

CURRICULUM

FOR

DIPLOMA PROGRAMME

(Automobile Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Electronics & Communication Engineering, Electrical & Electronics Engineering, Information Technology, Instrumentation Engineering, Mechanical Engineering)

IN

1st Year(1st & 2nd Semester)

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

CONTENTS

SR.NO.	PARTICULARS	PAGE NO.
-	Contents	1
-	Preface	2
1.	Salient Features of the Diploma Programme	3
2.	Guidelines <i>(for Assessment of Student Centered Activities and internal assessment)</i>	4
3.	Study and Evaluation Scheme	5-6
4.	Detailed Contents of Various Subjects	7

FIRST SEMESTER

1.1	English and Communication Skills - I	8-12
1.2	Applied Mathematics - I	13-14
1.3	Applied Physics – I	15-17
1.4	Applied Chemistry – I	18-20
1.5	Engineering Drawing – I	21-22
1.6	Computer Fundamentals & Skills <i>(Group-I) in 1st Semester & (Group-II) in 2nd Semester</i>	23-24
1.6	General Workshop Practice – I	25-28

SECOND SEMESTER

2.1	English and Communication Skills - II	29-32
2.2	Applied Mathematics – II	33-34
2.3	Applied Physics - II	35-37
2.4	Applied Chemistry – II	38-40
2.5	Engineering Drawing - II	41-42
2.6	Basic of Electrical & Electronics Engg. <i>(Group-II) in 1st Semester & (Group-I) in 2nd Semester.</i>	43-45
2.7	General Workshop Practice – II	46-48

The subject of Computer Fundamentals & Skills (Sr. No. 1.6) will be taught to Group-I i.e. Automobile Engineering, Civil Engineering, Instrumentation Engineering, Electrical Engineering, Fashion Technology in the 1st semester, whereas Basics of Electrical & Electronics Engineering (Sr. No. 2.6) will be taught to Group-II i.e. Electronics & Communication Engineering, Electrical & Electronics Engineering, Information Technology, Computer Engineering, Mechanical Engineering in place of Computer Fundamentals & Skills.

The subject of Basics of Electrical & Electronics Engineering (Sr. No. 2.6) will be taught to Group-I i.e. Automobile Engineering, Civil Engineering, Instrumentation Engineering, Electrical Engineering, Fashion Technology in the 2nd semester, whereas Computer Fundamentals & Skills (Sr. No. 1.6) will be taught to Group-II i.e. Electronics & Communication Engineering, Electrical & Electronics Engineering, Information Technology, Computer Engineering, Mechanical Engineering in place of Basics of Electrical & Electronics Engineering).

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.

1st YEAR OF THREE YEAR DIPLOMA PROGRAMME ENGINEERING DISCIPLINE

1. SALIENT FEATURES

- 1) Name of the Programme : Three year Diploma Programme
(Technical Stream)
- 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 : 1st year of Three year Diploma
Programme(Technical Stream)

7) **Student Centred Activities:**

A provision of 2-4 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. These activities will comprise of co-curricular & other activities such as expert lectures, games, seminars, declamation contests, educational field visits, NCC, NSS and cultural activities & hobby classes like photography, painting, singing etc.

2. GUIDELINES

2.1 GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

Distribution of 25 marks for SCA will be as follows:

- i. 5 Marks shall be given for general behaviour
- ii. 5 Marks for attendance shall be based on the following distribution:
 1. Less than 75% Nil
 2. 75-79.9% 3 Marks
 3. 80-84.9% 4 Marks
 4. Above 85% 5 Marks
- iii. 15 Marks shall be given for the Sports/NCC/Cultural and Co-curricular activities/other activities after due consideration to the following points:
 1. For participation in sports/NCC/Cultural/Co-curricular activities at National or above level, shall be rewarded with minimum of 10 marks
 2. For participation in sports/NCC/Cultural/Co-curricular activities at Inter-polytechnic level, shall be rewarded with minimum of 08 marks
 3. For participation in two or more of the listed activities, 5 extra marks should be rewarded

Note: *Head of Department Applied Science shall ensure that these marks are conveyed to the H.P. Takniki Shiksha Board, Dharamsala at the end of semester along with sessional record.*

2.2 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 should be house test. 30% weightage shall 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 practicals.

STUDY AND EVALUATION SCHEME

FIRST SEMESTER

SR. NO	SUBJECTS	STUDY SCHEME <i>Hrs/Week</i>		MARKS IN EVALUATION SCHEME								Total Marks
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
1.1	English and Communication Skills – I	3	2	30	20	50	100	3	50	3	150	200
1.2	Applied Mathematics - I	5	0	50	-	50	100	3	-	-	100	150
1.3	Applied Physics – I	4	2	30	20	50	100	3	50	3	150	200
1.4	Applied Chemistry – I	4	2	30	20	50	100	3	50	3	150	200
1.5	Engineering Drawing – I	0	6	-	50	50	-	-	100	4	100	150
1.6	► Computer Fundamentals & Skills(Group-I) in 1 st Semester & (Group-II) in 2 nd Semester	2	2	30	20	50	100	3	50	3	150	200
1.7	General Workshop Practice	0	6	-	100	100	-	-	50	4	50	150
#Student Centred Activities		-	2	-	25	25	-	-	-	-	-	25
Total		18	22	170	255	425	500	-	350	-	850	1275

These activities will comprise of co-curricular & other activities such as expert lectures, games, seminars, declamation contests, educational field visits, NCC, NSS and cultural activities & hobby classes like photography, painting, singing etc.

► *The subject of Computer Fundamentals & Skills(Sr. No. 1.6) will be taught to **Group-I** i.e. **Automobile Engineering, Civil Engineering, Instrumentation Engineering, Electrical Engineering, Fashion Technology** in the 1st semester, whereas Basics of Electrical & Electronics Engineering (Sr. No. 2.6) will be taught to **Group-II** i.e. **Electronics & Communication Engineering, Electrical & Electronics Engineering, Information Technology, Computer Engineering, Mechanical Engineering** in place of Computer Fundamentals & Skills.*

SECOND SEMESTER

SR. NO.	SUBJECTS	STUDY SCHEME <i>Hrs/Week</i>		MARKS IN EVALUATION SCHEME								Total Marks
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
2.1	English and Communication Skills - II	3	2	30	20	50	100	3	50	3	150	200
2.2	Applied Mathematics – II	5	0	50	-	50	100	3	-	-	100	150
2.3	Applied Physics-II	3	2	30	20	50	100	3	50	3	150	200
2.4	Applied Chemistry-II	3	2	30	20	50	100	3	50	3	150	200
2.5	Engineering Drawing-II	0	6	-	50	50	-	-	100	4	100	150
2.6	► Basics of Electrical & Electronics Engineering(Group-II) in 1 st Semester & (Group-I) in 2 nd Semester.	4	2	30	20	50	100	3	50	3	150	200
2.7	General Workshop Practice – II	0	6	-	100	100	-	-	50	4	50	150
#Student Centred Activities		-	2	-	25	25	-	-	-	-	-	25
Total		18	22	170	255	425	500		350		850	1275

These activities will comprise of co-curricular & other activities such as expert lectures, games, seminars, declamation contests, educational field visits, NCC, NSS and cultural activities & hobby classes like photography, painting, singing etc.

► *The subject of Basics of Electrical & Electronics Engineering (Sr. No. 2.6) will be taught to **Group-I** i.e. **Automobile Engineering, Civil Engineering, Instrumentation Engineering, Electrical Engineering, Fashion Technology** in the 2nd semester, whereas Computer Fundamentals & Skills(Sr. No. 1.6) will be taught to **Group-II** i.e. **Electronics & Communication Engineering, Electrical & Electronics Engineering, Information Technology, Computer Engineering, Mechanical Engineering** in place of Basics of Electrical & Electronics Engineering).*

**2. DETAILED CONTENTS
OF
1st YEAR SUBJECTS**

1.1 ENGLISH AND COMMUNICATION SKILLS – I

L T P
3 - 2

RATIONALE

*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. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practical's mentioned in the curriculum.*

DETAILED CONTENTS

1. **Facets of Literature** (14 hrs)
 - 1.1 Short Stories
 - 1.1.1 Homecoming – R.N. Tagore
 - 1.1.2 The Diamond Necklace- Guy- De Maupassant
 - 1.2 Prose
 - 1.2.1 I Have A Dream – Martin Luther King
 - 1.2.2 On Habits – A. G. Gardiner
 - 1.3 Poems
 - 1.3.1 Ozymandias – P.B. Shelley
 - 1.3.2 Daffodils – William Wordsworth
 - 1.3.3 Stopping by Woods on a Snowy Evening – Robert Frost
2. **Grammar and Usage** (10 hrs)
 - 2.1 Parts of speech
 - 2.1.1 Nouns
 - 2.1.2 Pronouns
 - 2.1.3 Adjectives
 - 2.1.4 Articles
 - 2.1.5 Verbs
 - 2.1.6 Adverbs
 - 2.1.7 Prepositions
 - 2.1.8 Conjunction
 - 2.1.9 Interjection
 - 2.1.10 Identifying parts of speech
 - 2.2 Pair of words (Words commonly confused and misused)
 - 2.2.1 Tenses
 - 2.2.2 Correction of incorrect sentences
 - 2.2.3 One word Substitution
3. **Translation** (04 hrs)

