

# CURRICULUM OF BRIDGE COURSE

FOR

**VERTICAL MOBILITY SCHEME (LATERAL ENTRY)**  
**i.e. 10+2 Science, Vocational & I.T.I. Pass Outs Students**

**IN DIPLOMA PROGRAMME**

**FOR THE STATE OF HIMACHAL PRADESH**



Implemented w.e.f. Session 2012-13

*Prepared by:-*

**Composite Curriculum Development Centre  
Directorate of Technical Education,  
Vocational & Industrial Training, Sundernagar(H.P.)**

July, 2012

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## PREFACE

*India, in last two decades, has made significant progress in all major spheres of activity. Since 1947, the Technical Education System has grown into fairly large sized system, offering opportunities for education and training in wide variety of trades / disciplines at different levels. Needless to say that well trained technical manpower is the backbone of any growing economy in the era of fast industrialization. It has been the endeavor of the Technical Education Department to take decisive steps to enhance the capacities of technical institutions with major emphasis on quality and excellence in technical education .Our country is the only country in the world which has 50% population below the age of 25 years whereas America has 30% and China 40%.Working Age Population (WAP) is increasing in India whereas it is decreasing in other parts in the world. Challenge before us is to train this WAP for the world of work .Updated curriculum is one of the most powerful tools to improve the quality of training.*

*Curriculum Document is a comprehensive plan or a blue print for developing various curriculum materials and implementing given educational programme to achieve desired and formally pre-stated educational objectives. Moreover it (the document) is the output of exhaustive process of curriculum planning and design, undertaken by the implementers under the expert guidance of curriculum designer.*

*While working out the detailed contents and study and evaluation scheme, the following important elements have been kept in mind:*

- i) Major employment opportunities of the diploma holders.*
- ii) Modified competency profile of the diploma holders with a view to meet the changing needs due to technological advancement and requirements of various employment sectors.*
- iii) Vertical and horizontal mobility of diploma pass outs for their professional growth.*
- iv) Pragmatic approach in implementing all the curricula of diploma programmes in engineering and technology in the state of H.P.*

*The document is an outcome of the feedback received from field organizations/ industry of different categories viz. small, medium and large scale which offer wage employment for the diploma pass outs. In every stage of planning and designing of this curriculum, suggestions and advice of experts representing industry, institutions of higher learning, research organizations etc. were sought and incorporated as per the requirement of curriculum . The document contains the study and evaluation scheme and detailed subject/course contents to enable the H.P. Polytechnics to implement revised curriculum and to achieve the desired objectives.*

*Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which Communication Lab has been introduced during the first year itself.*

*We hope that this revision will prove useful in producing competent diploma holders in the state of Himachal Pradesh. The success of this curriculum depends upon its effective implementation and it is expected that the managers of polytechnic education system in Himachal Pradesh will make efforts to create better facilities, develop linkages with the world of work and foster conducive and requisite learning environment.*

**Er. L.R. Rana**  
**Head(CCDC)**  
**Directorate of Technical Education,**  
**Vocational & Industrial Training,**  
**Sundernagar, Himachal Pradesh.**

## **LATERAL ENTRY OF THREE YEAR DIPLOMA PROGRAMME ENGINEERING DISCIPLINE**

### **1. SALIENT FEATURES**

- 1) Name of the Programme : Three year Diploma Programme  
Under Vertical Mobility Scheme (Lateral Entry)  
i.e. 10+2 Science, Vocational & I.T.I. Pass Outs Students
- 2) Duration of the Programme : Three years (06 Semesters)
- 3) Entry Qualification : As prescribed by H.P. Takniki  
Shiksha Board
- 4) Intake : As approved by H.P. Takniki  
Shiksha Board
- 5) Pattern of the Programme : Semester Pattern
- 6) Curriculum for : Bridge Course Lateral Entry Scheme

### **2. GUIDELINES FOR INTERNAL ASSESSMENT**

- The distribution of marks for Internal Assessment in theory subjects and drawing shall be made as per the following guidelines:
  - i. 60% of internal assessment shall be based on the performance in the tests. At least three tests shall be conducted during the semester out of which at least one house test should be conducted. 30% weight age will be given to house test and 30% to class test(One best out of two).
  - ii. 20% marks shall be given to home assignments, class assignments, seminars etc.
  - iii. 20% marks shall be given for attendance/punctuality in the subject concerned.
- The distribution of marks for Internal Assessment in practical subjects shall be made as per the following guidelines:
  - i. 60% marks shall be awarded for performance in practical
  - ii. 20% marks shall be given for Report/Practical book and punctuality in equal proportion.
  - iii. 20% marks shall be for Viva-voce conducted during the practical.

