

## 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

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|----|---|----------|
| 1. | Facets of Literature                                      | (14 hrs) |
|    | 1.1 Short stories   |          |
|    | 1.1.1 The Portrait of a Lady - Khushwant Singh            |          |
|    | 1.1.2 The Doll's House – Katherine Mansfield              |          |
|    | 1.1.3 The Refugees – Pearl S. Buck                        |          |
|    | 1.2 Prose   |          |
|    | 1.2.1 Walking Tours – R.L. Stevenson                      |          |
|    | 1.2.2 A Dialogue on Civilization – C.E.M. Joad            |          |
|    | 1.2.3 The Sign of Red Cross – Horace Shipp                |          |
|    | 1.3 Poems   |          |
|    | 1.3.1 All The World's A Stage – W. Shakespeare            |          |
|    | 1.3.2 Say Not, The Struggle Nought Availeth – A.H. Clough |          |
|    | 1.3.3 Pipa's Song – Robert Browning                       |          |
| 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                                      |          |

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| 5. | Drafting   | (06 hrs) |
|    | 5.1 Report Writing   |          |
|    | 5.2 Inspection Notes   |          |
|    | 5.3 Memos, Circulars and Notes                                     |          |
|    | 5.4 Notices  |          |
|    | 5.5 Press Release  |          |
|    | 5.6 Agenda and Minutes of Meetings                                 |          |
|    | 5.7 Applying for a Job: Forwarding letter, Resume/C.V., follow up. |          |
| 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   |          |
|    | 7.5 Body language  |          |
|    | 7.6 Humour in Communication  |          |

### LIST OF PRACTICALS

1. Practice on browsing information from Internet and e-mail
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 NITTTTR, 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. 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, Alwinder Dhillon and Parmod Kumar Singla, Prescribed by NITTTTR, Chandigarh Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
2. Rich Vocabulary Made Easy by Kuldip Jaidka , Mohindra Capital Publishers, Chandigarh
3. Spoken English (2<sup>nd</sup> Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw Hills, New Delhi.
4. Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
5. Spoken English –A foundation course (Part-I & Part-II) By Kamlesh Sdanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
6. Practical Course in English Pronunciation by J Sethi, Kamlesh Sadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
7. A Practical Course in Spoken English by JK Gangal; Published by PHI Learning Pvt. Ltd; New Delhi.
8. English Grammar, Composition and Usage by NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.
9. Business Correspondence & Report writing (4<sup>th</sup> Edition) by RC Sharma and Krishna Mohan; Published by Tata MC Graw Hills, New Delhi.
10. Business Communication by Urmila Rani & SM Rai; Published by Himalaya Publishing House, Mumbai.
11. Business Communication Skills by Varinder Kumar, Bodh Raj & NP Manocha; Published by Kalyani Publisher, New Delhi.
12. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
13. Business Communication and Personality Development by Bsiwajit Das and Ipseeta Satpathy; Published by Excel Books, Delhi
14. Succeeding Through Communication by Subhash Jagota; Published by Excel Books, Delhi
15. Communication Skills for professionals by Nira Konar; Published by PHI Learning Pvt. Ltd; New Delhi.
16. Developing Communication Skills (2<sup>nd</sup> Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
17. Effective Technical Communication By M .Ashraf Rizwi; Published by Tata MC Graw Hills, New Delhi.
18. Basic Communication Skills for Technology by Andrea J Rutherford; Published by Pearson Education, New Delhi
19. English & Communication Skills for students of Science & Engineering by SP Dhanavel; Published by Orient BlackSwan, Hyderabad.
20. Technical Communication- Principles & Practices by Meenakshi Raman & Sangeetha Sharma; Published by Oxford University Press, New Delhi.
21. Technical English by S. Devaki Reddy & Shreesh Chaudhary; Published by Macmillan Publishers India Ltd; New Delhi.

