

CURRICULUM OF BRIDGE COURSE

FOR

VERTICAL MOBILITY SCHEME (LATERAL ENTRY) (N-2022)

i.e. 10+2 Science (Non-Medical, Vocational & I.T.I. Pass Out Students

IN

DIPLOMA PROGRAMME

FOR THE STATE OF HIMACHAL PRADESH



Implemented w.e.f. Session 2023-24

Prepared by: -

Composite Curriculum Development Centre

Directorate of Technical Education,

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SALIENT FEATURES

Programme	Three Year Diploma Under Vertical Mobility Scheme (Lateral Entry) i.e. 10+2 Science(Non-Medical), Vocational & I.T.I. Pass Out Students.
Duration	Three years (Six Semesters)
Entry Qualification	As prescribed by H.P. Takniki Shiksha Board /AICTE
Intake	As approved by H.P. Takniki Shiksha Board
Pattern	Semester System

GENERAL GUIDELINES FOR CURRICULUM IMPLEMENTATION

1. Weightage for the internal assessment in respect of theory subjects will be as follow:
 - a. House Test: 40%
 - b. Class Test: 20%
 - c. Home Assignment: 20%
 - d. Attendance: 20%
2. There will be two class tests in every semester and the average of the two tests will be taken into account.
3. The syllabus for the class tests will be as under:
 - a. Class Test-I: 30% of syllabus
 - b. Class Test-II: next 30% of syllabus
4. Class Test-I &II will be conducted as per Academic Calendar.
5. The 30%, 60% and 80% contents of the syllabus will be based on the number of hours allocated for the topics in the detailed curriculum of each subject.
6. The question paper for both the class tests will be of 30 marks each and of one- hour duration.
7. Improvement test can be conducted after every class test on the basis of some genuine reason to be judged by the Head of concerned Department.
8. There will be one house test as per Academic Calendar and syllabus coverage will be 80%.
9. The house test will be of total 60 marks and the duration of House Test should be two hours.
10. In case student fails to attend the house test due to genuine reasons, re-examination will be conducted with the approval of concerned Principal on the recommendation of concerned Head of Department.
11. There will be minimum two home assignments per subject per semester.
12. Weightage for the internal assessment in respect of Practical subject should be:
 - a. Practical Performance: 60%, Report Writing: 20% and Viva Voce:20%
13. Weightage for Internal Assessment in respect of Drawing subjects will be as under:
 - a. House Test and Class Test =40%

- a) Class performance/Drawings Sheets 40%
- b) Attendance/punctuality =10%
- c) Viva Voce =10%

14. For 13 a), b), c) marks should be given in each drawing sheet by concerned teacher during evaluation.

Abbreviations

Course code	Definitions
L	Lecture
DCS	Doubt Clearing Session
P	Practical
T	Theory

STUDY AND EVALUATION SCHEME

Semester- III

Sr. No.	Course Title	Contact Hours		Total Contact Hrs.	Credits	Evaluation Scheme								
		L	P			Internal			External				Total	
						T	P	Total	T	Hrs.	P	Hrs.		Total
3.1	Engineering Graphics	-	36	36	-		40	40	60	3	-	-	60	100
3.2	Applied Mathematics	36	-	36	-	40	-	40	60	3	-	-	60	100
3.3	English & Communication Skills	20	10	30	-	40	40	80	60	3			60	140
Total Teaching Load		56	46	102										
Total					-	80	80	160	180					340

NOTE:

1. Course mentioned in Sr. No. 3. 1 is to be taught to ITI, +2 Science (Non-Medical) and +2 Vocational Pass out students.
2. Course mentioned in Sr. No. 3. 2 is to be taught to ITI and +2 Vocational Pass out students.
3. Course mentioned in Sr. No. 3. 3 is to be taught to ITI pass out Students.
4. Classes for Bridge Courses shall be engaged during vacation/holidays.