**STUDY AND EVALUATION SCHEME FOR BRIDGE COURSES TO LATERAL ENTRY(ITI/VOCATIONAL PASS OUTS) DIPLOMA PROGRAMMES FOR 3<sup>rd</sup> SEMESTER (FOR THE STATE OF HIMACHAL PRADESH)**

**THIRD SEMESTER**

SR. NO	SUBJECTS	Total Contact Hours		MARKS IN EVALUATION SCHEME					Total Marks
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT		
		Th.	Pr	Th	Pr	Total	Th	Hrs	
3.1	Applied Mathematics	36	-	50	-	50	100	3	150
3.2	Engineering Drawing	-	36	-	50	50	100	4	150
3.3	Graphics Presentation	-	36	-	50	50	100	4	150

- *Sr. No. 3.1, 3.2 common to both ITI, +2 Vocational & +2 Science Passout in for Engineering Courses*
- *Sr. No. 3.1 & 3.3 common for ITI Passout +2 Vocational pass outs in Architecture Assistantship Diploma*
- *Sr. No. 3.3 for +2 Science in Architecture Assistantship*

*Note: Classes for Bridge Courses shall be engaged during vacation/holidays.*

**STUDY AND EVALUATION SCHEME FOR BRIDGE COURSES TO LATERAL  
ENTRY(ITI/VOCATIONAL PASS OUTS) DIPLOMA PROGRAMMES FOR 4<sup>TH</sup> SEMESTER  
(FOR THE STATE OF HIMACHAL PRADESH)**

**FOURTH SEMESTER**

SR. NO	SUBJECTS	Total Contact Hours		MARKS IN EVALUATION SCHEME									Total Marks
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
4.1	English and Communication Skills	20	10	50	25	75	75	2	-	-	-	150	
4.2	Applied Physics	22	10	25	25	50	75	2	25	2	100	150	
4.3	Applied Science	36	-	50	-	50	100	3	-	-	100	150	
4.4	Applied Chemistry	28	8	25	25	50	75	3	25	2	100	150	
4.5	General Workshop Practice	-	36	-	50	50	100	-	100	4	100	150	
4.6	Sketching, Lettering and Printing	-	36	-	50	50	100	-	100	4	-	150	

- *Sr. No. 4.1, 4.2, 4.4 for ITI pass out in Engineering Courses*
- *Sr. No. 4.1,4.3 4.6 for ITI passout in Architectural Assistantship Diploma*
- *Sr. No. 4.2, 4.4, 4.5 for +2 Vocational Passouts in Engineering Courses*
- *Sr. No. 4.5,4.6 for +2 Science passouts in Architecture Assistantship.*
- *Sr.No. 4.3,4.5 & 4.6 for +2 vocational courses in Architecture Assistantship.*
- *Sr. No. 4.5 for +2 Science in Engg. Courses.*

*Note: Classes for Bridge Courses shall be engaged during vacation/holidays.*

**Detailed Contents  
of  
Bridge Course**

### 3.1 APPLIED MATHEMATICS

(Lecture +Practical)  
36+ 0 hours

#### DETAILED CONTENTS

1. **Algebra** (5Hrs)
  - 1.1 Complex Numbers:- Definition, Real and Imaginary parts of a complex number, Modulus and amplitude of complex number.
  - 1.2 Partial Fraction:- Partial fraction(linear factor only)
  
2. **Trigonometry:-** (10Hrs)
  - 2.1 Measurement of angle (sexagesimal, centesimal and circular system) and their conversion from one form to another.
  - 2.2 T-ratios of allied angles.
  - 2.3 Addition, Subtraction, formulae, Transformation from product to sum or difference and vice versa multiple and submultiple angles (without proof) simple applications.
  
