Curriculum

for

Diploma Programme
in
TEXTILE CHEMISTRY

For the State of Uttar Pradesh

Prepared by:

Curriculum Development Cell

Institute of Research Development & Training

U. P., (Government Polytechnic Campus)

Kanpur-208002

1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN TEXTILE CHEMISTRY

1)	Name of the Programme	:	Diploma Programme in TextileChemistry
2)	Duration of the Programme	:	Three years (Six Semesters)
3)	Entry Qualification	:	Matriculation or equivalent NSQF Level as Prescribed by State Board of Technical Education, UP
4)	Intake	:	60 (or as prescribed by the Board)
5)	Pattern of the Programme	:	Semester Pattern
6)	NSQF Level	:	Level – 5
7)	Ratio between theory and Practical	:	45 : 55 (Approx.)

Practice

8) **Industrial Training:**
Four weeks of industrial training is included after IV semester break with allowed leaves. Total marks allotted to industrial training will be 50.

9) **Ecology and Environment :**
As per Govt. of India directives, a subject on Environmental Studies has been incorporated in the curriculum.

10) **Energy Conservation:**
A subject on Energy Conservation has been incorporated in the curriculum.

11) **Entrepreneurship Development:**
A full subject on Industrial Management and Entrepreneurship Development has been incorporated in the curriculum.

12) **Student Centred Activities:**
A provision of 3-6 hrs per week has been made for organizing Student Centred 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 and other cultural activities, disaster management and safety etc.

13) **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.

2. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN TEXTILE CHEMISTRY

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1	*Communication Skills-I	4	-	2	4	20	-	20	50	2 ½	-	-	50	70
1.2	*Applied Mathematics-I	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
1.3	*Applied Physics – I	5	-	2	5	20	-	20	50	2 ½	-	-	50	70
1.4	+General Mechanical Eng.	6	-	4	6	20	20	40	50	2 ½	40	3	90	130
1.5	+Engineering Drawing	-	-	10	5	20	-	20	50	3	-	-	50	70
1.6	+Textile Fibers-I	4	-	4	5	20	20	40	50	2 ½	40	3	90	130
	#Student Centered Activities (SCA)	-	-	2	1	-	30	30	-	-	-	-	-	30
Total		**24**	**-**	**24**	**30**	**120**	**70**	**190**	**300**		**80**	**-**	**380**	**570**

*   Common with other diploma programs
 #   Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.
+   Common with Textile Technology/Textile Engineering

SECOND SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1	*Applied Mathematics - II	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
2.2	*Applied Physics -II	5	-	2	5	20	20	40	50	2 ½	40	3	90	130
2.3	*Applied Chemistry	5	-	2	5	20	20	40	50	2 ½	40	3	90	130
2.4	+Textile Fibers-II	4	-	2	6	20	20	40	50	2 ½	40	3	90	130
2.5	Textile Manufacturing Processes	6	-	-	5	20	-	20	50	2 ½	-	-	50	70
2.6	+Workshop Practice	-	-	10	4	-	30	30	-	-	60	4	60	90
	#Student Centered Activities (SCA)	-	-	4	1	-	30	30	-	-	-	-	-	30
Total		**25**	**-**	**20**	**30**	**100**	**120**	**220**	**300**		**80**	**-**	**380**	**650**

*   Common with other diploma programmes

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

\+   Common with Textile Technology/Textile Engineering

3. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 30 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

i. 10 Marks for general behavior and discipline
    (by HODs in consultation with all the teachers of the department)

ii. 5 Marks for attendance as per following:
    (by HODs in consultation with all the teachers of the department)

    a) 75 - 80%   2 Marks
    b) 80 - 85%   4 Marks
    c) Above 85%   5 Marks

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
     (by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

    a) 15   -   State/National Level participation
    b) 10   -   Participation in two of above activities
    c) 5   -   Inter-Polytechnic level participation

Note: There should be no marks for attendance in the internal sessional of different subjects.

MAIN FEATURES OF THE CURRICULUM

TITLE OF THE COURSE   : Diploma in Textile Chemistry

DURATION   : Three Year (Six Semester)

PATTERN OF THE COURSE   : Semester System

INTAKE   : 60

TYPE OF COURSE   : Full Time

ENTRY QUALIFICATION   : Passed High School With 35% Marks

MODE OF ADMISSION   : Through Joint Entrance Examination

LIST OF EXPERTS

List of experts who contributed in the development of the curriculum in Review and Revision for the Three year (Six Semester) Diploma Textile Technology at I.R.D.T., U.P., Kanpur on 24 & 25 August 2022 are honorable named below :

1-	Shri B. D. Dixit	Retd. Professor, U.P.T.T.I., Kanpur
2-	Dr. Alka Ali	Professor, U.P.T.T.I., Kanpur
3-	Dr. Prashant Visnoi	Professor, U.P.T.T.I., Kanpur
4-	Shri Arun Kumar Gangwar	Associate Professor, U.P.T.T.I., Kanpur
5-	Shri Sanjeev Kumar Rajput	Associate Professor, U.P.T.T.I., Kanpur
6-	Shri R. K. Srivastava	Deputy Director D.T.E., U.P. Kanpur
7-	Shri D.K. Verma	Professor, I.R.D.T. Kanpur
8-	Shri Pankaj Yadav	Assistant Director D.T.E., U.P. Kanpur
9-	Shri R. K. Gupta	H.O.D./Principal, Govt. Poly., HindalpurHapur
10-	Shri Sambhaskar Singh	Assistant Professor, I.R.D.T., Kanpur
11-	Smt. Anubha Gupta	Lecturer, G. P., Kanpur
12-	Smt. Anjali Patel	Lecturer, G. P., Kanpur
13-	Shri Pravesh Verma	Assistant Professor, I.R.D.T., Kanpur (Course Co-ordinator)

First Semester

1.1   COMMUNICATION SKILLS – I

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4 - 2

RATIONALE

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
.
- Understand the importance of effective communication
- Describe the process of communication
- Communicate effectively in different contexts
- Identify parts of speech
- Write correct sentences using appropriate vocabulary
- Reproduce and match words and sentences in a paragraph
- Write various types of paragraphs, notices for different purposes and composition on picture with appropriate format
- Read unseen texts with comprehension
.