- 3.1 Glossary of Administrative Terms (English and Hindi)
- 3.2 Translation from Hindi into English and English to Hindi.
- 4. Paragraph of 100-150 words from outlines (08 hrs)
- 5. **Comprehension** (04 hrs)
Unseen passages of literacy, scientific, data/graph based for comprehension exercises
- 6. **Communication** (08 hrs)
 - 6.1 Definition, Elements and Process of Communication
 - 6.2 Objectives of Communication

LIST OF PRACTICALS

1. Locating a Book in Library
2. How to look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics,
3. How to Seek Information from an Encyclopedia
4. Listening pre-recorded English language learning programme
5. Paper Reading before an audience (reading unseen passages)
6. Study of spelling Rules
7. Study of essentials of a Good Speech to respond and comprehend visual, oral themes, situations or stimulus and practice before select gathering
8. Exercises on use of different abbreviations
9. Greetings for different occasions
10. Introducing oneself, others and leave taking
11. Exercises on writing sentences on a topic

Note:

1. *The Text Book on "English and Communication Skills, Book-I By Kuldip Jaidka et. al. developed by NITTTR, Chandigarh is recommended to be used for teaching and setting-up the question papers.*
2. *A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDs and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.*
3. *Elements of body language will be incorporated in all practicals*
4. *The practical exercises involving writing may also be included in Theory Examination.*

RECOMMENDED BOOKS

1. *English and Communication Skills, Book-I By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh Published By Abhishek Publication, 57-59, Sector-17, Chandigarh*
2. *Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons*
3. *The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India*

4. *New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,*
5. *New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,*
6. *A Practical English Grammar by Thomson and Marlinet*
7. *Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill*
8. *English Conversation Practice by Grount Taylor; Tata McGraw Hill*
9. *Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi*
10. *Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi*
11. *Communication Skills by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	40
2	10	15
3	4	10
4	8	10
5	4	10
6	8	15
Total	48	100

Glossary of Administrative Terms

1.	Senior	वरिष्ठ
2.	Cashier	खजान्ची
3.	Consent	सहमती
4.	Earned Leave	जमा छुट्टी
5.	Under Consideration	विचार अधीन
6.	Criterion	कसौटी
7.	Staff	कर्मचारी
8.	Tenure	कार्यकाल
9.	Working Committee	कार्य समिति
10.	Estate	सम्पदा
11.	Self-Sufficient	आत्मनिर्भर
12.	Emergency	आपात्तकाल
13.	General Body	आम सभा
14.	Exemption	छूट
15.	Daily wages	दिहाड़ीदार
16.	Death-Cum Retirement	मृत्यु और निवृत्ती
17.	Despatch Register	रवानगी रजिस्टर
18.	Despatch	रवानगी
19.	Stenography	आशुलिपिक
20.	Assurance	दिलासा
21.	Justify	सही साबित करना
22.	Superior	बढिया
23.	High Commission	उच्चायुक्त
24.	Simultaneous	साथ - साथ
25.	Precautionary	एहतियाती
26.	Commanding Office	कमांडिंग अफसर
27.	Negligence	लापरवाही
28.	Performance	पुरा करना
29.	Proof Reader	पुफ रीडर
30.	Take Over	काम सभालना
31.	Timely Compliance	समय दौरान पुरा करना
32.	Responsibility	जिमेदारी
33.	Chief Justice	मुख्य न्यायधिेश
34.	Disciplinary Action	अनुशासनिक कारवाई
35.	Efficiency Bar	दक्षता रोक
36.	Flying Squad	उड़न दस्ता
37.	Regret	खेद
38.	Inconvenience	असुविधा
39.	Ambiguous	अस्पष्ट
40.	Part Time	अशकालीन
41.	Academy	अकादमी
42.	Disparity	असमानता
43.	Extraordinary	असाधारण
44.	Provisional	अस्थायी
45.	Income Tax	आयकर
46.	Bonafide	असली
47.	Acting in Official Capacity	बतौर अधिकारिक हैसियत
48.	Contractor	ठेकेदार
49.	On probation	परिवीक्षाधीन
50.	State	राज्य

51.	Administrator	प्रशासक
52.	Admission	प्रवेश
53.	Aforesaid	पूर्वोक्त, उपरोक्त
54.	Affidavit	शपथपत्र
55.	Agenda	कार्यसूची
56.	Alma Mater	विद्यालय जहां किसी व्यक्ति ने शिक्षा प्राप्त
57.	Appointing Authority	मनोनित अधिकारी
58.	Apprentice	शिल्पकारू
59.	Additional	अतिरिक्त
60.	Advertisement	विज्ञापन
61.	Assistant	सहायक
62.	Assumption of Charge	अधिकार ग्रहण करना
63.	Attested Copy	सत्यापित प्रति
64.	Chief Minister	मुख्यमन्त्री
65.	Clerical Error	लेखन सम्बन्धी भ्रम
66.	Code	कानून की किताब, गुप्त भाषा
67.	Corruption	नैतिक भ्रष्टाचार, खोटापन
68.	Craftsman	कारीगर
69.	Compensation	हरजाना
70.	Compensatory Allowance	क्षतिपूरक भत्ता
71.	Compile	संकलन करना, संग्रह करना
72.	Confidential Letter	गुप्त पत्र
73.	Chief Engineer	मुख्य अभिन्यता
74.	Data	स्वीकृत तत्त्व (आंकड़े)
75.	Dearness Allowance	संहर्गाई भत्ता
76.	Department	विभाग
77.	Dictionary	शब्द कोष
78.	Director	निदेशक, संचालन
79.	Director of Tech. Edu.	तकनीकी शिक्षा निदेशक
80.	Executive Engineer	अधिशासी अभिन्यता
81.	Employment Exchange	व्यवसाय केन्द्र
82.	Head Office	मुख्य कार्यालय
83.	Head Clerk	प्रधान लिपिक
84.	Indian Admn. Service	भारतीय प्रशासनिक सेवा
85.	Legislative Assembly	विधान सभा
86.	Officiating	स्थानापन्न
87.	Office Record	कार्यालय रिकार्ड
88.	Office Discipline	कार्यालय अनुशासन
89.	Polytechnic	बहुतकनीकी
90.	Temporary	अस्थायी
91.	Qualified	योग्यता प्राप्ति
92.	Under Investigation	जांच अधीन
93.	Sub-treasury	उप-खजाना
94.	Target Date	लक्ष्य तिथि
95.	Technical Approval	तकनीकी मान्यता
96.	Verification	जांच पड़ताल
97.	Viva-voce	मौखिक परीक्षा
98.	Write off	बटटेखाते डालना
99.	Warning	चेतावनी
100.	Yours faithfully	भवदीय

1.2 APPLIED MATHEMATICS - I

L T P

5 - -

RATIONALE

Applied Mathematics forms the backbone of engineering students. Basic elements of algebra, trigonometry, coordinate geometry have been included in the curriculum as foundation course. This course will develop analytical abilities to make exact calculations and will provide continuing educational base to the students.

DETAILED CONTENTS

1. **Algebra** (25 hrs)
 - 1.1 Complex Numbers: Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other, conjugate of a complex number, modulus and amplitude of a complex number Addition, Subtraction, Multiplication and Division of a complex number. De-moivier's theorem, its application.
 - 1.2 Partial fractions (linear factors, repeated linear factors)
 - 1.3 Permutations and Combinations: Value of ${}^n P_r$ ${}^n C_r$. Simple problems
 - 1.4 Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems
2. **Trigonometry** (25 hrs)
 - 2.1 Concept of angles, measurement of angles in degrees, grades and radians and their conversions.
 - 2.2 T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).
 - 2.3 Graphs of

Sin x, cos x, tan x and e^x

3. **Differential Calculus** (30 hrs)

3.1 Definition of function; Concept of limits.

Four standard limits

$$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}, \quad \lim_{x \rightarrow 0} \frac{\sin x}{x},$$

$$\lim_{x \rightarrow 0} \left(\frac{a^x - 1}{x} \right), \quad \lim_{x \rightarrow 0} (1 + x)^{1/x},$$

3.2 Differentiation by definition of $x^n, \sin x, \cos x, \tan x, e^x, \log_a x$

3.3 Differentiation of sum, product and quotient of functions. Differentiation of function of a function.

3.4 Differentiation of trigonometric inverse functions. Logarithmic differentiation. Exponential differentiation Successive differentiation (excluding nth order).