- 3 **Differential Calculus:-** (12Hrs)
  - 3.1 Use of the following limits (with out Proof)
 
$$\lim_{x \rightarrow a} \left( \frac{x^n - a^n}{x - a} \right) = n a^{n-1}$$

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

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

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

#### SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	20
2	10	25
3	12	30
4	9	25
<b>Total</b>	<b>36</b>	<b>100</b>



## 3.2 ENGINEERING DRAWING-I

(Lecture +Practical)  
0+36 hours

### RATIONALE

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

#### Note:-

- 1.1 *First angle projection is to be followed.*
- 1.2 *Minimum of 6 sheets to be prepared by each student.*
- 1.3 *SP46-1988 should be followed.*
- 1.4 *Instruction relevant to various drawing may be given along with appropriate demonstration before assigning drawing practice to students.*

### DETAILED CONTENTS

1. **Introduction** (Practice on Sketch Book)
    - 1.1 Drawing Instruments, material layouts of drawing sheets size of standard drawing sheets.
    - 1.2 Sizes of drawing boards & drafting table/board etc.
  2. **Introduction to Different types of Lines**
    - 2.1 Different types of lines & arrow heads in Engineering Drawing as per BIS specifications.
  3. **Lettering Technique and Practice**
    - 3.1 Instrumental single stroke(Capital and inclines) lettering of 35mm height in the ratio of 7:4.
    - 3.2 Free hand lettering(Alphabet and numerals)-lower case and upper case, single stroke, vertical and inclines at 75° in different standards, series of 2.5,3,5,7, 10 and 15mm height in the ration of 7:4.
  4. **Introduction Dimension Technique** (1 Sheet)
    - 4.1 Dimensioning of overall sizes, circles thread holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on PCD, counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches-chain and parallel dimensioning
    - 4.2. Introduction & plain diagonal scale.
  5. **Principle of Projections** (1 Sheet)
    - 5.1 Introduction to 1<sup>st</sup> angle and 3<sup>rd</sup> angle projection.
    - 5.2 Drawing 3 orthographic views of given objects.
    - 5.3 Identifications of surfaces as drawn orthographic view.
- (1 Sheet)

6. **Introduction to sectioning:-** (1 Sheet)
- 6.1 Introduction of sectioning and conversion, full section, half section, Partial broken out sections, offset sections, revolved section and removed section.
- 6.2 Different conventions for materials in section, conventions breaksb for shafts, pipes, rectangular, square, angle, channels & rolled sections.
7. **Introduction to Threads, Nuts & Bolts:-** (1 Sheet)
- 7.1 Nomenclature of threads, types of threads(metric), single and multiple start threads.
- 7.2 Forms of various external threads sections such as V, square and acme threads, BA,BSW and Knuckle, Metric, Seller Threads, Buttress Threads.
- 7.3 Simplified conventions of left hand and right hand threads both external and internal threads
- 7.4 Different Views of hexagonal and square nuts, Different views of hexagonal and square nuts, Assembly of hexagonal headed, Square headed, Square headed with square neck bolt with hexagonal and square nuts and washers. Foundations bolts and Lewis bolt.
8. **Rivets and Riveted Joints** (1 Sheet)
- 8.1 Types of structural and general purpose rivet heads.
- 8.2 Caulking and fullering of riveted joints.
- 8.3 Types of riveted joints- lap, butt(single) riveted, double riveted lap joint, single cover plate and double cover plate), chain and Zig-Zag riveting.
9. **Keys and Cotters** (1 Sheet)
- Introduction to keys and cotters and their practical application, free hand sketch of
- 9.1 Muff or Box coupling } Practice on sketch work
- 9.2 Flange coupling(non-protected) }

**Recommended Books:-**

1. *Elementary Engineering Drawing(in first angles prohection) by N.D. Bhatt Charotar, Publishing House.*
2. *A Text Books of Engineering Drawing by Surjit Singh Published by Dhanpat Rai & Co. Delhi.*
3. *Engineering Drawing by P.S. Gill, S.K. Kataria & Sons, New Delhi.*
4. *N.S. Kumar, IPH.*

