	800
25.	Zinc rod	1	1,000
26.	Voltameter (0-12V)	1	700
27.	DC variable voltage source(0-30V)	1	8,000
28.	Chemicals - EDTA-1 kg - Eriochrome Black-T(solochrome black T)-200g - Buffer solution (NH_3 - 2.5 ltr, NH_4Cl – 1 kg) - Zinc sulphate- 1kg - H_2SO_4- 2.5 ltr - Phenolphthalein indicator (as per requirement) - Methyl orange indicator (as per requirement) - Charcoal (as per requirement) - Kerosene (as per requirement) - KCl & agar-agar - Distilled water (as per requirement) - Cement - Ferrous ammonium sulphate - 40%Ammonium thiocyanate - Fuels(solid & Liquid) - Oxalic acid - Copper sulphate - NaOH - $KMnO_4$, Na_2CO_3, KOH, 2-Propanol - Hematite ore, copper pyrite ore - Hypo($Na_2S_2O_3$) , 10% KI, CH_3COOH	LS	40,000
29.	Miscellaneous	LS	10,000

Sr. No.	Description	Qty	Approx. Total Price (Rs)
1.	Stools	40	10,000
2.	Display Board/Screen	2	6,000
3.	Sound recording and playing system	1	6,000
4.	Audio cassettes	60	2,000
5.	Overhead Projector	1	5,000
6.	Transparencies slides	100	500
7.	TV, VCR and camera for video recording	1 each	20,000
8.	English spoken course	1	2,000
9.	A Quiz room equipped with two way audio system, back projection system and slide projector	1	30,000
10.	Miscellaneous	LS	1,500

COMMUNICATION LAB

ENGINEERING WORKSHOP PRACTICE

S.No.	Description	Qty.	Approx. Total price (Rs.)
	CARPENTRY SHOP		
1.	Work benches fitted with 4 carpenter vices 9"	5	60,000
2.	Circular saw grinder	1	6,000
3.	Wood cutting band saw-vertical	1	10,000
4.	Bench grinder	1	5,000
5.	Bench drilling machine with different drill bits	1	8,500
6.	Wood turning lathe machine	1	40,000
7.	Wood planner	1	20,000
8.	Tool accessories measuring and marking instruments	25	25,000
9.	Band saw blade brazing unit	1	10,000
10.	Miscellaneous	LS	1,500

PAINTING AND POLISHING SHOP			
1	Spray gun 1 Ltr. cup capacity with hose pipe	1	3,000
2	Paint brushes & rollers	20	3,000
3	Paint/varnish	LS	2,000
4	Air compressor with 2 hp motor	1 set	21,000
5	Miscellaneous	LS	2,000
WELDING SHOP			
1.	Electrical welding transformer set with accessories	3	30,000
2.	Gas cutting unit	1	3,000
3.	Work benches with vices	3	5,000
4.	Portable welding machine (220 amp)	1	9,000
5.	Oxy acetylene welding set with accessories	1	7,000
6.	Acetylene generating set	1	6,000
7.	Electric welder tool kit	10	10,000
8.	Projection welding machine	1	15,000
9.	Brazing equipment with accessories	1	10,000
10.	Soldering irons	3	1,000
11.	Pedestal grinder	1	3,000
12.	Angle grinder	1	3,000
13.	Metal spraying gun	1	10,000
14.	Spot welding machine	1	25,000
15.	Tig welding set	1	1,00,000
16.	Mig welding set	1	1,00,000
17.	Welding partition screen	5	2,500
18.	Miscellaneous	LS	3,000

FITTING AND PLUMBING SHOP			
1.	Work benches with vices (4 vices on each bench)	5	60,000
2.	Marking tables with scribers	4	24,000
3.	Surface plates	5	20,000
4.	Accessories like calipers, v blocks, height, gauges steel rules and scribers	25	50,000
5.	Tool kits —taps, dies, drills, number punch, letter punch	25	40,000
6.	Tool kits — chisels, hammers, files, hacksaw	25	25,000
7.	Bench drilling machine 3 phase	1	10,000
8.	Hand drill machine	1	5,000
9.	Pipe vice	2	10,000
10.	Chain wrenches	2	2,000
11.	Bench grinder	1	6,500
12.	Ring spanner set	5	600
13.	Pipe die set 2"	2 set	2,000
14.	Pipe bending device	1	5,000
15.	Various plumbing fittings	LS	2,000
16.	Miscellaneous	LS	1,500
SHEET METAL SHOP			
1.	Hammers	8	3,000
2.	Mallets (hard & soft)	5	2,000
3.	Sheet and wire gauges	2	8,00
4.	Hand shearing machine	1	20,000
5.	Bar folding machine	1	20,000
6.	Burring machine	1	10,000
7.	Various sheet (black plain, galvanized iron)	1 Each	1,000
8.	Hand shears/snippers	4	2,000
9.	Nuts, bolts, rivets, screw	LS	1,000
10.	Miscellaneous	LS	2,000