22. Advanced Technical Communication, by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
23. Communication Skills for Engineer & Scientist by Sangeeta Sharma & Binod Mishra; Published by PHI Learning Pvt. Ltd; New Delhi.

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	14	30
2	4	10
3	8	10
4	4	10
5	6	10
6	4	10
7	8	20
<b>Total</b>	<b>48</b>	<b>100</b>

## GLOSSARY OF TECHNICAL AND SCIENTIFIC TERMS

1. Absolute	परम, अचर, पूर्ण, स्थिर	مکمل - ساکن
2. Acceleration	त्वरण, प्रवेग	حرکت
3. Acid	अम्ल	عمل - تیزاب
4. Alkaline	क्षारीय, खारा	کھارا
5. Air Compressor	वायु-संपीडक	ہوا کے دباؤ - ایرکمپریشر
6. Air Conditioning	वातानुकूलन	ایئر کنڈیشن -
7. Alignment	सरेखन	ایک لائن میں - ایک سیدھے میں
8. Alternating Current	प्रत्यावर्ती धारा	تعمیر کرنٹ - اے سی کرنٹ
9. Altimeter	ऊंचाई मापने का यंत्र	اُونچائی ماپنے کا آلہ
10. Alum	फिटकरी	پھٹکڑی
11. Ammeter	अम्मीटर	بجلی کا کرنٹ ماپنے کا آلہ - ایلمی میٹر
12. Ampere	ऐम्पियर	بجلی کی طاقت کو ماپنے کی اکائی - ایمپیر
13. Amplication	प्रवर्धन	پرو دھن - ایمپلی فیکیشن
14. Amplitude	आयाम	ایام - ایمپلیٹی ٹیوڈ
15. Angle	कोण	زاویہ - کون
16. Angular velocity	कोणीय वेग	کوئیے ویگ
17. Angular Momentum	कोणीय संवेग	کوئیے سٹوئیگ
18. Annealing	तापानुशीतन	تاپ اُونشٹن - انی ٹنگ
19. Anode	अनोड	انوڈ
20. Apex	शीर्ष, शिखर, शिखाग्र	اُونچائی - سب سے اُونچا
21. Apparent	स्पष्ट	صاف
22. Applied mechanics	अनुप्रयुक्त यंत्रिकी	الوپریکٹ آلہ - ایپلائڈ میکینک
23. Applied Science	अनुप्रयुक्त विज्ञान	الوپریکٹ سائنس - ایپلائڈ سائنس
24. Archimedes's Principle	आर्किमिडीज़ का सिद्धांत	آرک میڈیز کا اصول
25. Architecture	वास्तुकला, स्थापत्यकला	تعمیراتی سائنس - تعمیراتی کلا
26. Armature	आर्मेचर	وائیچر
27. Atom	परमाणु	ایٹم
28. Automatic	स्वचलित	اپنے آپ چلنے والا
29. Axis	अक्ष	اکش
30. Axle	धुरी	ڈھرا - ایکسل