**SUGGESTIVE DISTRIBUTION OF MARKS**

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)	Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	6	12	6	6	15
2			7	6	15
3			8	4	15
4	4	12	9	4	15
5	6	16	<b>Total</b>	<b>36</b>	<b>100</b>

## 3.3 GRAPHIC PRESENTATION-I

(Lecture +Practical)  
0+ 36 hours

### RATIONALE

Graphic presentation forms a core subject for preparing perspective drawings, scale drawings, three dimensional views, furniture drawings and layouts. Therefore, this course aims at equipping the students with the skills of graphic presentation.

Teachers are expected to lay considerable stress on practical work so that student attain desired competencies for preparing good quality perspectives of interior and exterior of buildings in different media. Teachers are also expected to stress upon appropriate line work, properties, dimensioning, lettering, printing, colour rendering techniques, shades/shadows and sciography.

### DETAILED CONTENTS

#### Exercises on the following:

1. **Introduction:**
  - 1.1 Line lettering & dimensioning
2. **Plane Geometry:**
  - 2.1 **Geometrical construction**  
Construction of Pentagon, hexagon, Octagon etc.
  - 2.2 **Scales**  
Types of Scales
  - 2.3 **Conic Section**  
Construction of ellipse Hyperbola & parabola etc.
3. **Solid Geometry**
  - 3.1 Theory of Projection-First Angle & Third Angle
  - 3.2 Projections of Solids
4. **Isometric Projections & Views**
  - 4.1 Simple Problems of Isometric views such as cube box step, interior of rooms

#### SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	4	12
2	12	32
3	12	32
4	8	24
<b>Total</b>	<b>36</b>	<b>100</b>

## 4.1 ENGLISH AND COMMUNICATION SKILLS

(Lecture +Practical)

20+10 hours

### 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. Comprehension from unseen passages (2 Hrs)  
[Note: The teacher should integrate vocabulary building exercise from the passage]
2. Grammar (8 Hrs)
  - 2.1 Tenses
  - 2.2 Voice
  - 2.3 Narration
  - 2.4 Correction of incorrect sentences.
3. Vocabulary (2Hrs)
  - 3.1 Admission terms
  - 3.2 Technical Terms
- 4 Correspondence (4 Hrs)
  - 4.1 Business
  - 4.2 Official
  - 4.3 Personal
- 5 Translation from Hindi to English (2Hrs)
- 6 Communication process (2Hrs)

### LIST OF PRACTICALS

1. How to look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics,
2. Paper Reading before an audience (reading unseen passages)
3. Study of essentials of a Good Speech to respond and comprehend visual, oral themes, situations or stimulus and practice before select gathering
4. Exercises on use of different abbreviations
5. Introducing oneself, others and leave taking
6. Exercises on writing sentences on a topic

**Recommended Books:-**

1. *English & Communication Skills, Book-I & II* by Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Sinha, Prescribed by NITTTR Chandigarh, Published by Abhishek Publicaton, Chandigarh.
2. *A Practical English Grammer* by Thomoson and Marlinet
3. *High School English Grammar* by Wren & Martin.

**SUGGESTIVE DISTRIBUTION OF MARKS**

Sr. No.	Time Allotted (Hrs)	Marks Allotted in %
1	2	10
2	8	40
3	2	10
4	4	20
5	2	10
6	2	10
<b>Total</b>	<b>20 hours</b>	<b>100</b>

## 4.2 APPLIED PHYSICS

(Lecture +Practical)  
22+10 hours

### 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 in 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.
  - 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, coefficient 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)

## 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.
10. *A Text Book of Optics* by Subramanian and Brij Lal, S Chand & Co., New Delhi.
11. *Comprehensive Practical Physics, Vol, I & II*, JN Jaiswal, Laxmi Publishers

## SUGGESTIVE DISTRIBUTION OF MARKS

Sr. No.	Time Allotted (Hrs)	Marks Allotted in %
1	3	16
2	3	16
3	4	20
4	8	32
5	4	16
<b>Total</b>	<b>22 hours</b>	<b>100</b>

## 4.3 APPLIED SCIENCE

(Lecture +Practical)

36+ 0 hours

### 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.*

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

### DETAILED CONTENTS

- 1. 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 in 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** (3 hours)
  - 3.1 Types of thermometer and different scales.
  - 3.2 Modes of transfer of heat (Conduction, convection and radiation definition with examples).
  - 3.3 Heat Radiation.
- 4. Electrostatics & Electricity** (6 hours)
  - 4.1 Coulombs law, unit charge.
  - 4.2 Electric field intensity and electric potential.