DETAILED CONTENTS

1   Basics of Communication   (13 periods)

    1.1   Definition and process of communication
    1.2   Types of communication - formal and informal, oral and written, verbal and non-verbal
    1.3   Communications barriers and how to overcome them
    1.4   Barriers to Communication, Tools of Communication

2   Application of Grammer   (18 periods)

    2.1   Parts of Speech (Noun, verb, adjective, adverb) and modals
    2.2   Sentences and its types
    2.3   Tenses
    2.4   Active and Passive Voice
    2.5   Punctuation
    2.6   Direct and Indirect Speech

3   Reading Skill   (10 periods)
Unseen passage for comprehension (one word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)

4   Writing Skill   (15 periods)

     4.1   Picture composition
     4.2   Writing paragraph
     4.3   Notice writing

LIST OF PRACTICALS

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.
Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

Listening and Speaking Exercises

1. Self and peer introduction
2. Newspaper reading
3. Just a minute session-Extempore
4. Greeting and starting a conversation
5. Leave taking
6. Thanking
7. Wishing well
8. Talking about likes and dislikes
9. Group Discussion
10. Listening Exercises.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centred 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 Revathi Srinivas; 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/UBTE/NITTTR.

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

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	13	24
2	18	32
3	10	16
4	15	28
Total	**56**	**100**

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5 - -

RATIONALE

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.

LEARNING OUTCOMES

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

- Apply Binomial theorem to solve engineering problems
- Apply determinants properties and Crammer's rule to solve engineering problems
- Apply dot & cross product of vectors to find the solution of engineering problems
- Use complex numbers in various engineering problems
- Apply differential calculus and higher order to solve engineering problems
- Find velocity, acceleration, errors and approximation in engineering problems with application of derivatives.

DETAILED CONTENTS

1.   Algebra -I   (12 Periods)

1.1   Series : AP and GP; Sum, nth term, Mean
1.2   Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.
1.3   Determinants : Elementary properties of determinant of order 2 and   3, Multiplication system of algebraic equation,   Consistency of equation, Crammer's rule

2.   Algebra- II   (12 Periods)

2.1   Vector algebra : Dot and Cross product, Scaler and vector triple product.
2.2   Complex number.
        Complex   numbers, Representation, Modulus   and   amplitude   Demoivre theorem, its application in solving algebraic   equations, Mod. function and its properties..

3.   Trigonometry   (10 Periods)

3.1 Relation between sides and angles of a triangle: Statement of various formulae showing relationship between sides and angle of a triangle.

3.2 Inverse circular functions : Simple case only

4. Differential Calculus - I   (18 Periods)

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

4.2 Methods of finding derivative, Trigonometric functions, exponential function, Function of a function, Logaritimic differentiation, Differentiation of Inverse trigonometric function, Differentiation of implicit functions.

5. Differential Calculus - II   (18 Periods)

5.1 Higher order derivatives, Leibnitz theorem (without proof). Simple applications.

5.2 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

INSTRUCTONAL STRATEGY

The basic instructional strategy to teach basic mathematics, Binomial theorem, trigonometry, differential equations 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. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-I by Chauhan and Chauhan, Krishna Publications, Meerut.
4. Applied Mathematics-I (A) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	12	20
2.	12	20
3.	10	12
4	18	24

5	18	24
Total	**70**	**100**

1.3 APPLIED PHYSICS – I

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5 - 2

RATIONALE

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.

LEARNING OUTCOMES

After undergoing this course, the students must 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.

DETAILED CONTENTS

1.   Units and Dimensions   (10 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, 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 in calculation.

1.7 Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

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.

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, Principle of centrifuge.

2.9 Application of various forces in lifts, cranes, large steam engines and turbines

3. Work, Power and Energy   (10 periods)

3.1 Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force,

3.2 Friction: modern concept, types, laws of limiting friction, Coefficient of 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 potential energy with examples and their derivation, work energy theorem.

3.5 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

3.7   Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.

4   Rotational Motion   (10 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). Concept of Fly wheel.

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

4.6   Comparison of linear motion and rotational motion.

4.7   Application of rotational motions in transport vehicles, and machines.

5   Motion of planets and satellites   (08 periods)

5.1   Gravitational force, Kepler's law of planetary motion,

5.2   Acceleration due gravity and its variation,

5.3   Gravitational Potential and Gravitational potential energy,

5.4   Motion of satellite, orbital velocity and time period of satellite, Total energy and Binding energy of a satellite, Escape energy and escape velocity,

5.5   Types of satellites, Geo-stationary satellite, semi-synchronous, polar satellite (concept only) and their uses in science and technology,

5.6   Concept of Black Holes

6.   Properties of Matter   (12 periods)

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

6.2   Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications

6.3   Surface tension: concept, its units, angle of contact, Capillary action and determination of surface tension from capillary rise method, applications of surface tension, effect of temperature and impurity on surface tension

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

6.5   Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications.