31. Balance (Scale)	تولا، तराजू	ترازہ
32. Ball Bearing	بال-بیرنگ	بال بیرنگ
33. Bar magnet	छड़-चुम्बक	مقناطیس کا ٹکڑا
34. Barometer	वायुदाबमापी	ہوا کا دباؤ ماپنے کا آلہ۔ بیردمیٹر
35. Base	आधार	بنیادی
36. Base Plate	आधार पट्टिका	بنیادی پلیٹ۔ آڈیا رپٹر کا۔ بیس پلیٹ
37. Battery	बैटरी	بیٹری
38. Beaker	बीकर	بی کپ
39. Bending Moment	वंकन आधूर्ण	بنڈنگ مومینٹ جھکنے کی شکتی (طاقت) پچک
40. Blast Furnace	झोंका भट्टी	بلاسٹ فرنس۔ بلاسٹ بھیٹی۔
41. Bleach	विरंजक	بلیچ۔ ڈرنجک
42. Boiler	उबालक	بوایلر۔ اُبالنے والا۔ اَبالک۔
43. Bridge	पुल	پل
44. Burette	ब्यूरेट	بیوریٹ۔ لیبارٹری میں استعمال ہونے والی شیشے کی نامی۔
45. Callipers	कैलिपर्स	کیلیپرس۔
46. Calorie	कैलोरी	کیلو ریٹ۔ نوراگ کی طاقت ماپنے کی یونٹ
47. Canal	नहर	نہر۔
48. Capacitance	धारिता	کے پے سیٹنس۔ دہارتا
49. Carburettor	कार्बुरेटर	کاربوریٹر
50. Cast Iron	ढलवा लोहा	کچی لوہا۔ کاسٹ آئرن
51. Catalyst	उत्प्रेरक	آٹ پریٹرک۔
52. Cathode	कैथोड	کے کٹھوڈ
53. Centre of Gravity	गुरुत्वाकर्षण-केन्द्र	دھرتی کی طاقت کا مرکز۔
54. Centrifugal	उपकेन्द्रीय	مرکزت دور کرنے والا۔ آپ کینڈریہ
55. Centripetal	अभिकेन्द्रीय	مرکز کی طرف لانے والا۔ ابھی کینڈریہ
56. Centroid	केन्द्रीय	مرکزنی
57. C.G.S. System	सी.जी.एस. पद्धति	سی جی ایس سسٹم
58. Chemical Action	रासायनिक क्रिया	تیزابی نتیجہ
59. Chain	श्रृंखला, माला	سلسلہ۔ مالا۔
60. Change of State	अवस्था परिवर्तन	تبدیلی حالات
61. Characteristics	लक्षण	آثار۔ خصوصیات
62. Charge (n)	आवेश	آولیش۔ چارج بھرتا
63. Choke	चोक	چوک۔ بستی کی پوسٹ کو چلانے کیلئے دکایا جانے والا پڑھ
64. Chord, Major	गुरू स्वर-संघात	کارڈ میجر۔ لورڈ سورنگھات۔
65. Chord, Minor	लघु स्वर-संघात	کارڈ مائنر۔ چھوٹا سورنگھات
66. Circular	वृत्ताकार, वर्तुल	سرکولر۔ ورتا کار۔ ورتل۔ باہر سے جائے والا

67. Clock-wise	دائیں ہاتھ چلنے والا۔ دیکشن ورت کلاک وائیز۔
68. Coagulation	دائیں ہاتھ چلنے والا۔ دیکشن ورت کلاک وائیز۔
69. Coefficient of Expansion	کو اٹو لیشن۔ سکند
70. Coil	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
71. Combustion	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
72. Compass	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
73. Compound	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
74. Concave	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
75. Convex	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
76. Concentrated (Solution)	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
77. Concrete	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
78. Conduction	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
79. Conductor	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
80. Cone	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
81. Connection	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
82. Constant (Adj.)	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
83. Convection	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
84. Coulomb	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
85. Couple	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
86. Crane	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
87. Crystalline	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
88. Dehydrate	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
89. Distil	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
90. Effervescence	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
91. Element	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
92. Empirical Formula	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
93. Equivalent Weight	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
94. Flame Test	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
95. Flash Point	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
96. Flask	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
97. Spring Balance	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
98. Soluble	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
99. Viscosity	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔
100. Volumetric Analysis	کو ایضی شدت آف ایکشن۔ پراسار گنگ۔ نمبر پیلے نمبر لکھا گیا نمبر گونا گوں۔