3.5 Applications:

(a) Maxima and minima

(b) Equation of tangent and normal to a curve (for explicit functions only)

RECOMMENDED BOOKS

1. *Elementary Engineering Mathematics* by BS Grewal, Khanna Publishers, New Delhi
2. *Engineering Mathematics* by Vol. I & II by S Kohli, IPH, Jalandhar
3. *Applied Mathematics* by Dr. RD Sharma
4. *Applied Mathematics, Vol. I & II* by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. *Comprehensive Mathematics, Vol. I & II* by Laxmi Publications
6. *Engineering Mathematics* by Dass Gupta
7. *Engineering Mathematics* by C Dass Chawla, Asian Publishers, New Delhi
8. *Comprehensive Mathematics, Vol. I & II* by Laxmi Publications
9. *Engineering Mathematics, Vol I, II & III* by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi
10. *Engineering Mathematics* by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
11. *Engineering Mathematics, Vol I & II* by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. *Engineering Mathematics, Vol I & II* by AK Gupta, MacMillan India Ltd., New Delhi
13. *Applied Mathematics Vol-1 & II* by Hiteshi Publication.

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	25	30
2	25	30
3	30	40
Total	80	100

1.3 APPLIED PHYSICS– I

L T P
4 - 2

RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in 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 will behave. Concrete use 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** (08 hrs)
 - 1.1 Physical quantity (Definition only)
 - 1.2 Units - fundamental and derived quantities and their units, SI system and its advantages.
 - 1.3 Dimensions and dimensional formulae of physical quantities
 - 1.4 Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis
 - 1.5 Numerical on homogeneity of dimension.

2. **Force and Motion** (12 hrs)
 - 2.1 Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors
 - 2.2 Force, resolution and composition of forces – resultant, parallelogram law of forces, equilibrium of forces, Lami's theorem, Forces in nature (gravitational, electromagnetic, weak and strong force).
 - 2.3 Concept of Linear momentum, conservation of momentum, impulse, simple numerical problems
 - 2.4 Circular motion – angular displacement, angular velocity and angular acceleration
 - 2.5 Relation between linear and angular variables (velocity and acceleration)
 - 2.6 Centripetal force (derivation) and centrifugal force
 - 2.7 Banking of roads, Bending of cyclist.

3. **Work, Power and Energy** (10 hrs)
 - 3.1 Work: definition and its SI units
 - 3.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces)
 - 3.3 Power: definition and its SI units, calculation of power in simple cases
 - 3.4 Energy: Definition and its SI units: Types: Kinetic energy and Potential energy with examples and their derivation
 - 3.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another
 - 3.6 Concept of friction, cause and types, applications of friction in daily life, methods to reduce friction.

4. **Rotational Motion** (06 hrs)
- 4.1 Definitions of torque, angular momentum and their relationship
 - 4.2 Conservation of angular momentum (qualitative) and its examples
 - 4.3 Moment of inertia of a rigid body and its physical significance, radius of gyration
 - 4.4 Theorems of parallel and perpendicular axes (statements)
 - 4.5 Moment of inertia of rod and ring.
5. **Properties of Matter** (10 hrs)
- 5.1 Elasticity, definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hook's law
 - 5.2 Pressure – its units, gauge pressure, absolute pressure, atmospheric pressure(Definition).
 - 5.3 Surface tension – its units, angle of contact, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension
6. **Thermometry** (10 hrs)
- 6.1 Heat and temperature on the basis of K.E. of molecules
 - 6.2 Principles of measurement of temperature and different scales of temperature, Conversion of temperature formula and numerical.
 - 6.3 Criteria for selection of a thermo meter.
 - 6.4 Co-efficient of linear, surface and cubical expansions.
 - 6.5 Modes of transfer of heat (Conduction, convection and radiation with examples)
 - 6.6 Co-efficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method).
7. **Satellites, Nuclear Reactor & Radio-activity** (08 Hrs)
- Concept of Natural, artificial satellite, equitorial orbit, Geo-Stationary orbit, Polar orbit, Apogee, Perigee, inclination, Natural radioactivity, units, concept of nuclear fission, fusion and nuclear reactor. Distinguish between nuclear fission and nuclear fusion. Advantages and disadvantages of nuclear fuel over fossil fuel, Use of nuclear radiations.

LIST OF PRACTICALS (to perform minimum seven experiments)

1. To find the diameter of wire using a screw gauge
2. To find volume of cylinder using a vernier caliper
3. To determine the thickness of glass strip using a spherometer
4. To verify the parallelogram law of forces
5. To verify conservation of energy of a rolling solid sphere/cylinder
6. To find the diameter of a capillary tube using Travelling Microscop
7. To find the time period of a simple pendulum
8. To find the time period of cantilever
9. To determine the atmospheric pressure at a place using Fortin's Barometer
10. To find the surface tension of water using capillary method.

RECOMMENDED BOOKS

1. *Test Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T /C.B.S.E.*
2. *Test Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T /C.B.S.E.*
3. *Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi*
4. *Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi*
5. *Fundamentals of Physics by Resnick and Halliday & Walker, Asian Book Pvt. Ltd., New Delhi*
6. *Berkeley Physics Course, Vol. I, II &III, Tata McGraw Hill, Delhi*
7. *The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi*
8. *Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series*
9. *A Text Book of Optics by Subramanian and Brij Lal, S Chand & Co., New Delhi*
10. *Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers*
11. *Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi*
12. *Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar*
13. *Applied Physics I & II By J.R. Bhardwaj Hiteshi Publication, Hamirpur H.P.*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	15
2	12	20
3	10	15
4	06	10
5	10	15
6	10	15
7	08	10
Total	64	100

1.4 APPLIED CHEMISTRY - I

L T P
4 - 2

RATIONALE

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 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. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. **Basic concepts of Chemistry** (10 hrs)
 - 1.1 Matter, element, compound and mixtures, atom, molecule, ion, symbols and formulae (recapitulation only)
 - 1.2 Atomic mass (A), molar mass, mole concept, molar volume of gases
 - 1.3 Solution, strength of solutions in grams per liter, molarity (M), molality (m), mass fraction and mole fraction (numerical problems)
 - 1.4 Chemical equations, thermo-chemical equations, balancing of chemical equations (using partial equation method)
 - 1.5 Numerical problems based on mole concept
 - 1.6 Brief introduction and concept of Volumetry Analysis, Numerical problem.

2. **Atomic structure and Chemical Bonding** (10 hrs)
 - 2.1 Postulates of Bohr model of atom, success and failures of Bohr model of atom
 - 2.2 Heisenberg's uncertainty principle
 - 2.3 Elementary idea of modern concept of atom, quantum numbers (significance only), definition of shells, sub shells and orbitals, concept of orbitals, shapes of s & p orbitals only. Electronic configuration of elements (atomic number 1 to 30 only) on the basis of Aufbau principle, Pauli's principle and Hund's rule
 - 2.4 Modern periodic law, periods and groups,
 - 2.5 Division of the periodic table into s, p, d, and f blocks (details excluded)
 - 2.6 Chemical bond and cause of bonding, Different type of Hybridization (sp, sp², sp³)
 - 2.7 Ionic bond, covalent bond, orbital concept of covalent bonding, valence bond theory, sigma (σ) and pi (π) bonds.
 - 2.8 Metallic bonding (electron sea model)
 - 2.9 Coordinate bond with examples of ozone, ammonium chloride, H₃N-BF₃ complex