- 4.3 Capacitance, types of capacitors, capacitance of parallel plate Capacitor.
- 4.4 Ohm's law.
- 4.5 Series and parallel combination of resistors, specific resistance, co-efficient of resistance.
- 4.6 Heating effect of current and concept of electric power, electric energy and their units.

**5. Rotational Motion** 3 Hrs.

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

**PART-B(APPLIED CHEMISTRY)**

- 1. Language of Chemistry 4Hrs.
  - 1.1 Definition of symbol, formula, valency and chemical equation
  - 1.2 Writing of Chemical formula of a simple chemical compound.
- 2. Paint & Varnish 4 Hrs
  - 2.1 Definition, Components and its applications
- 3. Corrosion 6Hrs.
  - 3.1 Definition of corrosion and methods of its prevention.
  - 3.2 Definition and composition of Portland cement, ordinary glass and lead glass
- 4. Adhesive 4 Hrs.
  - 4.1 Definition & Classification and applications of Adhesive

**Recommended Books:-**

**Physics**

- 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.*
- 10) *A Text Book of Optics by Subramanian and Brij Lal, S Chand & Co., New Delhi.*
- 11) *Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers*

## **Chemistry**

1. Chemistry in Engineering by J.C.Kuriacose and J. Rajaram, Tata Mc. Graw Hill Publishing Company Ltd. New Delhi
2. "A Text Book of Applied Chemistry-I" by SS Kumar, Tata Mc. Graw Hill Publishing Company Ltd. New Delhi
3. Engineering Chemistry by Jain PC and Jain M
4. Chemistry of Engineering by Aggarwal CV
5. Progressive Applied Chemistry-I and II by Dr. G.H. Hugar, Eagle Parkashan, Jalandhar

### **SUGGESTIVE DISTRIBUTION OF MARKS**

Sr. No.	Time Allotted (Hrs)	Marks Allotted in %
1	3	8
2	3	8
3	3	10
4	6	20
5	3	8
6	4	10
7	4	10
8	6	16
9	4	10
<b>Total</b>	<b>36</b>	<b>100</b>

## 4.4 APPLIED CHEMISTRY

(Lecture +Practical)  
28+ 8 hours

### 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.*

### DETAILED CONTENTS

1. **Language of Chemistry** (03 hrs)
  - 1.1 Definition of symbol, formula, valency and chemical equation.
  - 1.2 Writing of the chemical formula of a simple chemical compound
2. **Water** (04 hrs)
  - 2.1 Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) in boilers for steam generation.
  - 2.2 Qualities of water used for drinking purposes.
3. **Solutions** (03 hrs)
  - 3.1 Definition of pH, Buffer solution salt hydrolysis .
4. **Electrolysis** (03 hrs)
  - 4.1 Definition of the terms: Electrolytes, Non-electrolytes, conductors and non-conductors with suitable examples.
  - 4.2 Faradays Law of Electrolysis, Numerical Problem.
  - 4.3 Different industrial applications of "Electrolysis"
5. **Metallurgy** (03 hrs)
  - 5.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration, roasting calcinations and refining as applied in relation to various metallurgical operations
  - 5.2 Definition of an alloy, purposes of alloying and uses of brass

6. **Fuels** (03 hrs)  
6.1 Definition of a "Fuel", characteristics of a good fuel and classification of fuels with suitable examples  
6.2 Definition of Calorific value of fuel, method of calculation by bomb calorimeter & dulong formula, numerical.
7. **Corrosion** (02 hrs)  
Definition of 'corrosion' and methods of its prevention
8. **Lubricants** (03 hrs)  
8.1 Definition of (i) lubricant (ii) lubrication  
8.2 Characteristics of a lubricant such as viscosity, viscosity index, emulsification, flash point and fire point and pour point.
9. **Carbon Compound** (04 hrs)  
9.1 Tetra covalency of carbon, catenation, structural & condensed formula of organic compound, homologous series., functional group(IUPAC name of alkane, alkene, alkyne).  
9.2 Polymerization, addition & condensation polymer with suitable example synthetic resins(both thermoplastic and thermosetting).