## 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. Differential Calculus (30 hrs)
  - 1.1 Definition of function; Concept of limits.  
 Four standard limits  $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$   
 $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ ,  $\lim_{x \rightarrow 0} \frac{a^x - 1}{x}$ ,  $\lim_{x \rightarrow 0} (1+x)^{1/x}$
  - 1.2 Differentiation by definition of  $x^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $e^x$ ,  $\log_a x$  only
  - 1.3 Differentiation of sum, product and quotient of functions. Differentiation of function of a function.
  - 1.4 Differentiation of trigonometric inverse functions. Logarithmic differentiation. Exponential differentiation Successive differentiation (excluding nth order).
  - 1.5 Applications:
    - (a) Maxima and minima
    - (b) Equation of tangent and normal to a curve (for explicit functions only) – Simple problems only
  
2. Integral Calculus (30 hrs)
  - 2.1 Integration as inverse operation of differentiation
  - 2.2 Simple integration by substitution, by parts and by partial fractions (for linear factors only)
  - 2.3 Evaluation of definite integrals (simple problems)-  
 Evaluation of  $\int_0^{\pi/2} \sin^n x \cdot dx$ ,  $\int_0^{\pi/2} \cos^n x \cdot dx$ ,  $\int_0^{\pi/2} \sin^m x \cdot \cos^n x \cdot dx$   
 using formulae without proof (m and n being positive integers only)
  
- 3 Ordinary Differential Equations (10 hrs)



- 3.1. Definition and formation of Differential Equations
- 3.2. Solution of first order Differential Equations of the type:  
 (i) Variable separable form  
 (ii) Homogeneous Differential Equations  
 (iii) Linear Differential Equations
4. Statistics (10 hrs)
- 4.1 Measures of Central Tendency: Mean, Median, Mode
- 4.2 Measures of Dispersion: Mean deviation, Standard deviation

### RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.
2. Applied Mathematics –II by Dr. Sunita Rani Jain, Abhishek Publishers, Chandigarh
3. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
4. Applied Mathematics by Dr. RD Sharma
5. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
6. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
7. Engineering Mathematics by Dass Gupta
8. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
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

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	30	35
2	30	40
3	10	10
4	10	15
<b>Total</b>	<b>80</b>	<b>100</b>

## 2.3 APPLIED PHYSICS – II

L T P  
4 - 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

1. Optics (10 hrs)
  - 1.1 Review of basic optics laws: reflection and refraction
  - 1.2 Refraction and refractive index, image formation in lenses, image magnification, lens formulae (thin lens only), power of lens, total internal reflection and their applications
  - 1.3 Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case), Terrestrial and Galileo's telescope (Concept only) and their applications
2. Electrostatics (12 hrs)
  - 2.1 Coulombs law, unit of charge, electric potential and electric potential difference
  - 2.2 Electric field, electric field intensity, electric lines of force, electric flux Gauss's Law
  - 2.3 Applications of Gauss law in finding electric field of point charge, straight charged conductor, plane charged sheet and between two plane parallel charged sheets
  - 2.4 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, and dielectric break down
  - 2.5 Application of electrostatics in electrostatic precipitator
3. DC Circuits (12 hrs)
  - 3.1 Concept of electricity, current and its units, direct and alternating current, voltage, resistance, potential difference and e.m.f,

- 3.2 Ohm's law and its applications, concept of resistance, conductance, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors, introduction to super conductivity.
  - 3.3 Kirchoff's laws, Wheatstone bridge principle and its applications (Slide Wire Bridge)
  - 3.4 Heating effect of current and concept of electric power, energy and their units, related numerical problems
  - 3.5 Application of electricity in various equipments, advantages of electrical energy over other forms of energy
4. Electromagnetism (13 hrs)
- 4.1 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units, Right hand thumb rule, magnetic lines of force due to straight conductor, circular coil and solenoid
  - 4.2 Force on a charge, moving in a uniform magnetic field (Lorentz force). Force on a current carrying straight conductor. Torque on a current carrying rectangular coil.
  - 4.3 Moving coil galvanometer conductor, its principle, construction and working, conversion of a galvanometer into ammeter and voltmeter.
  - 4.4 Electromagnetic induction, Faradays Laws, Lenz's Law.
  - 4.5 Applications of Electromagnetism
5. Semiconductor physics (07 hrs)
- 5.1 Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics
  - 5.2 Diode as rectifier – half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only)
6. Modern Physics (10 hrs)
- 6.1 Electro magnetic spectrum, photo electric effect and work function, X rays - properties, production and their applications in medicine and industries.
  - 6.2 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, Helium- Neon and ruby lasers, their engineering and medical applications

- 6.3 Fibre optics: introduction to optical fiber materials, types, light propagation and applications in communication.