INTRODUCTION TO IT SYSTEMS LAB /COMPUTER LAB

S.N.	Name of Equipment	No. of Equipment	Approx. Total Price
1	Computer System with latest configuration	30	21,00,000
2	Printer (MFP)	1	25,000
3	Printer (Laser)	1	35,000
4	Antivirus Software	LS	10,000
5	Internet Facility on Computers	LS	2,00,000
6	LCD Projector	1	70,000
7	UPS	30	60,000
8	Software (latest MS Office, Others) A4,A3 Size	1	1,00,000
9	Scanner (A4,A3 Size)	1	10,000

Fundamentals of Electrical and Electronics Engineering Lab

S.N.	Instruments	Quantity	Approx. unit price (Rs.)
1	Voltmeter	6	3000
2	Ammeter	6	3000
3	Wattmeter	6	4000
4	Single Phase Transformer	1	10000
5	Single Phase Variac	1	4000
6	Resistive Load	1	4000
7	Digital Multi-meter	6	10000
8	Variable Choke coil	1	5000
9	Bread board	5	500
10	Soldering stations temperature controlled	1	10500
11	Soldering Set	2	3000
12	PN junction experimental kit	1	3500
13	Digital logic trainer	2	20000
14	Miscellaneous (PN junction diodes, resistors, capacitors, CRO probes, multipurpose PCB, connecting wires, different logic gate ICs, etc.)	LS	7000
15	Decade resistors, capacitors and inductor box	2 each	4500
16	D.C regulated power supply	2	8000
17	CRO	2	30000
18	Function Generator	2	12000

ENGINEERING GRAPHICS

Sr No.	Instruments	Qty	Approx. unit Price in Rs.
1.	Drawing Boards (700 x 500mm)	60	800
2.	Draughtsman Tables	60	3,000
3.	Draughtsman Stools	60	750
4.	Computer Aided Drawing (CAD) Software	30 User	5,00,000
5.	Wooden Model of different solids- cone, cylinder, prism, and polygon.	1set	2,000
6.	Wooden Model of different hollow cut sections- cylinder, cube, and Rectangle.	1set	1,500
7.	Miscellaneous	LS	10,000

Note- This subject will be evaluated as a theory examination.

B - Furniture Requirement

Norms and standards laid down by AICTE -APH (latest) be followed for working out furniture requirement for diploma courses

C- Human Resources:

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

5- EVALUATION STRATEGY

INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and

systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section.

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

6 -RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated student's behavior as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1- Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.

2. An academic plan needs to be prepared and made available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics, in turn are supposed to prepare institutional academic plan.

3. HOD of every Programme Department along with HODs and in-charge of other departments are required to prepare academic plan at department level referring to institutional academic plan.

4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.

Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practical, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practical and field experiences. Teachers are also required to do all these activities within a stipulated period of time. It is essential for them to use the given time judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available and courses to be taught.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcomes and reinforce learning etc.

3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.

4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.

5. Concept and content-based field visits may be planned and executed for such content of course which is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem-based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.

7. Planning of progressive assessment encompasses periodical assessment in a semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive feedback to every student

8. The student-centered activities may be used to develop generic skills like task management, problem solving, managing self, collaborating with others etc.

9. Where ever possible, it is essential to use activity-based learning rather than relying on delivery based conventional teaching all the time.

10. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.

11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.

13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

7 - List of Experts

Mathematics I & II

1. Shri Pankaj Bhatnagar, Lecturer Mathematics, Govt. Poly. Deeh Sadar Unnao
2. Shri Nilesh Kumar, Lecturer Mathematics, Govt. Poly. Unnao
3. Smt. Pushpa Gautam, Lecturer Mathematics, Govt. Poly. Jamunia Deeh Harak Barabanki
4. Shri Manish Kumar, Lecturer Mathematics, Govt. Poly. Ghatampur Kanpur
5. Smt. Kshama Mishra, Lecturer Mathematics, Govt. Poly. Kanpur
6. Shri Sanjiv Agrawal, Lecturer Mathematics, Govt. Poly. Orai Jalaun