STUDY AND EVALUATION SCHEME

Semester- IV

Sr. No.	Course Title	Contact Hours		Total Contact Hrs.	Credits	Evaluation Scheme								
		L	P			Internal			External					
						T	P	Total	T	Hrs.	P	Hrs.	Total	Total
4.1	Engineering Workshop Practice	-	36	36	-		40	40			60	3	60	100
4.2	Applied Physics	22	10	32	-	40	40	80	60	3	60	3	120	200
4.3	Applied Chemistry	28	8	36	-	40	40	80	60	3	60	3	120	200
Total Teaching Load		50	54	104	-									
Total					-	80	120	200	120		180		300	500

NOTE:

1. Course mentioned in Sr. No. 4. 1 is to be taught to +2 Science (Non-Medical) and +2 Vocational Pass out students.
2. Course mentioned in Sr. No. 4. 2 & 4.3 are to be taught to ITI and +2 Vocational Pass out students.
3. Classes for Bridge Courses shall be engaged during vacation/holidays.

Detailed Contents of Bridge Course

Course Title	:	Engineering Graphics
Number of Credits	:	0
Lecture+ Practical	:	0+36 Hours
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To understand the language of graphics which is used to express ideas, convey instructions while carrying out engineering jobs.
- To develop drafting and sketching skills, to know the applications of drawing equipment, and get familiarize with Indian Standards related to engineering drawings.
- To develop skills to visualize actual object or a part of it, on the basis of drawings.
- To develop skills to translate ideas into sketches and to draw and read various engineering curves, projections and dimensioning styles.
- To understand the basic commands and develop basic skills related to computer aided drafting, of how to draw, modify, and edit basic shapes (2D), using AUTOCAD.

Course Content

Unit – I Basic elements of Drawing

Drawing Instruments and supporting materials: method to use them with applications. Convention of lines and their applications.

Representative Fractions – reduced, enlarged and full size scales; Engineering Scales such as plain and diagonal scale.

Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning.

Unit – II Orthographic projections

Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. (No question to be asked in examination).

Introduction to orthographic projection, First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only).

Unit – III Isometric Projections

Introduction to isometric projections. 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 – IV Free Hand Sketches of engineering elements

Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washer, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching).

Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper).

Unit – V Computer aided drafting interface

Computer Aided Drafting: concept.

Hardware and various CAD software available. System requirements and Understanding the interface.

Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, status bar, drawing area, UCS icon.

File features: New file, Saving the file, opening an existing drawing file, creating templates, Quit.

Setting up new drawing: Units, Limits, Grid, Snap. Undoing and redoing action.

Unit – VI Computer aided drafting

Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Polyline.

Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates.

Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers.

Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions.

Dim scale variable. Editing dimensions. Text: Single line Text, Multiline text.

Standard sizes of sheet. Selecting various plotting parameters such as Paper size, paper units, drawing orientation, plot scale, plot offset, plot area, print preview.

Sr. No.	Practical Exercises	ED Sheets	Approx. Hrs.
1	Draw horizontal, Vertical, 30 degrees, 45 degrees, 60 and 75 degrees lines, different types of lines, dimensioning styles using Tee and Set squares/drafter.	1	04
2	Write alphabets and numerical in 7:4 scale (Vertical only) (do this exercise in sketch book).		
3	Draw some problems covering basic of dimensioning technique.	1	04

4	Draw some problems on Engineering Plain and Diagonal scale.	1	04
5	Draw some problems on orthographic projections using first angle method of projection having plain and slanting, cylindrical surfaces, ribs and slots.	2	10
6	Draw some problems on Isometric view of simple objects having plain and slanting and cylindrical surface (e.g. Cube, Cone and cylinder etc.) by using natural scale.	1	04
7	Draw free hand sketches/conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements.	1	04
8	Draw basic 2D entities like: Rectangle, Rhombus Polygon using AutoCAD (Print out should be a part of progressive assessment).	1	02
9	Draw basic 2D entities like: Circles, Arcs, circular using AutoCAD (Printout should be a part of progressive assessment).		04
Total		Instrumental 7: +CAD:1 = 08	36

Note: 1. AutoCAD sheets will be considered for internal evaluation only.