### **LIST OF PRACTICALS** (To perform minimum eight experiments)

1. To find the focal length of convex lens by displacement method.
2. To determine the magnifying power of an astronomical telescope
3. Conversion of Galvanometer into an Ammeter of given range.
4. Conversion of Galvanometer into Voltmeter of given range.
5. To verify ohm's laws by drawing a graph between voltage and current.
6. To verify laws of resistances in series and in parallel connection.
7. To find resistance of galvanometer by half deflection method
8. To measure very low resistance and very high resistance using Wheat Stone bridge
9. To find the time constant of a capacitor
10. To draw characteristics of a pn junction diode and determine knee and break down voltages
11. To find wave length of He Ne semiconductor laser.

### **INSTRUCTIONAL STATREGY**

Teacher may use various instructional media like models, charts and graphs while imparting instructions. The field application should be made clear before teaching the basics of waves, sound, light, electrostatics, dc circuits, electromagnetism, and semiconductor physics etc to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

### **RECOMMENDED BOOKS**

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi
5. Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series
6. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
7. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers
8. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
9. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
10. Applied Physics Vol II by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
11. Basic Electronics and Linear Circuits by NN Bhargava et al Tata Mc Graw Hill Publishers, New Delhi
12. Principles of Electronics by SK Sahdev, Dhanpat Rai and Co, New Delhi

13. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER**

<b>Sr No</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	Optics	10	15
2	Electrostatics	12	20
3	DC Circuits	12	20
4	Electromagnetism	13	20
5	Semiconductor Physics	07	10
6	Modern Physics	10	15
	<b>Total</b>	<b>64</b>	<b>100</b>

## 2.4 APPLIED CHEMISTRY-II

L T P  
3 - 2

### RATIONALE

The role of chemistry in every branch of engineering and technology is expanding greatly. Now a days, various chemical products 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 behaviour 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 demonstrations/ minor projects and with the active involvement of students.

**Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.**

### DETAILED CONTENTS

1. Metallurgy (08 hrs)
  - 1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), ore, roasting, calcinations, smelting and refining of metal.
  - 1.2 Metallurgy of (i) Aluminium (ii) Iron
  - 1.3 Definition of an alloy, purposes of alloying, composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin, alnico, stainless steel and invar.
2. Fuels (10 hrs)
  - 2.1 Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples
  - 2.2 Definition of Calorific value of a fuel and determination of calorific value of a solid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values
  - 2.3 Brief description of 'Proximate' and 'Ultimate' analysis of a coal. Importance of conducting the proximate and ultimate analysis of a fuel
  - 2.4 Merits of gaseous fuels over those of other varieties of fuels

- 2.5 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas
- 2.6 Composition, calorific values and applications of (i) LPG (ii) CNG (iii) Power alcohol
- 2.7 Fuel rating
  - 2.7.1 Octane number for petrol
  - 2.7.2 Cetane number for diesel
- 3 Corrosion (06 hrs)
  - 3.1 Definition of corrosion
  - 3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory
  - 3.3 Passivity
  - 3.4 Prevention of corrosion by
    - 1. (a) Alloying
    - (b) Providing metallic coatings
    - 2. Cathodic protections:
      - (a) Sacrificial
      - (b) Impressed voltage method
    - 3. Heat treatment (quenching, annealing, tempering & normalizing)
- 4 Lubricants (06 hrs)
  - 4.1 Definition of (i) lubricant (ii) lubrication
  - 4.2 Classification of lubricants
  - 4.3 Principles of lubrication
    - (i) fluid film lubrication
    - (ii) boundary lubrication
    - (iii) extreme pressure lubrication
  - 4.4 Properties of lubricants
    - 4.4.1 Physical properties: viscosity, viscosity index, flash-point, fire-point, cloud-pour point, oiliness, volatility, emulsification
    - 4.4.2 Chemical properties-Total acidity number (TAN) saponification and iodine value, coke number and aniline point.