7.   Heat and Thermodynamics   (10 periods)

7.1   Difference between heat and temperature

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

7.3   Different scales of temperature and their relationship

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

7.5   Heat conduction in a metal rod, Temperature gradient, Concept of Co-efficient of thermal conductivity, Uses and effects of Heat conduction in Daily life.

7.6   Isothermal and Adibatic process
7.7   Zeroth, First and second law of thermodynamics, Heat engine (concept Only), Carnot cycle.
7.8   Application of various systems of thermometry in refrigeration and air-conditioning etc.

LIST OF PRACTICALS (to perform minimum six experiments)

1   To find radius of wire and its volume and the maximum permissible error in these quantities by using both vernier calipers and screw gauge.
2   To find the value of acceleration due to gravity on the surface of earth by using a simple pendulum.
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 study conservation of energy of a ball or cylinder rolling down an inclined plane.
6   To find the Moment of Inertia of a flywheel about its axis of rotation
7   To determine the atmospheric pressure at a place using Fortin's Barometer
8   To determine the viscosity of glycerin by Stoke's method
9   To determine the coefficient of linear expansion of a metal rod
10 To determine force constant of spring using Hooks law

INSTRUCTIONAL STATREGY

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 ASSEMENTS

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

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

TOPIC WISE DISTRIBUTION OF PERIODS AND MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	10	15
3	10	15
4	10	15
5	08	10
6	12	16
7	10	14
Total	**70**	**100**

1.4 GENERAL MECHANICAL ENGINEERING

                                                                    L T P
                                                                    6 - 4
RATIONALE

For every practicing engineer some knowledge of Mechanical Engineering relevant to his discipline is a must. This paper is meant to provide the would be textile technologists elements of mechanical engineering relevant to their work.Topic Wise Distribution of Periods

DETAILED CONTENTS

1. FOUNDATIONS AND INSTALLATIONS:

General principles and considerations for machine foundations, vibrations in machine foundations. Layout of foundation bolts, alignment of machines care and precautions to be used in installation of machines, introduction to Indian Standards on machine foundations. Practice in blueprint reading for installations.

2. PIPE AND PIPE FITTINGS:

Classification of pipes according to materials used, fieldof application, IS specifications of water, air and steam pipes, various types of pipe fittings and their applications, laying of pipes, cuttings threading and jointing of pipes.

3. BEARINGS AND LUBRICATION:

Various kinds of bearings, bush bearing, ball and rollerbearing, thrust bearing and their application in textile machineries. Principle of film lubrication. Various methods of lubrication, lubricants and their properties. Selection of lubricants for various textile machineries.

4. POWER TRANSMISSTION & MATERIAL HANDLING:

(a) Different types of Trolleys used in process house.
(b) Belt and gear drive.

Types of gears, spur gear, bevel gear, helical gear, worm and worm wheel, rack and pinion.

Power transmission by belt, chain and gears. Gear drive, application of various kinds of gears and drives in textile machinery. Variable speed drives.

5. COUPLINGS, CLUTCHES, ECCENTRICS AND CAMS:

Necessity of coupling, types of couplings, rigid and flexible couplings, universal coupling, fluid coupling. Introduction to common types of clutches, eccentrics and cams, their function and use.

6. FUELS AND COMBUSTION :

Common solid, liquid and gas fuels. Their composition, higher and lower calorific values. Calculation of air required for complete combustion of unit mass/volume. Concept of excess air in boiler furnace combustion. Heat carried away by flue gases. Flew gas analysis by Or sat apparatus.

(Simple Numerical Problems)

Idea of specific properties of liquid fuels such as knock resistance (Cetane and Octane numbers). Flash point, Flame point, Solidification point.

7. THERMODYNAMICS:

Concept of thermodynamic systems and surroundings, Work and its relation to heat. First law of thermodynamics and its application to Constant volume, Constant pressure, Constanttemperature and adiabatic processes in dealing with gases and vapors. Representation of these processes in P. V. diagram, calculation of work done.Second law of thermodynamics. Concept of enthalpy, entropy of thermodynamic system. Concept of Heat engine, Heat pump and refrigerator. Carnot cycle efficiency of heat engine,coefficient of performance of refrigerator and heat pump Steady state flow process. Its equation and application.

8. STEAM GENERATION AND STEAM GENERATORS:

Idea of steam generation from water at 0oC. Pressure and temperature curve of steam generation. Idea of wet, drysaturated and super-heated steam. Saturation pressure, temperature, degree of super heat, Enthalpy, Entropy and specific volume of wet, dry saturated and super-heated steam. Use of steam tables for simple calculations. Introduction to water tube, fire tube boilers e. g. Lancashire, Babcock Wilcox's, Cochran and Simple verticalboilers. Boilers mountings and accessories. Steam traps, Reducers, Expansion bends. Boilers specification. Equivalent evaporation, Boiler efficiency, Draught, Chimney height, Conditions for maximum draught through chimney.Measurement of steam consumption. Simple numerical problems.

9. PUMPS & AIR COMPRESSORS:

Elementary knowledge of working of reciprocating,Centrifugal and Vacuum pumps, Blowers and Compressors, Fans and Exhausts Difference between reciprocating and rotary compressors. Their types and working, Single stage and Multi stage compressors. Power required to drive single stage compressor. Volumetric efficiency and effect of temperature on it. Use of compressed in textile industry.

10. REFRIGERATION AND AIR CONDITIONING:

Meaning of the term refrigeration. Its application, Unit. Refrigeration methods. Bellcoleman air cycle, air refrigerator, Vapor compression refrigeration. Analysis of simple saturated cycle for vapor compression refrigerator.

Characteristics of good refrigerants. Properties of common refrigerants such as NH_3, Co_2, So_2 Fe-12.