3. **Water** (10 hrs)
- 3.1 Sources of water
 - 3.2 Hard water, soft water, types of hardness, action of soap on hard water
 - 3.3 Degree of hardness in terms of calcium carbonate, Units of hardness in Clark degree, French degree and ppm, Numerical problems.
 - 3.4 Principle of hardness by EDTA method,
 - 3.5 Disadvantages of hard water in domestic and industrial uses
 - 3.6 Boiler water: causes and prevention of scale and sludge formation, corrosion, priming & foaming and caustic embitterment
 - 3.7 Softening of hard water by premitit and ion exchange processes
 - 3.8 Qualities of drinking water and purification of available water for drinking purposes, Reverse osmosis and drinking water purification through reverse osmosis unit.
4. **Equilibrium, Acids and Bases.** (10 hrs)
- 4.1 Equilibrium state, equilibrium constant and statement of Le-chatelier's principle with illustration
 - 4.2 Ionization of electrolyte in aqueous solution, ionic equilibrium, degree of ionization, self-ionization of water and ionic product of water (K_w)
 - 4.3 Concept of pH and pH scale, solubility product.
 - 4.4 Arrhenius concept of acids/bases; strong acids/bases, weak acids/bases, dissociation constants of acids/bases. Neutralization, acid base titration, choice of indicators for acid base titration
 - 4.5 Hydrolysis of salts, buffer solutions (acidic and basic), buffer action of a buffer solution, applications of buffer solution
 - 4.6 Simple numerical problems on pH, and degree of ionisation.
5. **Electrochemistry.** (9 hrs)
- 5.1 Electronic concept of oxidation and reduction, redox reactions
 - 5.2 Electrolytes and non electrolytes
 - 5.3 Electrolysis, Faradays laws of electrolysis
 - 5.4 Applications of electrolysis in electrometallurgy, electro-refining and electroplating.
 - 5.5 Galvanic cells (elementary idea) brief description of Daniel cell, Ni-Cd cell, dry cell and lithium iodide cell
 - 5.6 Lead storage batteries and maintenance free batteries
 - 5.7 Simple numerical problems related to Faraday's laws
6. **Organic Chemistry.** (10 hrs)
- 6.1 Tetra covalency of carbon, catenation (definition only) Homologous series, functional groups and following organic families:
(a) alkanes (b) alkenes (c) alkynes (d) alcohols (e) ethers (f) aldehydes and ketones (g) Carboxylic acids (h) esters (i) amides (with structure and IUPAC names).
 - 6.2 Organic Reaction mechanism, cleavage of covalent bond(Homolytic and heterolytic) attacking reagents (Electrophilles and Nucleophiles), Types of organic reaction(substitution, Addition, elimination and rearrangement reactions).

6.3 Brief introduction concept of isomerism and stereo isomerism (definition and geometrical isomerism in alkenes).

7. **Environmental Pollution and its control** (05 hrs)
- 7.1 Introduction
 - 7.2 Causes and control of air, water, and soil pollutions
 - 7.3 Noise pollution
 - 7.4 Radio active pollution and its control
 - 7.5 Sewage and its treatment
 - 7.6 Green Chemistry (a new route to the environmental Pollution).

LIST OF PRACTICALS

Perform any eight Practical.

1. *Introduction to volumetric analysis, apparatus used and molarity based calculations*
2. *To determine strength of given solution of sodium hydroxide by titrating against standard solution of oxalic acid using phenolphthalein indicator.*
3. *To determine strength of given solution of sulphuric acid by titrating against standard solution of sodium carbonate using methyl orange indicator.*
4. *Estimation of hardness of water by EDTA method.*
5. *Estimation of total alkalinity in the given sample of water by titrating against standard solution of sulfuric acid.*
6. *Determination of the dosage of bleaching powder required for sterilization or disinfection of different samples of water, using standard sodium thiosulfate solution*
7. *Estimation of chloride ions in the given sample of water by titrating against standard solution of silver nitrate.*
8. *To determine %age purity of ferrous sulphate in given solution of known strength using potassium permanganate solution.*
9. *To distinguish between aldehyde and ketone by Tollen's reagent (benzaldehyde and acetone may be used)*
10. *To prepare iodoform from ethanol or acetone*
11. *To prepare the Mohr's salt from ferrous sulphate and ammonium sulphate.*

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose And J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company New Delhi.
3. Engineering Chemistry by Shashi Chawla.
4. Progressive Applied Chemistry – I by Dr. G.H. Hugar Eagle Prakashan Jalandhar
5. Applied Chemistry by A.N. Singha & A.D. Sharma, Hiteshi Publication.

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	10	15
3	10	10
4	10	18
5	9	18
6	10	14
7	05	10
Total	64	100

1.5 ENGINEERING DRAWING - I

L T P
- - 6

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 12 sheets to be prepared*
- iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students*

DETAILED CONTENTS

Section-I

1. **Introduction to Free Hand Sketching and Lettering**
 - 1.1 Drawing instruments, material & layout of drawing sheets.
 - 1.2 Different types of lines & arrow heads in Engineering drawing as per BIS specifications
 - 1.3 Practice of free hand sketching of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves
2. **Lettering Technique and Practice** (01 sheets)
 - 2.1 Instrumental single stroke lettering of 35 mm and 70 mm height in the ratio of 7:4
 - 2.2 Free hand lettering (Alphabet and numerals)- lower case and upper case, single stroke, vertical and inclined at 75 degree in different standards, series of 3, 5, 8 and 12 mm heights in the ratio of 7:4
3. **Dimensioning Technique** (01 sheet)
 - 3.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
 - 3.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sink holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

Section-II

4. **Scales** (01 sheets)
 - 4.1 Scales - their need and importance (Theoretical instructions).
 - 4.2 Drawing of plain and diagonal scales

Section-III

5. **Projection** (04 sheets)
 - 5.1 Introduction to 1st angle projection and 3rd angle projection

- 5.2 Drawing 3 views of given objects (Non-symmetrical objects may be selected for this exercise)
- 5.3 Identification of surfaces and exercises on missing surfaces and views
6. **Sections** (02 sheets)
- 6.1 Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventions in sectioning
- 6.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
- 6.3 Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
- 6.4 Exercises on sectional views of different objects.
7. **Isometric Views** (02 sheets)
- 7.1 Fundamentals of isometric projections (Theoretical instructions)
- 7.2 Isometric views from 2 or 3 given orthographic views.

Section-IV

8. **Symbols and Conventions** (02 sheets)
- 8.1 Civil engineering, sanitary fitting symbols
- 8.2 Electrical fitting symbols for domestic interior installations
- 8.3 Application of sanitary & electrical symbols on building plan drawing.
- 8.5 Engineering material, symbols & conventions.
- 8.6 Introduction to welding symbols and conventions.

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, Character Publishing House*
4. *Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar*
5. *Engineering Drawing I & II by N.S. Kumar.*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.		Time Allotted (Hrs)	Marks Allotted (%)
Section I	1	32 Hrs	30
	2		
	3		
Section II	4	10 Hrs	10
Section III	5	42 Hrs	45
	6		
	7		
Section IV	8	12 Hrs.	15
Total		96 Hrs	100

1.6 COMPUTER FUNDAMENTALS & SKILLS

L T P
2 - 2

RATIONALE

At the end of the programme, the student will be able to acquire basic computer skills for various applications to students of all branches of study.

- *Familiarize various operating systems*
- *Know the usage of word package*
- *Understand the facilities in a spread sheet*
- *Prepare slides using power point*
- *Make use of internet facility*

DETAILED CONTENTS

- 1. Basics of Computer System:** (04 hrs)
 - 1.1 History of Computer
 - 1.2 Data, Information & Program
 - 1.3 Elements of Computer System – Hardware, Software
 - 1.4 Types of Computers
 - 1.5 Block diagram of Computer system
 - 1.6 Applications of Computers
- 2. Basics of Input /Output Devices:** (04 hrs)
 - 2.1 Input Devices: Keyboard, Mouse, Scanner, Touch Screen, MICR.
 - 2.2 Output Devices: : VDU, Printers (Impact &Non Impact).
- 3. Basic of Storage Devices:** (06 hrs)
 - 3.1 Concept of Primary and Secondary Memory
 - 3.2 Cache Memory
 - 3.3 RAM & ROM
 - 3.4 Floppy Disk, Hard Disk, CD-ROM, CD-RW, DVD.
- 4. Basic of Computer Software:** (06 hrs)
 - 4.1 Software, Types of Software
 - 4.2 Computer Languages
 - 4.3 Translators - Assembler, Interpreter, Compiler .
 - 4.4 Booting (Cold & Warm Booting).
- 5. Basics of Operating System:** (06 hrs)
 - 5.1 Introduction
 - 5.2 Major features of the operating systems
 - 5.3 Types of Operating System
 - 5.4 Most desirable characters of the operating system
- 6. Basics of IT:** (06 hrs)
 - 6.1 Information Technology Concepts and Scope
 - 6.2 Role of IT in Social & Society
 - 6.3 Network and its applications
 - 6.4 Types of Network
 - 6.5 Internet, uses and its future
 - 6.6 Internet Browsers, WWW.