- 5 Glass (04 hrs)
- 5.1 Glass: Chemical composition, types of glasses and their applications
- 5.2 Manufacture of ordinary glass and lead glass
6. Classification and Nomenclature of Organic Compounds (06 hrs)
- Classification of Organic Compounds, functional group, Homologous Series, IUPAC-Nomenclature of various homologous series i.e. alcohols, aldehydes, ketones, carboxylic acids, and phenols.
7. Polymers & Plastics (08 hrs)
- 7.1 Definition of polymer, monomer & degree of polymerization
- 7.2 Brief introduction of addition & condensation polymers with suitable examples (PVC, Polyester, Teflon, Nylon 66, Bakelite)
- 7.3 Definition of plastic & type of plastics (thermo & thermo setting plastics) with suitable examples
- 7.4 Applications of polymers & plastics in daily life.

#### LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances
3. Determine the viscosity of a given oil with the help of "Redwood viscometer"
4. Determine the flash point of the given oil with the help of Abel's Flash Point Apparatus
5. Estimate the amount of moisture in the given sample of coal
6. Estimate the amount of ash in the given sample of coal
7. Electroplate the given strip of Cu with Ni
8. Confirmation test of alcohol, aldehydes, carboxylic acid, amine
9. To determine the total acidity number of a lubricant
10. Detection of metal ions in the rust (solution of rust in concentrated HCl may be given)
11. To prepare Bakelite
12. To study the effect of metal coupling on corrosion of metals



## INSTRUCTIONAL STRATEGY

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

## 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 Text Book of Applied Chemistry-I by SS Kumar; Tata McGraw Hill, Delhi
4. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M Dhanpatrai publishers. New Delhi
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. A Text Book of Applied Chemistry-I by Sharma and Others; Technical Bureau of India, Jalandhar

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	16
2	10	20
3	06	14
4	06	14
5	04	08
6	06	12
7	08	16
<b>Total</b>	<b>48</b>	<b>100</b>

## 2.5 BASIC ELECTRICAL ENGINEERING

L T P  
4 - 2

### RATIONALE

A diploma holder may be involved in various jobs ranging from preventive maintenance of electrical installation to fault location. In addition, he/she may be working in testing laboratories where he/she uses measuring instruments. To carry out these and similar jobs effectively, knowledge of basic concepts, principles and their applications is very essential. This course will enable the students to understand the basic concepts and principles of dc and ac fundamental, ac circuits, batteries, electromagnetic induction, voltage and current sources etc

### DETAILED CONTENTS

1. Overview of DC Circuits (06 hrs)
  - 1.1 Simple problems on series and parallel combination of resistors with their wattage consideration,
  - 1.2 Application of Kirchhoff's current law and Kirchhoff's voltage law to simple circuits. Star – Delta connections and their conversion.
2. DC Circuit Theorems (06 hrs)
 

Thevenin's theorem, Norton's theorem, application of network theorems in solving d.c circuit problems.
3. Voltage and Current Sources (04 hrs)
  - 3.1 Concept of voltage source, symbol and graphical representation characteristics of ideal and practical sources.
  - 3.2 Concept of current sources, symbol, characteristics and graphical representation of ideal and practical current sources.
4. Electro Magnetic Induction (10 hrs)
  - 4.1 Concept of electro-magnetic field produced by flow of electric current, magnetic circuit, concept of magneto-motive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.
  - 4.2 Faraday's laws of electro-magnetic induction, principles of self and mutual induction, self and mutually induced e.m.f, simple numerical problems.
  - 4.3 Concept of current growth, decay and time constant in an inductive (RL) circuit.
  - 4.4 Energy stored in an inductor, series and parallel combination of inductors.