Air Conditioning:

Meaning of the term and its application. Gas and vapor mixture. Dry and wet bulb temperature, Dew-point, Depressionof wet bulb temperature and Depression of Dew-point.Saturated air, specific humidity, relative humidity, Absolute humidity. Humid specific volume, Heat enthalpy of moist air. Use of psychometric charts and tables. Sensible heating and cooling. Humadification. Dehumadification and their methods.

Air conditioning for human comfort. Air conditioning, for summer and winter. Air conditioning round the year, Psychometric air conditioning. Industrial air conditioning.

GENERAL MECHNICAL ENGINEERING-LAB

A. Demonstration of the following for study and sketch.

1. (a) Bio Gas Plant.
   (b) Wind Mill.
   (c) Solar Cooker.
   (d) Voltaic Cell Type Solar Energy Converter.

2. Key's, Key ways and Splined shaft e.g. Jib head key, Flat key, Saddle key, Woodruff key, Feather key, Pin key, Splined shaft.

3. Pins- Split pin, Taper cotter type split pin, Cottorpin,Cottor bolts. Foundations Bolts- Lewis rag bolt, Fish tail bolt and Square head bolt.

4. Friction clutch and Coupling- Cone cluch, Plate cluch (Single Pair); Muffcoupling, Flange coupling, Universal or Hook's joint coupling. Flexible coupling- Belt and Pin Type, Coil spring type.

5. Bearings- Plane, Bush, Split step bearings, Ball Roller bearings, Thrust bearings.

6. Gears- Spur gear, Single and Double herical gears, Bevel gears.

7. Gear Trains- Simple spur gear train, Compound gear train,Epicyclic gear train.

8. Compressor and Tension helical springs.

9. Slider Crank Mechanism and Quick Return Mechanism.

   Performance Practical's:

10. Determination of velocity ratio of a spur gear train.
11. Velocity diagram of a four bar chain mechanism.
12. Performance evaluation of solar cooker.

   NOTE:-

Field visits are recommended for equipment's not available in the institution such as biogas plant, wind mill, Boilers. No need to purchase them. Models of Boilers may be procured for study purpose.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	8	10
2	8	10
3	8	10
4	8	8
5	8	10
6	8	10
7	8	10
8	10	12
9	8	8
10	10	12
Total	**84**	**100**

1.5   ENGINEERING DRAWING

L T P
- - 10

RATIONALE

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, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

Note:
i)   First angle projection is to be followed
ii)   Minimum of 25 sheets to be prepared and atleast 2 sheets on AutoCAD
iii)   Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

LEARNING OUTCOMES

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

- Identify and use of different grades of pencils and other drafting instruments which are 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 drawings of 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 not visible 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 regular objects and general fittings used in Civil and Electrical household appliances
- Draw the different type of Machine Drawing
- Use basic commands of AutoCAD.

DETAILED CONTENTS

1. Introduction to Engineering Drawing   (03 sheets)

    1.1 Introduction to drawing instruments, materials, different types of lines in Engineering drawings as per BIS Specifications .

    1.2 Practice of vertical, horizontal and inclined lines, triangles, rectangles, circles, hexagonal, pentagon with the help of drawing instruments.

    1.3 Free hand and instrumental lettering (Alphabet and numerals) , (Capital Letter), vertical and inclined at 75 degree.

2. Dimensioning Technique   (01 sheet)

    2.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)

    2.2 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

3. Scales   (02 sheets)

    3.1 Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale

    3.2 Drawing of plain and diagonal scales

4. Orthographic Projections   (06 sheets)

    4.1 Theory of orthographic projections (Elaborate theoretical instructions)

    4.2 Projection of Points in different quadrant

    4.3 Projection of Straight Line (1st and 3rd angle)
       4.3.1. Line parallel to both the planes
       4.3.2. Line perpendicular to any one of the reference plane
       4.3.3. Line inclined to any one of the reference plane.

    4.4 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

    4.5 Three views of orthographic projection of different objects. (At least one sheet in 3rd angle)

    4.6 Identification of surfaces

5. Projection of Solid   (01 sheets)

    5.1. Definition and salient features of Solid

    5.2. To make projections, sources, Top view, Front view and Side view of various types of Solid .

6. Sections   (02 sheets)

    6.1 Importance and salient features

6.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.

6.3 Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections

6.4 Orthographic sectional views of different objects.

7. Isometric Views   (02 sheets)

7.1 Fundamentals of isometric projections and isometric scale.

7.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism.

8. Common Symbols and Conventions used in Engineering   (02 sheets)

8.1 Civil & Electrical fitting symbols .

9. Introduction to Machine Drawing   (08 Sheets)

9.1 Draw the assembly from part details of objects

9.2 Identify and draw different types of screw threads used in various machines and assemblies as per domestic and international standards

9.3 Draw different types of nuts, bolts and washers

9.4 Draw various locking devices and foundation bolts

9.5 Draw different section of various types of keys and cotter joints

9.6 Draw various riveted joints

9.7 AutoCAD

* **Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.**

INSTRUCTIONAL STRATEGY

Teacher should show model of realia 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 Auto CAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice 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   TEXTILE FIBRE-I

L T P
4 - 4

Learning Outcomes:

After completing the course student will be able to:

- Able to understand the desirable properties of textile fibres, textile fibre classification.
- Able to understand the cultivation of cotton, different cotton varieties, morphological structure of cotton, jute & other natural fibres
- Be able to understand the important properties of wool fibres, their structure & their uses
- Be able to understand & explain the properties of silk fibres, its structure & uses

1.7.1   Introduction: various definitions related to textile fibres, classification of textile fibres, difference between staple & filament, essential & desirable properties of textile fibres, advantages & disadvantages of natural fibres.