List of Practical

1. Study of various components of computer system and their functions.
2. Practice in installing a computer system by interconnecting various parts.
3. Study of various input Devices & output devices.
4. Working with WINDOWS OS (Latest edition)
 - 4.1 Creating , renaming and removing a folder.
 - 4.2 Making the taskbar wider, arranging icons on the Desktop, Displaying and hiding the taskbar clock, Controlling the size of start menu options. Creating shortcuts
 - 4.3 Adding a program to the start menu, Recovering files and folders from Recycle bin, Customizing the mouse settings.
 - 4.4 Displaying the properties for a file or folder ,Using cut ,copy and paste operations to a file, Finding a file or folder, by name, Compressing a file using WinZip.
5. Working on MS – WORD (latest edition)
 - 5.1 Creating ,Opening, Saving a word document.
 - 5.2 Using various editing features of MS-Word.
 - 5.3 Using various formatting features of MS-Word
 - 5.4 . Creating a table
 - 5.5 Using mail merge
 - 5.6 Prepare your Bio-data/Resume using above features.
- 6 Working on MS – EXCEL(latest edition)
 - 6.1. Create a worksheet in Excel .
 - 6.2 Copy, Move and Merge the cells
 - 6.3 Using various Formatting features
 - 6.4 Using formula and functions prepare worksheet for storing subject marks of ten students and perform the following:
 - 6.4.1 Calculate the student wise total and average
 - 6.4.2 Calculate the subject wise total and average
 - 6.4.3 Calculate the overall percentage and also individual percentage of the student.
 - 6.4.4 Create a Circle diagram (Pie chart) for the above.
7. Working on MS – POWER POINT(latest edition)
 - 7.1 Create a simple presentation with atleast 5 slides about your institution
- 8 Working on INTERNET
 - 8.1 Log-in to internet
 - 8.2 Navigation for information seeking on internet
 - 8.3 Browsing and down loading of information from internet
 - 8.4 Creating an e-mail account
 - 8.5 Sending and receiving e-mail
 - 8.6 Attaching a file with e-mail message

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No	Time Allotted (Hrs)	%age Marks Allotted
1	4	12
2	4	16
3	6	16
4	6	20
5	6	20
6	6	16
Total	32	100

1.7 GENERAL WORKSHOP PRACTICE - I

L T P

- - 6

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 hand on experience about use of different tools and basic manufacturing practices.

This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS (PRACTICALS)

The following shops are included in the syllabus:

1. Carpentry and Painting Shop-I
2. Fitting Shop –I
4. Sheet Metal Shop-I
5. Smithy Shop –I
6. Electric Shop –I
7. Welding Shop-I

1. Carpentry and Painting Shop – I

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Hollack, Sheesham, Champ, etc. (Demonstration and their identification).
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.
Job I Marking, sawing and planing practice
Job II Extensive planing practice on soft wood
Job III Chiseling practice
- 1.3 Introduction to various types of wooden joints, their relative advantages and uses.
Job IV Preparation of half lap joint
Job V Preparation of Mortise and Tenon Joint
- 1.4 Demonstration of various methods of painting wooden items.
Job V Preparation of surface before painting.
Job VI Application of primer coat
Job VII Painting wooden items by brush/roller/spray

2. Fitting Shop – I

- 2.1 Introduction to fitting shop, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.) Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.

- 2.2 Description and demonstration of various types of work benches. Holding devices and files, Precautions while filing. Different types of punches and their uses
 Job I Filing practice (Production of flat surfaces) Checking by straight edge.
 Job II Marking of jobs, use of marking tools and measuring instruments, such as vernier calipers, vernier height gauges, V block & angle plate.
 Job III Filing a dimensioned rectangular or Square piece of an accuracy of $\pm 0.25\text{mm}$.
 Job IV Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.
 Job V Making a cutout from a square piece of MS Flat using Hand hacksaw.
- 2.3 Introduction to chipping, Demonstration on chipping and its applications. Demonstration and function of chipping tools.
 Job IV Chipping practice
- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set, surface plate, universal angle plate. Handling of measuring instruments, checking of zero error, finding of least count.
 Job I Preparation of a job by filing on non-ferrous metal upto an accuracy of $\pm 0.1\text{mm}$
 Job II Preparation of job involving thread on GI pipe and fixing of different types of elbow, tee union, socket, stopcock, taps, etc.

3. **Welding Shop – I**

- 3.1 Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes and their specifications, welding screens and other welding related equipment and accessories.
- 3.2 Electric arc welding, (ac. and dc.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc.
 Job I Practice of striking arc while using electric arc welding set.
 Job II Welding practice job on arc welding for making uniform and straight weld beads.
- 3.3 Various types of joints and end preparation.
 Job III Preparation of butt joint by arc welding.
 Job IV Preparation of lap joint by arc welding.
 Job V Preparation of corner joint by using electric arc welding.
 Job VI Preparation of Tee joint by arc welding.

4. Electric Shop – I

- 4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories.
- 4.2 Study of electrical safety measures and demonstration about use of protective devices.
Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin, plugs.
Job II Lay out of complete wiring of a house (i) batten wiring (ii) plastic casing and capping.
- 4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan/ table fan, electric mixer, electric Geyser, desert cooler etc.
Job III: Testing and rectification of simulated faults in above said electrical appliances.
- 4.4 Introduction to a Lead-acid battery and its working.
Job IV Installation of a battery and to connect in series and parallel
Job V Charging a battery and testing it with the help of hydrometer and cell tester.

5. Smithy Shop – I

- 5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in Smithy shop. Safety measures to be observed in the smithy shop.
- 5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers, etc.
- 5.3 Demonstration and description of tongs, fullers, swages
Job I To forge a L-Hook.
Job II To prepare a job involving upsetting process
Job III To forge a chisel
Job IV To prepare a cube from a M.S. round by forging method.

6. Sheet Metal Shop –I

- 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.
- 6.1 Introduction and demonstration of hand tools used in sheet metal shop.
 - 6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Burring Machine, Nibbling machine, Wiring Machine, Forming Machine, Punching Machine.
 - 6.3 Introduction to various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.
 - 6.4 Study of various types of Nuts, Bolts, Rivets, Steel Screws etc.
Job I Shearing practice on a sheet using hand shears.
 - a) Single rivetted lap joint/Double rivetted lap joint

b) Single cover plate chain type/zig-zag type single rivetted
Butt Joint

RECOMMENDED BOOKS

1. *Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay*
2. *Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.*
3. *Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi*
4. *Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	16	16
2	16	16
3	16	18
4	16	16
5	16	16
6	16	18
Total	96	100

2.1 ENGLISH AND COMMUNICATION SKILLS - II

L T P
3 - 2

RATIONALE

*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. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.*

DETAILED CONTENTS

1. **Facets of Literature** (14 hrs)
 - 1.1 Short stories
 - 1.1.1 The Portrait of a Lady - Khushwant Singh
 - 1.1.2 The Refugees – Pearl S. Buck
 - 1.2 Prose
 - 1.2.1 Forgetting- Robert Lynd.
 - 1.2.2 Walking Tours- Robert Louis Stevenson
 - 1.3 Poems
 - 1.3.1 All The World's A Stage – W. Shakespeare
 - 1.3.2 No Men are Foreign- James Kirkup
2. **The Art of Précis Writing** (04 hrs)
3. **Grammar and Usage** (08 hrs)
 - 3.1 Narration
 - 3.2 Voice
 - 3.3 Idioms and Phrases
4. **Correspondence** (04 hrs)
 - 4.1 Business Letters
 - 4.2 Personal letters
 - 4.3 Application for Job
5. **Drafting** (06 hrs)
 - 5.1 Report Writing
 - 5.2 Inspection Notes
 - 5.3 Memos, Circulars
 - 5.4 Telegrams
 - 5.5 Press Release
 - 5.6 Agenda and Minutes of Meetings
6. Glossary of Technical & Scientific Terms (04 hrs)
7. **Communication** (08 hrs)
 - 7.1 Media and Modes of Communication
 - 7.2 Channels of Communication
 - 7.3 Barriers to Communication
 - 7.4 Listening Skills- Types of Listening
 - 7.5 Body language

LIST OF PRACTICALS

1. Practice on browsing information from Internet
2. Group Discussions
3. Mock Interviews
4. Telephone Etiquette – demonstration and practice
5. Situational Conversation with feedback through video recording
6. Presentation on a given theme (using PowerPoint)
7. Exercises leading to personality development like mannerism, etiquettes, body language etc.
8. Reading unseen passages
9. Writing (developing) a paragraph
10. Exercises on writing notices and telephonic messages

Note:-

1. *The Text Book on “English and Communication Skills, Book-II By Kuldip Jaidka et. al. developed by NITTTR, Chandigarh is recommended to be used for teaching & setting-up the question papers.*
2. *A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDS and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.*
3. *E Elements of body language will be incorporated in all practicals.*
4. *The practical exercises involving writing may also be included in Theory Examination.*

RECOMMENDED BOOKS:-

1. *English and Communication Skills, Book-II By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh & Published By Abhishek Publication, 57-59, Sector-17, Chandigarh*
2. *Essentials of Business Communication by Pal and Rorualing; Sultan Chand and Sons*
3. *The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India*
4. *New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,*
5. *New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,*
6. *A Practical English Grammar by Thomson and Marlinet*
7. *Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill*
8. *English Conversation Practice by Grount Taylor; Tata McGraw Hill*
9. *Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi*
10. *Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi*
11. *Communication Skills by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	40
2	4	10
3	8	15
4	4	10
5	6	10
6	4	5
7	8	10
Total	48	100