SUGGESTED LEARNING RESOURCES

1. Bureau of Indian Standards. Engineering Drawing Practice for Schools and Colleges IS: Sp-46. BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978- 93- 80358-17-8.
3. Jain & Gautam, *Engineering Graphics & Design*, Khanna Publishing House, New Delhi (ISBN: 978-93-86173-478).
4. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07- 064837-1.
5. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN:81-219-1431-0.
6. Shah, P. J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
7. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD*. PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
8. Jeyapooan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas Publishing House Pvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
9. Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.
10. Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers*. Dream tech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

Software/Learning Websites

1. <https://www.youtube.com/watch?v=TJ4jGyD-WCw>
2. https://www.youtube.com/watch?v=dmt6_n7Sgcg
3. <https://www.youtube.com/watch?v=MQScnLXL0M>
4. <https://www.youtube.com/watch?v=3WXPanCq9LI>
5. <https://www.youtube.com/watch?v=fvjk7PlxAuo>
6. <http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf>
7. <https://www.machinedesignonline.com>

Course Outcomes:

Following outcomes will be achieved:

- 1) Select and construct appropriate drawing scales, use drawing equipment's, and understand Indian Standards of engineering drawing.
- 2) Draw views of given object and components
- 3) Sketch orthographic projections into isometric projections and vice versa.
- 4) Apply computer aided drafting tools to create 2D engineering drawing.

Course Title	:	Applied Mathematics
Number of Credits	:	0
Lecture+ Practical	:	36 +0 Hours
Prerequisites	:	NIL
Course Category	:	BS

RATIONALE

Applied Mathematics forms the back bone of engineering students. This course is designed to give a comprehensive coverage of an introductory level to the subject of Trigonometry, Differential Calculus, Integral calculus and Basic elements of algebra. This will develop analytical abilities to apply in engineering field and will also provide continuing education.

DETAILED CONTENTS

1. **Algebra: -** (5Hrs)
 Complex Numbers: - Definition, Real and Imaginary parts of a complex number, Modulus and amplitude of complex number.
 Partial Fraction: - Partial fraction (linear factor only)
2. **Trigonometry: -** (10Hrs)
 Measurement of angle (sexagesimal, centesimal and circular system) and their conversion from one form to another. T-ratios of allied angles. Addition, Subtraction, formulae, Transformation from product to sum or difference and vice versa (without proof) simple applications.
- 3 **Differential Calculus: -** (12Hrs)
 Use of the following limits (without Proof)

$$\lim_{x \rightarrow a} \left(\frac{x^n - a^n}{x - a} \right) = na^{n-1}$$

$$\lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right) = 1, \quad \text{Where } x \text{ is in radian}$$

$$\lim_{x \rightarrow 0} \left(\frac{a^x - 1}{x} \right) = \log_e a$$

$$\lim_{x \rightarrow 0} (1 + x)^{1/x} = e$$
 Differentiation by first principle x^n , $\sin x$, $\cos x$, $\tan x$, e^x , a^x and $\log x$ Differentiation of sum, product and quotient rules of different functions. Simple applications.
- 4 **Integral Calculus: -** (9 Hrs)
 Integration as inverse operation of differentiation.
 Integration by substitution, by parts and by partial fractions

Reference books:

- *Simplified approach to Applied Mathematics I & II by Eagle publication Jalandhar*
- *B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.*
- *G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley,*

9th Edition, 1995.