1.7.2   Cotton cultivation and harvesting, development of cotton fibres in seed, cotton varieties and grading, morphological structure, physical and chemical properties of cotton fibre and its applications.

1.7.3   Jute cultivation, retting and extraction process, structure of jute fibre, physical and chemical properties of jute fibre and its applications, Introduction to other natural bast fibres like flax, hemp, ramie, banana and leaf fibres etc. and their applications.

1.7.4   Types of wool and its grading, Morphological structure, chemical composition, physical & chemical properties, varieties of wool fibres and their applications, introduction to other animal fibres like angora fibres, camel hair fibre, goat fibre etc. and their applications.

1.7.5   Types of silk and its production, chemical composition and morphological structure of silk, physical & chemical properties of silk and its applications.

Recommended Books -

1. वस्त्र रेशे –उत्पादन विशेषताएँ एवं उपयोग –DR. D.B. Shakyawar& Dr. M.K. Singh , abhishek Publication Chandigarh/ New Delhi.
2. TextileFibrebyGhol and Valanslk`

3.   S. P. Mishra, A text book of Fibres Science and technology, New Age International (p) Ltd 2000.

4. H V S Murthy, Textile Fibres- Textile Association Publication 1995.

5. Textile Fibres –I By Dr. V.A. Shenai

List of Experiments

1. To distinguish animal fibres from vegetable fibres.

    (i)   With an alkali

    (ii)   With an acid

2. To distinguish

    (i)   Linen from cotton

    (ii)   Silk from wool fibres

3. To identify textile fibres such as cotton, wool, silk, jute under microscope and to draw their longitudinal and cross-sectional views.

4. Checking moisture regain of different natural textile fibres by shirley moisture meter and by good brand conditioning oven.

5. To check the maturity ratio of cotton fibres by 10% caustic soda solution.

6. To identify natural textile fibres by

    (i)   Staining test

    (ii)   Solubility test

    (iii)   Burning test

2.1   APPLIED MATHEMATICS - II

L   T   P
5   -   -

RATIONALE

Basic elements of integral calculus, differential calculus, numerical methods, differential m equations included in this course will play a vital role in understanding engineering problem mathematically. This will also develop analytical as well as conceptual abilities among students.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:
* Calculate simple integration by methods of integration
* Evaluate the area under curves, surface by using definite integrals.
* Calculate the area and volume under a curve along areas
* Solve the engineering problems with numerical methods.
* Understand the geometric shapes used in engineering problems by co-ordinate geometry.

DETAILED CONTENTS

1. Integral Calculus - I   (20 Periods)

   Methods of Indefinite Integration :-
   1.1   Integration by substitution.
   1.2   Integration by rational function.
   1.3   Integration by partial fraction.
   1.4   Integration by parts.
   1.5   Integration of special function

2. Integral Calculus - II: (20 Periods)

   2.1   Meaning and properties of definite integrals, Evaluation of definite   integrals..
   2.2   Application : Length of simple curves, Finding areas bounded by simple curves Volume of solids of revolution, centre of mean of plane areas.
   2.3   Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson's method(without proof), Numerical solutions of simultaneous equations; Gauss elimination method(without proof)

3. Co-ordinate Geometry (2 Dimension)   (18 Periods)

   3.1   Circle
            Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

4. Co-ordinate Geometry (3 Dimension)   (12 Periods)

  4.1 Straight lines and planes in space
       Distance between two points in space, direction cosine and direction ratios,
       Finding equation of a straight line (without proof)

INSTRUCTONAL STRATEGY

Basic elements of Differential Calculus, Integral Calculus and differential equations can be taught conceptually along with real engineering applications in which particular algorithm and theory can be applied. Numerical examples will be helpful in understanding the content of the subject.

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1.   Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2.   Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3   Applied Mathematics-II by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4.   Applied Mathematics-I (B) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	20	28
2.	20	28
3.	18	24
4	12	20
Total	**70**	**100**

2.2 APPLIED PHYSICS – II

L T P
5 - 2

RATIONALE

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.

LEARNING 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 itsmeasurement.
- 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 Biot-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 fibre and its uses in Medical field and Communication.

DETAILED CONTENTS

1.   Wave motion and its applications   (12 periods)
    1.1   Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application

1.2   Wave equation $y = r \sin wt$, phase, phase difference, principle of superposition of waves

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

1.4   Free, Damped and forced oscillations, Resonance with examples, Q-factor

1.5   Definition of pitch, loudness, quality and intensity of sound waves, intensity level, Echo and reverberation, Sabine formula for reverberation time(without derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Accoustics of building defects and remedy.

1.6   Ultrasonics –production, detection, properties and applications in engineering and medical applications.

2.   Wave Optics   (6 periods)
2.1   Dual nature of light, wave theory of light, laws of reflection and refraction, Snell's law, Power of lens, magnification.

   2.2   Two-Source Interference, Double-Slit interference, Interference due to thin films, Fresnel's biprism.

   2.3   use of interference making highly efficient solar panel.

   2.4   diffraction, Single Slit diffraction, Intensity calculation etc

   2.5   Polarization of electromagnetic waves, polarizing sheets, polarizing by Reflection (Brewser's law), Malus law, use of polariods.

3.   Electrostatics   (12 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, Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numericals), charging and discharging of a capacitor.

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

   3.5   Application of electrostatics in electrostatic precipitation of microbes and moisture separation from air and gases in industry for pollution control (Brief explanation only)

4.   Current Electricity   (12 periods)
   4.1   Electric Current, Resistance, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Colour coding of carbon Resistances, Ohm's law. Superconductivity.