GLOSSARY OF TECHNICAL & SCIENTIFIC TERMS

1. Absolute	परम, अचर, पूर्ण, स्थिर
2. Acceleration	त्वरण, प्रवेग
3. Acid	अम्ल
4. Alkaline	क्षारीय, खारा
5. Air Compressor	वायु-संपीडक
6. Air Conditioning	वातानुकूलन
7. Alignment	सरेखन
8. Alternating Current	प्रत्यावर्ती धारा
9. Altimeter	ऊंचाई मापने का यंत्र
10. Alum	फिटकरी
11. Ammeter	अम्मीटर
12. Ampere	ऐम्पियर
13. Amplification	प्रवर्धन
14. Amplitude	आयाम
15. Angle	कोण
16. Angular Velocity	कोणीय वेग
17. Angular Momentum	कोणीय संवेग
18. Annealing	तापानुशीतन
19. Anode	अनोड
20. Apex	शीर्ष, शिखर, शिरवाग्र
21. Apparent	स्पष्ट
22. Applied Mechanics	अनुप्रयुक्त यंत्रिकी
23. Applied Science	अनुप्रयुक्त विज्ञान
24. Archimedes's Principle	आर्किमिडीज़ का सिद्धांत
25. Architecture	वास्तुकला, स्थापत्यकला
26. Armature	आर्मेचर
27. Atom	परमाणु
28. Automatic	स्वचलित
29. Axis	अक्ष
30. Axle	धुरी
31. Balance (Scale)	तुला, तराजू
32. Ball Bearing	बाल-बेयरिंग
33. Bar magnet	छड़-चुम्बक
34. Barometer	वायुदाबमापी
35. Base	आधार
36. Base Plate	आधार पट्टिका
37. Battery	बैटरी
38. Beaker	बीकर
39. Bending Moment	वंकन आघूर्ण
40. Blast Furnace	झोका भट्टी
41. Bleach	विरंजक
42. Boiler	उबालक
43. Bridge	पुल
44. Burette	ब्यूरेट
45. Callipers	कैलिपर्स
46. Calorie	कैलोरी
47. Canal	नहर
48. Capacitance	धारिता
49. Carburettor	कार्बुरेटर
50. Cast Iron	ढलवा लोहा

51.	Catalyst	उत्प्रेरक
52.	Cathode	कैथोड
53.	Centre of Gravity	गुरुत्वाकर्षण - केन्द्र
54.	Centrifugal	उपकेन्द्रीय
55.	Centripetal	अभिकेन्द्रीय
56.	Centroid	केन्द्रीय
57.	C.G.S. System	सी.जी.एस. पद्धति
58.	Chemical Action	रासायनिक क्रिया
59.	Chai	श्रृंखला, माला
60.	Change of State	अवस्था परिवर्तन
61.	Characteristics	लक्षण
62.	Charge (n)	आवेश
63.	Choke	चोक
64.	Chord, Major	गुरु स्वर - संचात
65.	Chord, Minor	लघु स्वर - संचात
66.	Circular	वृत्ताकार, वर्तुल
67.	Clock-wise	दक्षिणा वर्त
68.	Coagulation	स्कंदन
69.	Coefficient of Expansion	प्रसार गुणांक
70.	Coil	कुंडली
71.	Combustion	दहन
72.	Compass	दिशासूचक
73.	Compound	यौगिक
74.	Concave	अवतल
75.	Convex	उत्तल
76.	Concentrated (Solution)	गाढ़ा, सांद्रित (घोल)
77.	Concrete	कंकरीट
78.	Conduction	चालन
79.	Conductor	चालक
80.	Cone	शंकु
81.	Connection	सम्बंध, जोड़
82.	Constant (Adj.)	स्थिर, अचल, एकसमान
83.	Convection	संवहन
84.	Coulomb	कूलोम (विद्युत शक्ति की इकाई)
85.	Couple	बल युग्म
86.	Crane	क्रेन
87.	Crystalline	रवेदार
88.	Dehydrate	निर्जल करना
89.	Distil	आसहन करना
90.	Effervescence	बुदबुदाहट
91.	Element	तत्त्व, मूलतत्त्व
92.	Empirical Formula	मूलअनुपाती सूत्र
93.	Equivalent Weight	तुल्यांकी - भार
94.	Flame Test	ज्वाला - परीक्षण
95.	Flash Point	प्रज्वलन - ताप
96.	Flask	फ्लास्क
97.	Spring Balance	कमानी तुला
98.	Soluble	विलयशील
99.	Viscosity	गाढ़ापन
100.	Volumetric Analysis	आयतनी विश्लेषण

2.2 APPLIED MATHEMATICS - II

L T P
5 - -

RATIONALE

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus and integral calculus and statistics have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

DETAILED CONTENTS

1. **Algebra** (12 hrs)
 - 1.1 Determinants: Elementary properties of determinants up to 3rd order, consistency of equations, Cramer's rule.
 - 1.2 Matrix: Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.

2. **Co-Ordinate Geometry** (18 hrs)
 - 2.1 Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula
 - 2.2 General equation of a circle and its characteristics. To find the equation of a circle, given:
 - * Centre and radius
 - * Three points lying on it
 - * Coordinates of end points of a diameter;
 - 2.3 Definition of conics (Parabola, Ellipse, Hyperbola) their standard Equations without proof.
Problems on conics when their foci, directrices or vertices are given.

3. **Integral Calculus** (34 hrs)
 - 3.1 Integration as inverse operation of differentiation
 - 3.2 Simple integration by substitution, by parts and by partial fractions (for linear factors only)
 - 3.3 Use of formulas
$$\int_0^{\pi/2} \sin^n x dx, \int_0^{\pi/2} \cos^n x dx, \int_0^{\pi/2} \sin^m x \cos^n x dx$$
for solving problems Where m,n are positive integers
 - 3.4 Applications of integration for :
 - (a) Simple problem on evaluation of area bounded by a curve and axes.
 - (b) Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).

4. **Vector Algebra** (10 hrs)
 a) Definition notation and rectangular resolution of a vector.
 b) Addition and subtraction of vectors.
 c) Scalar and vector products of 2 vectors.
 d) Simple problems related to work, moment and angular velocity
5. **Differential Equations** (06 hrs)
 Solution of first order and first degree differential equation by variable separation method (simple problems)

RECOMMENDED BOOKS

1. *Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.*
2. *Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar*
3. *Applied Mathematics by Dr. RD Sharma*
4. *Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain/ M.L. Moudgil & P.C. Chopra, Eagle Parkashan, Jalandhar*
5. *Comprehensive Mathematics, Vol. I & II by Laxmi Publications*
6. *Engineering Mathematics by Dass Gupta*
7. *Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi*
8. *Comprehensive Mathematics, Vol. I & II by Laxmi Publications*
9. *Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi*
10. *Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi*
11. *Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,*
12. *Engineering Mathematics, Vol I & II by AK Gupta, Macmillan India Ltd., New Delhi*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	18	20
3	34	40
4	10	10
5	06	10
Total	80	100

2.3 APPLIED PHYSICS – II

L T P
3 - 2

RATIONALE

Applied physics includes the study of a large number of diverse topics 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 behave. Concrete use of physical principles and analysis in various fields of engineering and technology

DETAILED CONTENTS

Section – A : Waves and Applications

1. **Waves and vibrations** (7 hrs)
 - 1.1 Wave motion with examples, generation of waves by vibrating particles
 - 1.2 Types of wave motion - transverse and longitudinal wave motion, velocity, frequency and wave length of a wave. Relationship between wave velocity, frequency and wave length.
 - 1.3 Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.
 - 1.4 Free, forced and resonant vibrations with examples
 - 1.5 Numericals based on S.H.M.
2. **Applications of sound waves** (6 hrs)
 - 2.1 Sound Waves, Beats, Doppler effect of sound, apparent frequency, determination of apparent frequency(when the source of sound moving towards and away from stationary observer).
 - 2.2 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time
 - 2.3 Ultrasonics– production (magnetostriction and piezoelectric methods) and their engineering applications
3. **Light** (6 hrs)

Electromagnetic Waves, properties of Electromagnetic waves, Electromagnetic Spectrum interference of light, constructive & destructive interference, Coherent and non coherent sources of light.

Section – B : Electrical Circuits and Electromagnetism

4. **Electrostatics** (06 hrs)
- 4.1 Coulombs law, unit charge
 - 4.2 Electric flux and Gauss's Law, Electric field intensity and electric potential at any point due to a point charge.
 - 4.3 Capacitance, Principle of capacitor, capacitance of parallel plate capacitor, series and parallel combination of capacitors
 - 4.4 Numerical based on combination of capacitor.
5. **DC Circuits** (06 hrs)
- 5.1 Current, voltage and resistance, potential difference, Electric power, electrical energy and their units.
 - 5.2 Ohm's law
 - 5.3 Series and parallel combination of resistors, specific resistance, effect of temperature on resistance.
 - 5.4 Kirchhoff's laws
 - 5.5 Numerical based upon combination of resistances.
6. **Electromagnetism** (06 hrs)
- 6.1. Magnetic field and its units
 - 6.2. Biot-Savart Law, magnetic field around a current carrying straight conductor,
 - 6.3. Force on a moving charge and current carrying conductor in a magnetic field.
 - 6.4. Classification of material on the basis of magnetism(dia, para and ferromagnetic materials).