- Reena Garg, *Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)*
- V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, *Engineering Mathematics, 6/e., Vikas Publishing House.*
- Reena Garg & Chandrika Prasad, *Advanced Engineering Mathematics, Khanna Publishing House, New Delhi. C*

SUGGESTIVE DISTRIBUTION OF TIME AND MARKS

TopicNo.	Time Allotted(Hrs.)	Marks Allotted in (%)
1	05	20
2	10	25
3	12	30
4	9	25
Total	36	100

Course Title	:	Engineering Workshop Practice
Number of Credits	:	0
Lecture+ Practical	:	0+36 Hours
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To understand basic engineering processes for manufacturing and assembly.
- To understand, identify, select and use various marking, measuring, and holding, striking and cutting tools and equipment's.
- To understand and interpret job drawings, produce jobs, and inspect the job for specified dimensions.
- To understand the various types of wiring systems and acquire skills in house wiring.
- To understand, operate, control different machines and equipment's adopting safety practices.

Course Content:

Sr. No.	Details Of Practical Content
1.	Carpentry: i) Demonstration of different wood working tools / machines. ii) Demonstration of different wood working processes, like planing, marking, chiseling, grooving, turning of wood etc. iii) One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.
2.	Fitting: i) Demonstration of different fitting tools and drilling machines and power tools ii) Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. iii) One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.
3.	Welding: i) Demonstration of different welding tools / machines. ii) Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding. iii) One simple job involving butt and lap joint.
4.	Sheet Metal Working: i) Demonstration of different sheet metal tools / machines. ii) Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting. iii) One simple job involving sheet metal operations and soldering and riveting.
5.	Smithy Shop*: i) Demonstration and explanation of tools & equipment used Safety measure to be observed in smithy shop. ii) Demonstration of bending operation, up-setting operation. iii) Description and specifications of anvils, swage blocks, hammer etc. IV) Demonstration and description of tongs, fullers. V) To forge a L-hook.

6.	Electrical House Wiring: Practice on simple lamp circuits (i) one lamp controlled by one switch by surface conduit wiring. (ii) Lamp circuits- connection of lamp and socket by separate switches. (iii) Connection of Fluorescent lamp/tube light. (iv) simple lamp circuits-in- stall bedroom lighting. (v) Simple lamp circuits- install stair case wiring. vi) Demonstration of measurement of Current, Voltage, Power and Energy. vii) Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. viii) Tools for Cutting and drilling.
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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. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
4. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York

Course Outcomes:

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

CO1	Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools & equipment's and machines.
CO2	Understand job drawing and complete jobs as per specifications in allotted time.
CO3	Inspect the job for the desired dimensions and shape.
CO4	Operate, control different machines and equipment's adopting safety practices.

Suggested Distribution of Hours & Marks

Topic No.	Time Allotted(Hrs) for *	Time Allotted for Rest Branches
1	06	08
2	06	08
3	06	08
4	06	06
5	06	N/A
6	06	06
Total	36	36

Note: *- Smithy Shop will be taught only to branches Automobile Engineering, Agriculture Engineering, Civil Engineering, Mechanical Engineering, Mechanical Engineering (Refrigeration and Air Conditioning) and Mechanical Engineering (Tool & Die).

Course Title	:	English and Communication skills
Number of Credits	:	0
Lecture+ Practical	:	20+10 Hours
Prerequisites	:	NIL
Course Category	:	HS

RATIONALE

The State of Himachal Pradesh has allowed lateral entry in the second year of different 3 year diploma courses. This is with a view to provide vertical mobility to talented aspirants.

Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English.