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

   4.3   Concept of terminal potential difference and Electro motive force (EMF), potentiometer.

   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

   4.5   Examples of application of DC circuits in various electrical and electronics equipment such as C.R.O, T.V., Audio-Video System, Computers etc.

5.   Magneto Statics and Electromagnetism   (12 periods)

5.1 Magnetic poles, force on a moving charge, circulating charges, force on a current carrying wire, Hall effect, torque on a current loop.

5.2 Magnetic field due to moving charge(Biot-Savart Law), due to current (Biot-Savart Law), parallel currents, field of a solenoid, Ampere's law.

5.3 Faraday's law, Lenz' law, motional emf, induced electric fields.

5.4 Magnetic dipole and force on a magnetic dipole in a non-uniform field, Magnetization, Gauss' law for magnetism.

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

5.6 Application of electromagnetism in ac/dc motors and generators.

6. Semiconductor physics   (8 periods)

6.1 Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode and its V-I characteristics

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

6.3 Semiconductor transistor, pnp and npn (concepts only)

6.4 Application of semiconductor diodes (Zener, LED) and that of transistor as amplifier and oscillator.

7. Modern Physics   (8 Periods)

7.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; laser and its characteristics, population inversion, Types of lasers; Ruby and He-Ne lasers, engineering and medical applications of lasers.

7.2 Fibre optics: Total internal reflection and its applications, Critical angle and conditions for total internal reflection, introduction to optical fibers, light propagation, types, acceptance angle and numerical aperture, types and applications of optical fibre in communication.

7.3 Introduction to nanotechnology, nanoparticles and nano materials,

LIST OF PRACTICALS (To perform minimum six experiments)

1. To determine the velocity of sound with the help of resonance tube.
2. To find the focal length of convex lens by displacement method.
3. To find the refractive index of the material of given prism using spectrometer.
4. To find the wavelength of sodium light using Fresnel's biprism.
5. To verify laws of resistances in series and parallel combination
6. To verify ohm's laws by drawing a graph between voltage and current.
7. To measure very low resistance and very high resistances using Slide Wire bridge
8. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
9. To draw hysteresis curve of a ferromagnetic material.
10. To draw characteristics of a pn junction diode and determine knee and break down voltages.
11. To find wave length of the laser beam.
12. To find numerical aperture of an optical fiber.

INSTRUCTIONAL STATREGY

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	12	18
2	6	8
3	12	18
4	12	16
5	12	16
6	8	12
7	8	12
Total	**70**	**100**

2.3 APPLIED CHEMISTRY

L T P
5 - 2

RATIONALE

The use of various chemicals and chemical products in diverse technical and engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma-engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

LEARNING OUTCOMES

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

- Classify various substances based on state of aggregation
- Substantiate the laws and principles on which structure of atom is established.
- Explain and predict properties of substances.
- Explain sources of water and various characteristics of water (quantitatively).
- Explain cause and factors which can adversely affecting natural water quality and remedial measures available for water purification
- Think critically, develop and adapt water conservation techniques.
- Explain corrosion of metal and their preventive measures.
- explain chemical nature and causes of corrosion
- apply correct and efficient methods of corrosion prevention.
- explain chemistry of fuels and their relative advantages.
- select most efficient fuel for the engine and engineering applications.
- suggest how to subside air pollution caused by the use of fossil fuels
- explain the chemistry of various polymers and plastics
- verify suitability and select polymer/rubber/plastic materials for engineering applications.

DETAILED CONTENTS

1. **Atomic Structure, Periodic Table and Chemical Bonding** (14 periods)

    1.1 Fundamental particles- mass and charges of electrons, protons and neutrons with names of the scientists who discovered these fundamental particles.

    1.2 Bohr's model of atom and successes and limitations of atomic theory (qualitative treatment only).

    1.3 Atomic number, atomic mass number isotopes and isobars.

    1.4 Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance,

    1.5 Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are excluded).

    1.6 Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded)

    1.7 Chemical bonding and cause of bonding and types such as ionic bond in NaCl sigma (σ) and pi (π) covalent bonds in H_2, HCl, Cl_2, elementary idea of hybridization in $BeCl_2$, BF_3, CH_4, NH_3 and H_2O, VSEPR, Molecular orbital Theory

    1.8 States of Matter: Solid, Liquid & Gas, Metallic bonding- explanation with the help of electron gas (sea) model.

2. **Fuelsand Lubricants** (18 periods)

    2.1 Definition of fuel, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels

    2.2 Calorific value-higher calorific value, lower calorific value, determination of calorific value of solid or liquid fuel using Bomb calorimeter and numerical examples.

    2.3 Coal - types of coal and proximate analysis of coal

    2.4 Fuel rating – Octane number and Cetane number, fuel-structural influence on Octane and Cetane numbers

    2.5 Gaseous fuels – chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas.

    2.6 Elementary ideal on – hydrogen as future fuels, nuclear fuels.

    2.7 Lubricants: Definition and properties, mechanism, industrial application and its function in bearings.

    2.8 Synthetic lubricants and cutting fluids.

3. **Water** (14 periods)

    3.1 Demonstration of water resources on Earth using pie chart.

    3.2 Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter (mgL^{-1}) and

part per million (ppm) and simple numerical, pH and buffer solutions and their applications.

3.3 Disadvantages caused by the use of hard water in domestic and boiler feed water. Primming and foaming and caustic embrittlement in boilers.