Section – C : Advanced Physics

7. **Semiconductor physics** (05 hrs)
- 7.1 Energy bands, definition of conductor, semiconductor & insulator on the basis of band theory, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics
 - 7.2 Diode as rectifier – half wave and full wave rectifier
8. **Modern Physics** (06 hrs)
- 8.1 Lasers: concept of energy levels, ionization and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, ruby lasers and applications

8.2 Fibre optics: introduction, optical fiber materials, types, light propagation and its applications

LIST OF PRACTICALS (To perform minimum seven experiments)

1. To verify Ohm's law .
2. Determination of voltage-current relationship in a dc circuit.
3. To verify laws of resistances in series and in parallel
4. To convert a galvanometer into an ammeter of a given range
5. To convert a galvanometer into a voltmeter of a given range
6. To study characteristics of a pn junction diode
7. To find the capacitance of parallel plate capacitor.
8. To find the focal length of (i) convex lens (ii) Concave mirror.
9. To find the velocity of sound wave by quinks tube method.
10. Study of sine wave, square wave on CRO.

RECOMMENDED BOOKS

1. *Test Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T*
2. *Test Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T*
3. *Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi*
4. *Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi*
5. *Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi*
6. *Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi*
7. *The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi*
8. *Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series*
9. *A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi*
10. *Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers*
11. *Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi*
12. *Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar*
13. *Applied Physics I & II By J.R. Bhardwaj Hiteshi Publication, Hamirpur H.P.*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	07	15
2	06	10
3	06	10
4	06	15
5	06	15
6	06	15
7	05	10
8	06	10
Total	48	100

2.4 APPLIED CHEMISTRY - II

L T P
3 - 2

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. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. **Metallurgy** (10 hrs)
 - 1.1 General metallurgical terms/operations
 - 1.2 Extraction of pure iron, copper and aluminum from their chief ores
 - 1.3 Manufacture of wrought iron from pig iron, manufacture of steel by open hearth process and L.D. process
 - 1.4 Alloys: Types of alloys (ferrous and non ferrous) purposes of alloying, composition, properties and uses of – invar steel, nichrome, brass, bronze, gun metal, duralumin, alnico, magnalium

2. **Corrosion.** (06 hrs)
 - 2.1 Definition and electro chemical theory of corrosion, passivity of metals (e.g. Ti, Cr, Fe and Al), Galvanic Series.
 - 2.2 Preventions and control measures: (i) Internal measures (purification of metals, alloying with corrosion resistant elements, heat treatment) (ii) External measures (application of inhibitors, alteration of corrosion environments, protective coatings – (a) Metallic (b) Non-metallic coating and sacrificial anode)

3. **Fuels.** (12 hrs)
 - 3.1 Introduction, combustion, classification of fuels, characteristics of good fuel
 - 3.2 Calorific value, determination of calorific value by Bomb calorimeter, and Dulong's formula (equation to be assumed, numerical problems)
 - 3.3 Proximate and Ultimate analysis of coal
 - 3.4 Fuel rating: Octane number, cetane number, influence of chemical composition and structure on fuel rating
 - 3.5 Gaseous fuels : Natural gas, LPG, CNG, Hydrogen, Composition, manufacture and uses of water gas, producer gas, biogas,
 - 3.6 Merits and demerits of gaseous fuels over solid and liquid fuels
 - 3.7 Numerical problems on 3.2.

4. **Lubricants.** (04hrs)
 - 4.1 Definition and classification of lubricants
 - 4.2 Mechanism of lubrication
 - 4.3 Characteristics of good lubricants
 - 4.4 Properties of lubricants: such as oiliness, emulsification, flash and fire point, volatility, viscosity and viscosity index, cloud and pour point, acidity value, sponification value, coke number.

5. **Paints and Varnishes.** (04hrs)
 - 5.1 Constituent of paints, characteristics of good paint
 - 5.2 Constituent and characteristics of varnishes
 - 5.3 Constituent of enamels
 - 5.4 Uses of paints varnishes and enamels

6. **Refractories** (04 hrs)
 - 6.1 Introduction and characteristics of good refractory materials
 - 6.2 Types and chemical composition of acidic, basic and neutral refractories
 - 6.3 Applications of refractories

7. **Polymers, Plastics and Adhesives.** (08 hrs)
 - 7.1 Polymerization, degree of polymerization (DP). Addition and condensation polymers with suitable examples
 - 7.2 Definition, structure and applications of thermoplastics and thermosetting plastics with examples of each type
 - 7.3 Plasticizer, fillers and binders
 - 7.4 Definition and examples of fibers and elastomers (natural and synthetic rubber)
 - 7.5 Synthetic resins (both thermosetting and thermoplastic)

LIST OF PRACTICALS

1. Estimation of copper in the given copper ore solution by titrating against standard solution of sodium thiosulfate/ or spectrophotometrically.
2. Estimation of total dissolved salts in the given sample of water gravimetrically.
3. Estimation of moisture in the given coal sample gravimetrically
4. Estimation of ash in the given coal sample gravimetrically
5. Determination of viscosity of given liquid by Red Wood viscometer
6. Determination of flash / fire point of the given lubricant using Able' s flash point apparatus
7. Determination of total acid value (Total acid number TAN) of a lubricating oil.
8. Determine the Viscosity of a given liquid by using Ostward Viscometer.

RECOMMENDED BOOKS

1. *Chemistry in Engineering by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.*
2. *Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company New Delhi.*

3. *Applied Chemistry* by A.N. Singha & A.D. Sharma, Hiteshi Publication.
4. *Progressive Applied Chemistry – II* by Dr. G.H. Hugar, Eagle Prakashan Jalandhar.

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	17
2	06	10
3	12	25
4	04	10
5	04	10
6	04	10
7	08	18
Total	48	100

2.5 ENGINEERING DRAWING - II

L T P
- - 6

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:

1. *First angle projection is to be followed*
2. *12 sheets to be prepared*
3. *SP 46 -1988 should be followed*
4. *Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students*
5. *20 percent of drawing sheets to be prepared on the third angle projection*

DETAILED CONTENTS

Section -I

1. **Detail and Assembly Drawing** (01 sheet)
 - 1.1 Principle and utility of detail and assembly drawings
 - 1.2 Practical exercise on drawing from detail to assembly or vice versa using wooden joints as example

Section-II

2. **Threads** (01 sheet)
 - 2.1 Nomenclature of threads, types of threads (metric). Single and multiple start threads
 - 2.2 Forms of various external thread sections such as V, Square, Acme, Knuckle, Metric, Seller and Buttress thread
 - 2.3 Simplified conventions of left hand and right hand threads, both external and internal threads
3. **Nuts and Bolts** (01 sheet)
 - 3.1 Different views of hexagonal and square headed bolts and nuts
 - 3.2 Application of nuts and bolts with washers
4. **(4.1) Locking Devices** (02 sheet)
 - 4.1.1 Lock nuts, Castle nuts, Sawn nuts, Split pin lock nut
 - 4.1.2 Spring washers, Locking plates.**(4.2) Screws, Studs and Washers** (01 sheet)
 - 4.2.1 Drawing various types of machine screws
 - 4.4.2 Drawing various types of studs
 - 4.4.3 Drawing various types of washers

Section III

5. **Keys and Cotters** (02 sheets)
Various types of keys and their application. Preparation of drawings of various keys and cotters
- 5.1 Various types of joints
- Sleeve and Cotter joint
- Kunckle joint
- Spigot and Socket joint
6. **Coupling** (02 sheets)
- 6.1 Flange coupling (protected and unprotected coupling)
6.2 Pin type flexible coupling
6.3 Muff coupling

Section IV

7. **Rivets and Rivetted Joints** (02 sheets)
- 7.1 Types of general purpose rivet heads
7.2 Types of rivetted joints - lap, butt (single cover plate and double cover plate), chain and zig-zag riveting.
7.3 Caulking and fullering of rivetted joints.
8. Development of surfaces, cube, prism and funnel (01 sheet)
9. Intersection of surfaces, cylinder to cylinder, cylinder to cone and prism. (01 sheet)

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*
4. *Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.		Time Allotted (Hrs)	Marks Allotted (%)
Section I	1	12	15
Section II	2	30	30
	3		
	4		
Section III	5	24	25
	6		
Section IV	7	30	30
	8		
	9		
Total		96 Hrs	100

2.6 BASIC OF ELECTRICAL & ELECTRONICS ENGINEERING

L T P
4 - 2

RATIONALE

As we know that, the psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

DETAILED CONTENTS

- 1 Application and Advantages of Electricity: (4hrs)**
 - 1.1 Difference between AC and DC
 - 1.2 Various applications of electricity.
 - 1.3 Advantages of electrical energy over other types of energy.