DETAILED CONTENTS

- 1. Grammar** **(12Hrs)**
 - 1.1 Parts of Speech (Articles also included)
 - 1.2 Tenses (Identifying tenses and change of tenses)
 - 1.3 Basics of grammar: Spotting errors in sentences (Noun, Pronoun, Verb, Adverb, Adjective, Preposition, Conjunction, Article, Tenses)

- 2. Vocabulary** **(2Hrs)**
 - 2.1 Pair of words
 - 2.2 One word substitution

- 3. Correspondence** **(2Hrs)**
 - 3.1 Business
 - 3.2 Official

- 4. Communication** **(4Hrs)**
 - 4.1. Definition of Communication.
 - 4.2. Objectives of Communication
 - 4.3. Seven C's of Communication

LIST OF PRACTICALS

1. Introducing oneself, others and leave taking
2. Just a minute session: Extempore speech (Following principles of good speech)
3. Demonstration and Practice of Body language in inter-personal communication.
4. Etiquettes and Mannerism (Business, Social, Table manners, Telephone)
5. How to look up words in a Dictionary: meaning and pronunciation of words

as given in the standard dictionary using symbols of phonetics

Recommended Books:

1. English & Communication Skills, Book-I & II by Kuldip Jaidka, Alw ainder Dhillon and Parmod Kumar Singla, prescribed by NITTTR Chandigarh, Published by Abhishek Publications, Chandigarh.
2. New Approach to English Grammar and Composition by Sandal Grewal Pall, Rashtriya Book Depot
3. Self-Instruction in English Grammar by Dr. K.S.Joseph, Anmol Publication

SUGGESTIVE DISTRIBUTION OF MARKS

Sr. No.	Time Allotted (Hrs.)	Marks Allotted in %
1	12	35
2	2	20
3	2	20
4	4	25
Total	20 hours	100

Course Title	:	Applied Physics
Number of Credits	:	0
Lecture+ Practical	:	22+10 Hours
Prerequisites	:	NIL
Course Category	:	BS

RATIONALE

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

DETAILED CONTENTS

1. Units and Dimensions (3 hours)

- 1.1 Physical quantities.
- 1.2 Fundamental and derived units.
- 1.3 Systems of units (SI units).
- 1.4 Dimensions and Dimensional formulae of physical quantities.

2. Work, Power and Energy (3 hours)

- 2.1 Work: definition and its SI units
- 2.2 Power: definition and its SI units, calculation of power simple cases.
- 2.3 Energy: Definition and its SI units: Types: Kinetic energy and Potential energy with examples and their derivation
- 2.4 Principle of conservation of mechanical energy (for freely falling bodies) without derivation.

3. Heat and Temperature (4 hours)

- 3.1 Types of thermometer and different scales. Conversion from one scale to another.
- 3.2 Modes of transfer of heat (Conduction, convection and radiation definition with examples).
- 3.3 Heat Radiation.

4. Electrostatics & Electricity (8 hours)

- 4.1 Coulombs law, unit charge.
- 4.2 Electric field intensity and electric potential.
- 4.3 Electric field due to a point charge.
- 4.4 Capacitance, types of capacitors, capacitance of parallel plate Capacitor.
- 4.5 Ohm's law.
- 4.6 Series and parallel combination of resistors, specific resistance, co

efficient of resistance.

- 4.7 Heating effect of current and concept of electric power, electric energy and their units.

5. Rotational Motion

(4 Hrs.)

- 1.1 Definitions of angular momentum, torque, moment of inertia, radius of gyration
1.2 Conservation of angular momentum (qualitative)

LIST OF PRACTICALS (TO PERFORM MINIMUM FIVE EXPERIMENTS)

1. To measure length, radius of a given cylinder and find its volume.
2. To determine diameter of a wire and thickness of Cardboard using a screw gauge.
3. To verify law of conservation of mechanical energy (PE to KE).
4. To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.
5. To verify Ohm's law by plotting graph between current and potential difference.
6. To verify laws of resistances in series and parallel combination.
7. To study the dependence of capacitance of a parallel plate capacitor on various factors and determines permittivity of air at a place.