3.4 Removal of hardness -Permutit process and Ion-exchange process.

3.5 Physico-Chemical methods for Water Quality Testing
a) Determination of pH using pH meter, total dissolved solids (TDS)
b) Testing and Estimation of- alkalinity, indicator their types and application total hardness by EDTA method and O'Hener's Method. (chemical reaction of EDTA method are excluded).
c) Understanding of Indian Water Quality standards as per WHO

3.6 Natural water sterilization by chlorine and UV radiation and reverse osmosis.

3.7 Municipality waste water treatment. Definition of B.O.D and C.O.D.

4. Electrochemistry   (4 periods)

Redox Reaction, Electrode Potential, Nernst equation, Electrochemical cell (Galvanic and Electrobytes); Nernst equation.

5. Corrosion and its Control   (10 periods)

5.1 Definition of corrosion and factors affecting corrosion rate.

5.2 Theories of
a) Dry (chemical) corrosion- Pilling Bedworth rule
b) Wet corrosion in acidic atmosphere by hydrogen evolution mechanism

5.3 Definition of passivity and galvanic series

5.4 Corrosion control:
α) Metal coatings – Cathodic protection, Cementation on Base Metal Steel – Application of Metal Zn (Sheradizing),Cr (Chromozing) and Al (Calorizing), Sacrificial protection and impressed current voltage

β) Inorganic coatings – Anodizing and phosphating,

χ) Organic coatings - use of paints varnishes and enamels

δ) Internal corrosion preventive measures- alloying (with reference to passivating, neutralizing and inhibition) and heat treatment (quenching, annealing)

6. Organic compounds, Polymers and Plastics   (10 periods)

6.1 Classification of organic compounds and IUPAC Nomenclature

6.2 Definition of polymer, monomer and degree of polymerization

6.3 Brief introduction to addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite)

6.4 Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics

6.5 Applications of polymers in industry and daily life

LIST OF PRACTICALS

1. Estimation of total hardness of water using standard EDTA solution
2. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution
3. Proximate analysis of solid fuel)
4. Estimation of temporary hardness of water sample by O' Hener's Method.
5. Determination of flash and fire point of given lubricating oil using Able's flash point apparatus

INSTRUCTIONAL STRATEGY

Teachers may take help of various models and charts while imparting instructions to make the concept clear. More emphasis should be laid on discussing and explaining practical applications of various chemical process and reactions. In addition, students should be encouraged or motivated to study those processes in more details, which may find practical application in their future professional career.

MEANS OF ASSEMENTS
− Assignment & Quiz,
− Mid-Term and End-Term written test,
− Model Making,
− Actual Lab & Practical Work,
− Viva Voce

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose& J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij& Shiksha Vij, Lords Publications, Jalandhar.
6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, Meerut, India

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (hrs)	Marks Allotted (%)
1	14	20
2	18	24
3	14	20
4	4	6
5	10	15
6	10	15
Total	**70**	**100**

2.4 TEXTILE FIBRES-II
(Common with Textile Chemistry and Textile Engineering)

L T P
4 - 2

RATIONALE

Textile Fibre being the primary input to textile industry, any education in the field of textiles remains incomplete with some knowledge of textile fibres, so whether it is textile technologist or textile chemist knowledge of textile fibres is inevitable. The paper aims to expose the vital aspect of subject to the reader.

LEARNING OUTCOMES

Course Outcome: After completing the course student will be able to:
1. Explain classification of synthetic fibres, the role of degree of polymerization, molecular weight & other properties needed for fibre forming polymer
2. Explain the process of viscose fibre manufacture & its properties
3. Understand and able to explain different fibre spinning systems viz. melt spinning, solution spinning, dry spinning etc
4. Explain the process of forming fibres like polyester, polyamide, polypropylene & their properties
5. Explain the process of manufacture of PAN, & other high performance fibre

2.4.1 Classification of man madefibres, definition of regenerated and synthetic fibres, Concepts of molecular weight, Degree of polymerization, Orientation and Crystallinity, Characteristics of fibre forming polymer.

2.4.2:Introduction to methods of fibre formation by melt spinning, dry spinning, & wet spinning, manufacturing process of Polyester fibre. Physical & chemical properties of polyester fibres, applications.

2.4.3: Polyamide Fibres – History of development, Different types of polyamide fibres, Manufacturing process of Nylon-6,Nylon-66, Physical & chemical properties of Nylon-6 & Nylon-66 and applications.

2.4.4: Polyacrylonitrile fibres, Manufacturing process of Acrylic fibre, physical and chemical properties of acrylic fibres& its applications.

2.4.5: Introduction to regenerated fibre, Raw material for viscose rayon, Manufacturing sequence of viscose fibre, Introduction to Acetate and Cuprammonium rayons.

Recommended Books :

6. वस्त्र रेशे –उत्पादन विशेषताएँ एवं उपयोग –DR. D.B. Shakyawar& Dr. M.K. Singh , abhishek Publication Chandigarh/ New Delhi.
7. TextileFibrebyGhol and Valanslk`

8. S. P. Mishra, A text book of Fibres Science and technology, New Age International (p) Ltd 2000.
9. H V S Murthy, Textile Fibres- Textile Association Publication 1995.
10. Textile Fibres –I By Dr. V.A. Shenai

List of Experiments

1. To distinguish
   i) Nylon from other fibres
   ii) Polysters from other fibres

   iii)Viscose rayon, Cuprammonium rayon and Acetate rayon from other fibres.