- 2 Quantities of Electricity and Power factor: (8hrs)**
 - 2.1 Concept of voltage, current, power (True, Apparent and Reactive Power), electrical energy and power factor and their units.
 - 2.2 Instruments used for the measurements of voltage, current, power energy and power factor in an electric circuit and their connections to measure these electrical quantities.
 - 2.3 Power factor (unity, lagging and leading), its practical importance and improvement.

- 3 Introduction to Generation, Transmission and Distribution of Electrical Power. (10hrs)**
 - 3.1 Basic idea of single phase and three phase voltage generation.
 - 3.2 Single line representation for primary and secondary transmission and distribution system showing its practical working voltage.
 - 3.3 Three phase star- delta connection, voltage and current relationship (no derivation) (Simple Problems)
 - 3.4 Identification of three phase wires, neutral and the earth wire of low voltage distribution system.
 - 3.5 Practical line voltage and phase voltage used in low voltage distribution system. (Voltage between any two phases and any phase to neutral).
 - 3.6 Arrangement of supply system from pole to the distribution board.
 - 3.7 Function of service line, fuses or MCB, energy meter, main switch, distribution board and sub-distribution board.

- 4 Electric Installation (10hrs)**
- 4.1 Distinction between circuits and sub circuit.
 - 4.2 Distinction between light points and power points (light, fan circuits and power circuit.)
 - 4.3 Method of wiring (loop in system) universally employed for lighting circuit. Simple circuit exercise
 - 4.4 Method of counting light and power points of domestic installation.
 - 4.5 Calculation of load current for single phase and three phase load. (Simple Problems)
 - 4.6 Introduction of different wiring systems and various accessories used.
 - 4.7 Purpose of earthing.
- 5. Batteries (6hrs)**
- 5.1 Basic idea about primary and secondary cells.
 - 5.2 Charging methods used for lead acid accumulator.
 - 5.3 Testing of battery under charging and discharging condition.
 - 5.4 Maintenance of the battery.
 - 5.5 Rating of the battery.
- 6. Introduction to Semiconductor (6 hrs)**
- 6.1 Atomic structure, Energy band theory , classification based on energy band i.e. Insulator, semiconductor and conductor, concept of electron hole pairs. Crystal structure of Silicon and Germanium.
 - 6.2 Concept of Doping, intrinsic and extrinsic semiconductors, Effect of temperature on intrinsic and extrinsic semiconductors.
- 7. Semiconductor Diodes (12 hrs)**
- 7.1 PN Junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing in a PN junction. Concept of junction capacitance in forward and reverse biased conditions. Breakdown mechanism, Diode ratings/specifications.
 - 7.2 Ideal diode, Semiconductor diode characteristics, static and dynamic resistance.
 - 7.3 Use of diode as half wave and full wave rectifiers (centre tap and bridge type), relation between DC output and AC input voltage, rectifier efficiency (No derivation).
 - 7.4 Applications of Rectifiers.
 - 7.5 Introduction to filter circuits in rectifier.
 - 7.6 Special purpose diodes such as zener diode, light emitting diode, their working, characteristics and applications
- 8. Bi-polar Transistors (8 hrs)**
- 8.1 Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flow.
 - 8.2 Transistor configurations: common base (CB), common emitter (CE) and common collector (CC), current relation and their input/output characteristics; comparison of the three configurations

PRACTICAL EXERCISES

- 1) Measurement of current, voltage and power of single or three phase load.
- 2) Study of domestic and industrial installation.
- 3) Connections and reading down an energy meter.
- 4) Testing of a lead acid battery (specific gravity, voltage and current discharge test) and its charging.
- 5) V-I characteristics of a Semiconductor diode.
- 6) V-I characteristics of a zener diode.
- 7) 10. Observation of input and output wave shapes of a half-wave rectifier, Full wave rectifier and verification of relationship between dc output and ac input voltage.
- 8) Plotting input and output characteristics of a transistor in CB configuration.

SUGGESTIVE DISTRIBUTION OF MARKS

Sr. No	Time Allotted (Hrs)	Marks Allocation (%)
1	4	10
2	8	15
3	10	15
4	10	15
5	6	10
6	6	10
7	12	15
8	8	10
TOTAL	64	100

2.7 GENERAL WORKSHOP PRACTICE - II

L T P
- - 6

RATIONALE

As we know that, the psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

DETAILED CONTENTS (PRACTICALS)

The following shops are included in the syllabus:

1. Carpentry and painting shop-II
2. Fitting shop -II
3. Welding shop -II
4. Electric shop -II
5. Smithy shop –II
6. Sheet Metal Shop –II

1. Carpentry and Painting Shop - II

- 1.1 Introduction to joints, their relative advantages and uses.
Job I Preparation of Dovetail joint and glued joint.
Job II Preparation of Mitre Joint
Job III Preparation of a lengthening Joint
Job IV Preparation of atleast one utility job file handle.
- 1.2 Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.
- 1.3 Demonstration of job on Band Saw and Circular Saw, Jig Saw, Chain and Chisel, Universal wood working machine, Saw re-sharpening machine, Saw Brazing unit.
- 1.4 Importance and need of polishing wooden items, Introduction to polishing materials.
Job V Preparation of surface before polishing.
Job VI Application of primer coat.
Job VII Polishing on wooden items

2. Fitting Shop – II

- 2.1 Introduction to various types of threads (internal, external)-single start, multi-start, left hand and right hand threads.
- 2.2 Description and demonstration of various types of drills, taps and dies Selection of dies for threading, selection of drills and taps for tapping operations.
Job I Making internal and external threads on a job by tapping and dieing operations manually.

- 2.3 Precautions while drilling soft metals, e.g. copper, Brass, Aluminium etc.
Job II Drilling practice on soft metals(Aluminum, Brass and copper)
- 2.4 Introduction and demonstration of dial type indicator, sine bar and V block with clamps
- 3. Welding Shop – II**
- 3.1 Introduction to gas welding, spot welding and seam welding and machinery and equipment used. Adjustments of different types of flames in gas welding demonstration and precautions about handling welding equipment.
Job I Practice in handling gas welding equipment (Low pressure and High pressure) and welding practice.
- 3.2 Common welding joints generally made by gas welding.
Job II Preparation Butt joint by gas welding.
Job III Preparation of small cot frame from conduit pipe by electric arc welding/gas welding.
Job IV Preparation of square pyramid from MS rods by welding (type of welding to be decided by students themselves).
Job V Exercise job on spot/seam welding machine.
- 4 Electric Shop – II**
- 4.1 Importance of three-phase wiring and its effectiveness.
Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine.
- 4.2 Estimating and costing of power consumption.
Job II Connecting single-phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.
Job III Checking continuity of connection (with tester and lamp) location of faults with a multimeter) and their rectification in simple machines and/or other electric circuits fitted with earthing.
- 4.3 Demonstration of dismantling, servicing and reassembling a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geyser, electric oven, air conditioner etc.
Job IV Dismantling, servicing serving and reassembling of any of the above electrical appliances.
Job V Testing Single phase/three phase electrical motor by using voltmeters, ammeter, clip on meter, tachometer etc.
Job VI Reversing the rotation of a motor.
- 5. Smithy Shop – II**
- 5.1 Introduction to various heat treatment processes e.g annealing, hardening, tempering, normalizing etc.
- 5.2 Description of various types of power hammers and their usage (Demonstration only).
Job I To forge a ring to acquaint the students with forge welding

Job II To forge a chisel and acquaint the students with simple idea of hardening and tempering.

Job III To forge squares on both ends of a circular rod

Job IV To forge a single/double ended spanner.

Job V To prepare a job involving drawing down process

6. Sheet Metal Shop-II

6.1 Introduction to various metal forming processes e.g. Punching, Blanking, cup drawing

6.2 Introduction to soldering and brazing.

6.3 Introduction to metal forming process.

Job I Preparation of job involving shearing, circular shearing, rolling, folding, beading and soldering process e.g. Funnel or any other job involving above operations.

Job II Exercise on job involving brazing process

Job III Visit to an sheet metal industry e.g. coach builders etc.

RECOMMENDED BOOKS

1. *Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay*
2. *Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.*
3. *Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi*
4. *Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi.*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	16	18
2	16	18
3	16	16
4	16	16
5	16	16
6	16	16
Total	96	100

Designed and Composed by: Sudhir Sen(CA)