### **LISTS OF PRACTICALS**

1. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances
2. Estimate the amount of moisture in the given sample of coal
3. To determine the strength of given solution of sulphuric acid by titration against standard solutions of sodium carbonate using methyl orange indicator.
4. To determine percentage purity of ferrous sulphate in given solution of known strength using potassium permanganate.

### **RECOMMENDED BOOKS**

- 1) Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
- 2) Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
- 3) "A Test Book of Applied Chemistry-I" by SS Kumar; Tata McGraw Hill, Delhi
- 4) "A Test Book of Applied Chemistry-I" by Sharma and others; Technical Bureau of Indis, Jalandhar.
- 5) Engineering Chemistry by Jain PC and Jain M.
- 6) Applied Chemistry by A.S. Singha & A.D. Sharma, Hiteshi Publication

### SUGGESTIVE DISTRIBUTION OF MARKS

Sr. No.	Time Allotted (Hrs)	Marks Allotted in %
1	3	9
2	4	12
3	3	12
4	3	12
5	3	12
6	3	12
7	2	4
8	3	9
9	4	18
<b>Total</b>	<b>28</b>	<b>100</b>

## 4.5 GENERAL WORKSHOP PRACTICE

(Lecture +Practical)

0+ 36 hours

### RATIONALE

*Manual abilities to handle engineering materials with hand tools need to be developed in the studies. They will be using different types of tools/equipment I different shops for fabrication purpose. Beside developing the necessary skills, the students will appreciate the importance of quality and safety measure.*

### DETAILED CONTENTS

- *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 measure and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketch of various tools/jobs in their practical Notebook.*
- *The students should also be taken to various shops(not included in the curriculum) in the polytechnic in batches and should be given knowledge of the various machine/equipments.*

The following shops are included in the syllabus:

1. **Carpentry Shop**
2. **Fitting Shop**
3. **Welding Shop**
4. **Electrical Shop**
5. **Smithy Shop**
6. **Sheet Metal Shop**

#### 1. **Carpentry Shop**

- 1.1 Introduction to various types of wood, carpentry tools-their identifications with sketch. Different types of wood joints.
- 1.2 Simple operations viz. hand sawing, marking planning
- 1.3 Demonstration and use of wood working machines i.e. band saw, circular saw, rip saw, bow saw and trammels. Universal wood working machine and wood turning lathe.
- 1.4 Making of T-lap joint

#### 2. **Fitting Shop**

- 2.1 Introduction to fitting shop, common materials used in fitting shop, description and demonstration of various types of work-holding devices(Bench Vice, Pipe Vice, Angle Plate, Surface plate, V-Block)
- 2.2 Demonstration of fitting shop tools, Hand Hack Saw(fixed and adjustable) various types of files(according to shape, cut, grade) hammers, punches, scribers, scrapers, taps and dies.
- 2.3 Description, demonstration and practice of simple operation of hack saw, straight and angular cutting.

- 2.4 Introduction and use of measuring tools used in fitting shop like: Try square, Steel rule, Measuring Tape, Outside micrometer, Vernier Clipper and Vernier Height Gauge.  
Job 1- Cutting and filing practice on a square of 45x45x8mm M.S. Flat.
- 2.5 Demonstration of drilling machine.