Applied Physics

1. Shri Rakesh Kumar Verma, Lecturer Physics, Govt. Poly. Tirwa Kannauj
2. Smt. Shalini, Lecturer Physics, Govt. Poly. Bindki Fatehpur
3. Dr. Ajay Maurya, Lecturer Physics, Govt. Poly. Kanpur
4. Smt. Monika Tandon, Lecturer Physics, Govt. Poly. Ghatampur Kanpur
5. Smt. Neelam, Lecturer Physics, Govt. Poly. Deeh Sadar Unnao

Applied Chemistry

1. Dr. Jagrati, Lecture Chemistry, Govt. Poly. Bighapur Unnao
2. Dr Tahir Jafar, Lecture Chemistry, Govt. Poly. Sicundra Kanpur Dehat
3. Shri Santosh Kumar Singh, Lecture Chemistry, Govt. Poly. Fatehpur
4. Shri Ravi Rajak, Lecture Chemistry, MMIT, Kanpur Dehat
5. Smt. Manisha Gangwar, Lecture Chemistry, Govt. Poly. Deeh Sadar Unnao
6. Dr Anshu Singh, Lecture Chemistry, Govt. Girls Poly. Lucknow

Communication In Skills In English

1. Mohd. Kamrujjma, Lecture English, Govt. Poly. Deeh Harak Barabanki
2. Dr. Dhruv Shankar, Lecture English, MMIT Kanpur Dehat
3. Smt. Jyotishna Singh, Lecture English, Govt. Poly. Unnao
4. Dr. Rupali, Lecture English, Govt. Poly. Bindki Fatehpur
5. Shri Amit Agnihotri, Lecture English, Govt. Poly. Kanpur

Engineering Graphics

1. Shri Pradeep Kumar, HOD Mechanical, Govt. Poly. Lucknow.
2. Shri Atul Roy, Lecturer Mechanical, Govt. Poly. Kanpur
3. Shri Pankaj Singh, Lecturer Mechanical, MMIT Auraiya
4. Smt. Charu Bajpai, Lecturer Civil, Govt. Poly. Sikandra Kanpur dehat
5. Shri Ram Sajivan, Lecturer Mechanical, MMIT, Kannauj
6. Smt. Ruchi Singh, Lecturer Civil, Govt. Poly. Kanpur
7. Shri Sakib Ali, Lecturer Mechanical, Govt. Poly. Bighapur Unnao

Engineering Workshop Practice

1. Shri. Narendra Kumar, Workshop Superintendent, Govt. Poly. Kanpur
2. Shri Pravin Kumar, Workshop Superintendent, Govt. Girls Poly. Lucknow
3. Shri V. K. Shrivtastav, Workshop Superintendent, Govt. Poly. Ayodhya
4. Shri S. K. Saxsena, Workshop Superintendent, Govt. Poly. Jhansi
5. Shri A. K. Shrivatastav Workshop Superintendent, Govt. Poly. Hardoi

Introduction to IT Systems

1. Shri Madan Mishra, HOD Computer Science & Engg., MMIT Santkabir Nagar.
2. Dr. Jokhu Lal, HOD Computer Science & Engg., Govt. Girls Poly. Lucknow.
3. Shri janmejai Kumar, Lecturer CSE, Govt. Poly. Jansath Muzaffarnagar.
4. Smt. Roopali Singh, Lecturer CSE, Govt. Poly. Kanpur.
5. Dr. Vikas Yadav, Lecturer CSE, Govt. Poly. Bighapur Unnao.

Fundamental Of Electrical & Electronics Engineering

1. Shri Anand Kumar, Hod Electrical, Govt. Poly. Lucknow
2. Smt. Geeta Gautam, Lecturer Electronics, Govt. Poly. Fatehpur
3. Smt. Priyanka Tiwari, Lecturer Electrical Govt. Poly. Kanpur
4. Shri Santosh Kumar Yadav. Lecturer Electronics Govt. Poly. Kanpur
5. Smt. Garima Singh, Lecturer Electronics Govt. Poly. Kanpur
6. Miss. Preeti Sonkar, Lecturer Electrical, Govt. Poly. Kanpur

Engineering Mechanics

1. Shri Kuldeep Singh, HOD Mechanical, Jamunia Deeh Harak Barabanki
2. Shri Atul Roy, Lecturer Mechanical, Government Polytechnic Kanpur
3. Shri Pranjal Mishra, Lecturer Mechanical, Govt. Poly. Deeh Unnao
4. Smt. Anshita Awasthi, Lecturer Mechanical, Govt. Poly. Deeh Unnao
5. Mohd. Saqib Ali Lecturer Mechanical Govt. Poly. Bighapur Unnao
6. Shri Ram Sajivan, Lecturer Mechanical, MMIT Kannauj