2. To distinguish Orlon Acrylic fibres from other fibres.
3. To identify fibres such as viscose rayon, Polyester, Nylon and Acrylic fibres under microscope and to draw their longitudinal and cross-sectional views.
4. Checking moisture regain of different man made textile fibres by shirley moisture meter and by good brand conditioning oven.
5. To identify the man madefibres by
   (i) Staining test

   (ii) Solubility test

   (iii) Burning test

6. To do quantitative estimation of fibres in a blend.

2.5 TEXTILE MANUFACTURING PROCESSES

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RATIONALE

Aim of this paper is to give new intrants in the field of textiles first hand knowledge of principles and processes involved in the manufacture of fabrics beginning from fibre. It is to facilitate their further studies in the coming years of the course.

DETAILED CONTENTS

1. MANUFACTURE OF YARN:

Elementary idea of various processes involved in conversion of Fiber into yarn.

(a) Ginning and Mixing:

(i) Object, types and limitations of mixing processes.

(ii) Object and different types of Ginning - Suitability of various Ginning machines according to quality of fiber.

(b) Blow Room Line:

(i) Necessity of blow room line, Various machines used in blow room line and general idea of different processes completed in blow room line Viz. Opening, Cleaning and Lap formation

(ii) General idea of main defects found in blow room lap.

(c) Carding:

(i) Main objects, Line diagram of machines and descriptionof passage of material through Carding machine.

(ii) General concept of Card stripping and grinding.

(d) Draw Frame\:

(i) Passage of materials through machines and main functions involved in the processes.

(ii) General idea of graduated drafting system used in drawing process.

(e) Combing:

Definition and need of combing and preparation of material for combing process.

(f) Simplex (Fly Frame):

(i) Object of the process, Passage of material through machines.

(ii) Definition of bobbin leading and flyer leading machines.

(g) Spinning:

(i) Its objects, Passage of material on machine spindle.

(ii) General idea of spinning defects coming in the process.

2. DOUBLING:

Its objects, type, scope and uses of doubled yarn.

3. REELING:

Its object, methods and types of doffing styles used in reeling processes. Passage of material through reeling machine.

4. MANUFACTURE OF FABRIC:

Elementary idea of various processes involved in conversion of yarn into fabric. Viz.

(a) Winding:

(i) Its objects , types on basis of machine speed and winding packages . Passage of material through and any high speed drum winding machine e.g. Rotoconer

(ii) Faults found in winding package.

(iii)General idea of Pirn winding and its need and advantages.

(b) Warping:

Its main objects, general idea of beam and sectional warping machine.

(c) Sizing:

(i) Its main objects, methods of sizing on the basis of drying system used for drying wet yarn and on the basis of amount of size put on yarn.

(ii) Passage of warpsheet through Slasher sizing machine and knowledge of necessary parts of machine.

(d) Drawing-in & Beaming:

Main objects of drawing in and beaming.

(e) Weaving:

(i) Primary, Secondary and Auxillary motions in weaving process (Only name and functions of all motions).

(ii) Passage of warp on loom . Showing all its necessary parts.

(iii) Limitations   of Tappet Shedding, dobby,   Shedding, Jaquards Shedding, .

(iv) Name of some modern weaving techniques.

5. SIZING :

Main object and sizing ingredients.

NOTE:

Numerical problems and detailed description of any machine/mechanism are excluded.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	14	20
2	16	20
3	14	20
4	16	20
5	14	20
Total	**84**	**100**

2.6 WORKSHOP PRACTICE

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RATIONALE

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

LEARNING OUTCOMES

After completing the course, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Follow safety procedures and precautionary measures.
- Use safety equipment and Personal Protection Equipment.

DETAILED CONTENTS (PRACTICAL EXERCISES)

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

The following shops are included in the syllabus:

1 Fitting Shop
2 Sheet Metal Shop
3 Welding Shop
4 Foundry Shop
5 Machine Shop

1. FITTING SHOP

1.1 Use of personal protective equipment and safety precautions while working.
1.2 Basic deburring processes.
1.3 Introduction to fitting shop tools, marking and measuring devices/equipment.

1.4 Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)

1.5 Identification of various steel sections (flat, angle, channel, bar etc.).

1.6 Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

1.7 Job Practice

.   Job I   Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).

       JobII   Filing a rectangular/square piece to maintain dimensions within an accuracy of ±.25 mm.

       Job III Making a cut-out from a square piece of MS flat using hand hacksaw and chipping

       Job IV Drilling and tapping practice on MS Flat.

2. SHEET METAL SHOP

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

2.1 Introduction and demonstration of hand tools used in sheet metal shop.

2.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine,

2.4 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.

2.5 Study of various types of nuts, bolts, rivets, screws etc.

2.6 Job Practice

    Job I: Shearing practice on a sheet using hand shears.

    Job II: Practice on making Single riveted lap joint/Double riveted lap Joint.

    Job III: Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

3 WELDING SHOP – I

3.1 Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions.

3.2 Job Practice

    Job I   Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).

    Job II   Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).

    Job III   Preparation of lap joint using arc welding process.

    Job IV   Preparation of T-joint using gas welding or arc welding on 100 mm x 6 mm MS Flat

4   FOUNDRY SHOP

4.1 Study of metal and non metals
4.2 Study and Sketch of the Foundry tools
4.3 Study and sketch of Cupola and pit furnace
4.4 To prepare green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)
4.5. Casting of non ferrous (lead or aluminium)

5   MACHINE SHOP

5.1 Study   and sketch of lathe machine
5.2 Study and Sketch of grinders, milling machine, drilling machine and CNC machine.
5.3 Plain and step turning and knurling practice.
5.4 Study and sketch of planning/shaping machine and to plane a rectangle of cast iron.

MEANS OF ASSESSMENT

- Workshop jobs
- Report writing, presentation and viva voce

RECOMMENDED BOOKS

1.1   Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
1.2   Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
1.3   Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
1.4   Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
1.5   Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
1.6   Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
1.7   Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.