### **3. Welding Shop**

- 3.1 Introduction of welding, types of welding, common materials that can be welded, introduction to gas welding equipment, types of flame, adjustment of flame, applications of gas welding. Welding tools and safety precautions.
- 3.2 Introduction to electric arc welding(AC and DC), practice in setting current and voltage for striking proper arc, precautions while using electric arc welding. Applications of arc welding. Introduction to polarity and their use.
- 3.3 Demonstrate and use of the different tools used in the welding shop with sketches. Hand shield, helmet, clipping hammer, gloves, welding lead connectors, apron, goggles etc.
- 3.4 Demonstration of welding defects and various types of joints and end preparations
  - Job1: Preparation of lap joint by arc welding/Gas welding

### **4. Electrical Shop**

- 4.1 Demonstration of tools commonly used in Electric shop
- 4.2 Safety precautions, electric shock treatment
- 4.3 Demonstration of Common Electric materials like: wires, fuses, M.C., ceiling roses, battens and allied items.
- 4.4 Demonstration of Voltmeter, Ammeter, Multi-meter and Energy meter.
  - Job: Wiring practice in batten wiring and plastic casing-capping
  - Job: Control of one lamp and socket by switches
  - Job: Assembly of a tube light

### **5. Smithy Shop**

- 5.1 Demonstration and explanation of tools & equipment used. Safety measure to be observed in smithy shop.
- 5.2 Demonstration of bending operation, up-setting operation. Description and specifications of anvils, swage blocks, hammer etc.
- 5.3 Demonstration and description of tongs, fullers
  - Job1: To forge a L-hook

### **6. Sheet Metal Shop**

Introduction to sheet metal shop. Use of hand tools and accessories i.e. different types of hammers, mallet, sheet and wire gauge, selection of material.

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

- 6.2 Introduction and demonstrations of various machines and equipments used in sheet metal shop e.g. shearing machine, Bar folder, Nibbling M/C. Punching Machine, Bending Machine etc.
- 6.3 Introduction to various raw material used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, aluminum sheet etc.
- 6.4 Job1: Single riveted lap joint.

### SUGGESTIVE DISTRIBUTION OF MARKS

Sr. No.	Time Allotted (Hrs)	Marks Allotted in %
1	6	16
2	6	17
3	6	17
4	6	17
5	6	17
6	6	16
<b>Total</b>	<b>36</b>	<b>100</b>



## 4.6 SKETCHING, LETTERING AND PRINTING

(Lecture +Practical)

0+ 36 hours

### RATIONALE

*Free hand sketching, colouring and rendering, line sketching, shades and shadows, lettering and printing forms important components of Architecture discipline. This course aims at imparting desired skills in the above areas. Teachers are expected to lay considerable emphasis on practical work so that students attain sufficient skills in sketching, lettering and printing.*

### DETAILED CONTENTS

- 1) FREE HAND SKETCHING EXERCISES**
  - 1.1 Free hand sketching of simple geometrical surfaces (1 Sheet)
  - 1.2 Free hand drawing of three dimensional geometrical objects (cube, cone, Cylinder, pyramid, sphere) (1 Sheet)
  - 1.3 Free hand sketching of simple buildings , monuments & trees in different Techniques & mediums. (1 Sheet)
  
- 2) COLOURING & RENDERING EXERCISES**
  - 2.1 Definition & perception of colour , study of colours (emotional effects of colours . Warm & cool colours , receding & advancing colours) (1 Sheet)
  - 2.2 Colour circle, Hue Value & intensity of colours (1 Sheet)
  
- 3) LETTERING PRACTICE**
  - 3.1 ROMAN , GOTHIC & ITALIC lettering in 7:4 & 5:4 in single stroke/double stroke & capital/small letters (3 Sheet)
  - 3.2 Lettering withy the help of stencils (1 Sheet)
  
- 4) PREPARATION OF FORMS & ABILITY TO THINK IN THE ROUND**
  - 4.1 Mural Design Exercises (1 Sheet)
  
- 5) PRINTING PRACTICE**
  - 5.1 Tracing of a simple building (plan only) in ink (1 Sheet)

### SUGGESTIVE DISTRIBUTION OF MARKS

Sr. No.	Time Allotted (Hrs)	Marks Allotted in %
1	6	20
2	6	20
3	12	30
4	6	15
5	6	15
<b>Total</b>	<b>36</b>	<b>100</b>

*Designed & Prepared by Sudhir Sen(CA)*