RECOMMENDED BOOKS

1. *Applied Physics-I and Applied Physics-II* by J. R. Bhardwaj Hiteshi
Publisher Hamirpur H.P.
2. *Test Book of Physics for Class XI (Part-I, Part-II)* N.C.E.R.T /C.B.S.E.
3. *Test Book of Physics for Class XII (Part-I, Part-II)* N.C.E.R.T /C.B.S.E.
4. *Applied Physics, Vol. I and Vol. II*, TTTI Publications, Tata McGraw Hill, Delhi
5. *Concepts in Physics* by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi.
6. *Fundamentals of Physics* by Resnick and Halliday & Walker, Asian Book Pvt. Ltd., New Delhi.
7. *Berkeley Physics Course, Vol. I, II & III*, Tata McGraw Hill, Delhi.
8. *The Feynman Lectures on Physics* by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi.
9. *Fundamentals of Optics* by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series.

Suggestive Distribution of Hours and Marks

Sr. No.	Time Allotted (Hrs.)	Marks Allotted in %
1	3	15
2	3	15
3	4	20
4	8	35
5	4	15
Total	22 hours	100

Course Title	:	Applied Chemistry
Number of Credits	:	0
Lecture+ Practical	:	28+8 Hours
Prerequisites	:	NIL
Course Category	:	BS

RATIONALE

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

1. Atomic Structure

- 1.1 Fundamental particles of atoms : Electron, proton, neutron (Definitions)
- 1.2 Shapes of s, p orbitals
- 1.3 difference between orbit and orbital
- 1.4 Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule.

2. Chemical bonding and Solutions

- 2.1 Concept of chemical bonding – types of bonds: ionic bonding (NaCl example)
- 2.2 Difference between sigma and pie bond.
- 2.3 Idea of solute, solvent and solution.
- 2.4 **Methods** to express the concentration of solution- molarity (M = mole per liter), molality.

3. Electro Chemistry and Corrosion

- 3.1 Electronic concept of oxidation, reduction, Definition of terms: electrolytes, non-electrolytes with suitable examples.
- 3.2 Faraday's laws of electrolysis.
- 3.3 Industrial application of Electrolysis – Electroplating.
- 3.4 Introduction to Corrosion of metals – definition, types of corrosion (electrochemical),
- 3.5 Internal corrosion preventive measures – Purification, alloying and heat treatment and External corrosion preventive measures: metal (anodic, cathodic) coatings.

4. Engineering Materials

- 4.1 Natural occurrence of metals – minerals, ores of iron, aluminium and copper, Metallurgy and its types with Examples.
- 4.2 Concentration of ore Levitation, Froth flotation,(Roasting and calcinations)
- 4.3 Alloys – definition, purposes of alloying, ferrous.

5. Water

- 5.1 **Classification** of soft and hard water based on soap test, salts causing water

hardness,

5.2 Disadvantages of using hard water in boilers (scale and sludge, foaming and priming, corrosion.)

5.3 Municipal water treatment (in brief only) – sedimentation, sterilization.

5.4 Properties of water used for drinking and cooking purposes.

6.Fuels

6.1 Definition of fuel and combustion of fuel, classification of fuels

6.2 Calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula. Characteristics of good fuel

6.3 Petrol and diesel - fuel rating (octane and cetane number).

7.Lubrication

7.1Function and characteristic properties of good lubricant,

7.2 Lubrication mechanism – hydrodynamic and boundary lubrication, flash and fire point, cloud and pour point.

LIST OF PRACTICALS:

1. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
2. Experimental verification of Faraday's first law of Electrolysis using Copper sulphate solution and Copper electrodes.
3. To estimate total alkalinity of given water sample by titrating it against standard Sulphuric acid solution.
4. To estimate moisture in given coal sample gravimetrically.
5. To determine viscosity of given lubricating oil by Redwood viscometer.

Suggestive Distribution of Hours and Marks

Sr. No.	Time Allotted (Hrs.)	Marks Allotted in %
1	3	10
2	3	15
3	6	25
4	4	10
5	4	15
6	4	15
7	4	10
Total	28 hours	100