5. Batteries (06 hrs)
- 5.1 Basic idea of primary and secondary cells
  - 5.2 Construction, working principle and applications of Lead-Acid, Nickel-Cadmium and Silver-Oxide batteries
  - 5.3 Charging methods used for lead-acid battery (accumulator )
  - 5.4 Care and maintenance of lead-acid battery
  - 5.5 Series and parallel connections of batteries
  - 5.6 General idea of solar cells, solar panels and their applications
  - 5.7 Introduction to maintenance free batteries
6. AC Fundamentals (10 hrs)
- 6.1 Concept of alternating quantities
  - 6.2 Difference between ac and dc
  - 6.3 Concepts of: cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor.
  - 6.4 Representation of sinusoidal quantities by phasor diagrams.
  - 6.5 Equation of sinusoidal wave form for an alternating quantity and its derivation
  - 6.6 Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.
7. AC Circuits (16 hrs)
- 7.1 Concept of inductive and capacitive reactance
  - 7.2 Alternating voltage applied to resistance and inductance in series.
  - 7.3 Alternating voltage applied to resistance and capacitance in series.
  - 7.4 Impedance triangle and phase angle
  - 7.5 Solutions and phasor diagrams for simple RLC circuits (series and parallel).
  - 7.6 Introduction to series and parallel resonance and its conditions
  - 7.7 Power in pure resistance, inductance and capacitance, power in combined RLC circuits. Power factor, active and reactive power and their significance, definition and significance of power factor.
  - 7.8 j-notation and its application in solving series and parallel ac circuits
  - 7.9 Definition of conductance, susceptance, admittance, impedance and their units
8. Various Types of Power Plants (06 hrs)
- 8.1 Brief explanation of principle of power generation practices in thermal, hydro and nuclear power stations and their comparative study. A Visit to a nearby Power Station(s) may be organized for better understanding and exposure.
  - 8.2 Elementary block diagram of above mentioned power stations

## LIST OF PRACTICALS

1. Familiarization of measuring instruments viz voltmeter, ammeter, CRO, Wattmeter, multi-meter and other accessories
2. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.
3. Measurement of resistance of an ammeter and a voltmeter
4. Verification of dc circuits:
  - a.. Thevenin's theorem,
  - b. Norton's theorem,
5. Observation of change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.
6. Verification of Kirchhoff's Current and Voltage Laws in a dc circuit
7. To find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance
8. Computation of the voltage current relationship in single phase R-L and R-C series circuits, drawing of their impedance triangles and determination of the power factor in each case .
9. Charging and testing of a lead - acid storage battery.
10. Measurement of power and power factor in a single phase R-.L-.C. circuit and calculation of active and reactive powers in the circuit.
11. Visit to a nearby Power Station(s) may be arranged

## INSTRUCTIONAL STRATEGIES

Basic electrical engineering being a fundamental subject, it needs to be handled very carefully and in a manner such that students develop clear understanding of the related concepts and principles. The teacher may lay more emphasis on laboratory work and give home assignments to students to inculcate self-study and problem solving abilities amongst them.