Environmental Science

1. Shri Rakesh Kumar, HOD Chemical, Govt. Poly. Kanpur
2. Shri Ravi Sachan, HOD Civil, Govt. Poly. Lucknow
3. Smt. Charu Bajpai, Lecturer Civil, Govt. Poly. Sikandra Kanpur Dehat
4. Dr. Shashi Bala, Lecture Chemical, Govt. Poly. Kanpur
5. Smt. Ruchi Singh, Lecturer Civil, Govt. Poly. Kanpur
6. Smt. Pratiksha Chaurasiya, Lecturer Plastic and Mold Technology, Govt. Poly. Kanpur.

8- GUIDELINES FOR ASSESSMENT OF STUDENT-CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 50 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows

I. 15 Marks for general behaviour and discipline

(by HODs in consultation with all the teachers of the department)

II. 10 Marks for attendance as per following:

(by HODs in consultation with all the teachers of the department)

a) 75 - 80% 06 Marks

b) 80 - 85% 08 Marks

c) Above 85% 10 Marks

III. 25 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:

(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a) 25 - State/National Level participation

b) 20 - Participation in two of above activities

c) 15 - Inter-Polytechnic level participation

9 . Evaluation Scheme Guidelines : As Per AICTE

a. For Theory Courses:

(The weightage of Internal assessment is 40% and for End Semester Exam is 60%) The student has to obtain at least 40% marks individually both in internal assessmentand end semester exams to pass.

b. For Practical Courses:

(The weightage of Internal assessment is 60% and for End Semester Exam is 40%) The student has to obtain at least 40% marks individually both in internal assessmentand end semester exams to pass.

c. For Summer Internship / Projects / Seminar etc.

Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance, viva-voce in practical, lab record etc.

10- (Annexure –I)

^Curriculum of First and Second Semester for the following Engineering Branches -

Sr. No.	Name of Diploma Programme	Duration
1	Diploma in Mechanical Engineering	3 Years
2	Diploma in Mechanical Engineering (Repair & Maintenance)	3 Years
3	Diploma in Mechanical Engineering(Computer Aided Design)	3 Years
4	Diploma in Mechanical Engineering (Refrigeration & Air conditioning)	3 Years
5	Diploma in Mechanical Engineering (Automobile)	3 Years
6	Diploma in Mechanical Engineering(Production)	3 Years
7	Diploma in Electronics Engineering	3 Years
8	Diploma in Electronics Engineering (Advanced Microprocessor & Interface)	3 Years
9	Diploma in Electronics Engineering (Modern Consumer Electronics Appliances)	3 Years
10	Diploma in Electronics Engineering (Micro Electronics)	3 Years
11	Diploma in Electrical Engineering	3 Years
12	Diploma in Electrical Engineering (Industrial Control)	3 Years
13	Diploma in Electrical & Electronics Engineering	3 Years
14	Diploma in Electronics & Communication Engineering	3 Years
15	Diploma in Chemical Engineering	3 Years
16	Diploma in Chemical Technology (Rubber & Plastic)	3 Years
17	Diploma in Chemical Technology (Fertilizer)	3 Years
18	Diploma in Chemical Engineering (Petro Chemical)	3 Years
19	Diploma in Paint Technology	3 Years
20	Diploma in Civil Engineering	3 Years
21	Diploma in Computer Science & Engineering	3 Years
22	Diploma in Information Technology	3 Years
23	Diploma in Instrumentation & Control Engineering	3 Years

24	Diploma in Civil Engineering (Environmental Pollution & control)	3 Years
25	Diploma in Agricultural Engineering	3 Years
26	Diploma in Plastic Mould Technology	3 Years
27	Diploma in Glass & Ceramics	3 Years
28	Diploma in Architectural Assistant ship	3 Years
29	Diploma in Dairy Engineering	3 Years
30	Diploma in Leather Technology (Tanning)	3 Years
31	Diploma in Leather Technology Footwear (Computer Aided Shoe Design)	3 Years
32	Diploma in Textile Technology	3 Years
33	Diploma in Textile Chemistry	3 Years
34	Diploma in Textile Engineering	3 Years
35	Diploma in Printing Technology	3 Years
36	Diploma in Food Technology	3 Years
37	Diploma in Paper & Pulp Technology	3 Years
38	Diploma in Carpet Technology	3 Years
39	Diploma in Mining Engineering	3 Years
40	Renewable Energy	3 Years
41	Communication and Computer Networking	3 Years
42	Civil and Environment Engineering	3 Years