## RECOMMENDED BOOKS

1. Basic Electrical Engineering by PS Dhogal, Tata Mc Graw-Hill Education Pvt Ltd., New Delhi.
2. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Co, New Delhi.
3. Electrical and Electronics Engineering by SK Bhattacharya, Pearson Education, New Delhi
4. Electrical Technology, Fifth Edition by Edward Hughes, Longman Publishers.
5. Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi.
6. Electrical Science by Choudhury S.; Narosa Publishing House Pvt Ltd, Daryaganj, New Delhi.
7. Basic Electrical and Electronics Engineering by Kumar KM, Vikas Publishing House Pvt Ltd, Jang pura, New Delhi.
8. Basic Electrical Engineering by SK Bhattacharya, Pearson Education, New Delhi

9. Electrical Technology by BL Theraja, S Chand and Co, New Delhi.
10. Basic Electricity by BR Sharma; Satya Prakashan; New Delhi.
11. Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi.
12. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi.
13. Experiments in Basic Electrical Engineering by GP Chhalhotra, Khanna Publishers, New Delhi
14. Basic Electrical Engineering by J.S. Katre, Technical Max. Publication, Pune.

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1.	Overview of DC Circuits	06	8
2.	DC Circuit Theorems	06	10
3.	Voltage and Current Sources	04	08
4.	Electro Magnetic Induction	10	15
5.	Batteries	06	12
6.	AC Fundamentals	10	15
7.	AC Circuits	16	20
8	Various Types of Power Plants	06	12
	<b>Total</b>	<b>64</b>	<b>100</b>

## 2.6 BASICS OF INFORMATION TECHNOLOGY

L T P  
- - 4

### RATIONALE

Information technology has great influence on all aspects of our life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS Office/Open Office using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

### Note:

**Explanation of Introductory part should be dovetailed with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.**

### TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Information Technology – its concept and scope, applications of IT, ethics and future with information technology
2. Impact of computer and IT in society.-- Computer application in office, book publishing, data analysis, accounting, investment, inventory control, graphics, air and railway ticket reservation, robotics, military, banks, Insurance financial transactions and many more
3. Generations of computer, block diagram of a computer, CPU, memory, data – numeric data, alpha numeric data; program, processing of data.
4. Computers for information storage, information seeking, information processing and information transmission, computer organization, computer hardware and software; primary and secondary memory: RAM, ROM, PROM etc. Input devices; keyboard, mouse, scanner, etc ; output devices ; VDU and Printer(Impact and non-Impact printers), Plotter etc. Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory)
5. Introduction to Operating Systems such as MS-DOS and Windows, difference between DOS and Windows
6. Basics of Networking – LAN, MAN,WAN, Topologies

## LIST OF PRACTICALS

1. Identify and list functions of various components and peripherals of given computer.
2. Installation of operating system viz. \* Windows XP, \*Windows 2007 etc.
3. Installing a computer system by giving connection and loading the system-software and application software and various sources to install software
4. Exercises on entering text and data (Typing Practice)

Features of Windows as an operating system:

- Start , shutdown and restore
- Creating and operating on the icons
- Opening, closing and sizing the windows
- Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file , creating and operating on a folder
- Introduction to all properties such as changing settings like, date, time, colour (back ground and fore ground)
- Using short cuts

5. Word Processing (MS Office/Open Office)

File Management:

- Opening, creating and saving a document, locating files, copying contents in some different file(s),

Editing a document:

- Entering text, Cut, copy, paste using tool- bars

Formatting a document:

- Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
- Aligning of text in a document, justification of document ,Inserting bullets and numbering
- Formatting paragraph, inserting page breaks and column breaks, line spacing
- Use of headers, footers: Inserting footnote, end note, use of comments
- Inserting date, time, special symbols, importing graphic images, drawing tools

Tables and Borders:

- Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
- Print preview, zoom, page set up, printing options
- Using Find, Replace options

## 6. Spread Sheet Processing (MS Office/Open Office)

### Starting Excel

- open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets

### Menu commands:

- Create, format charts, organize, manage data, solving problem by analyzing data, creating graphs

### Work books:

- Managing workbooks (create, open, close, save), working in work books, Editing a worksheet:
- copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet

### Creating a chart:

- Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list

### Formulas:

Addition, subtraction, division, multiplication, percentage and auto sum

## 7. PowerPoint Presentation (MS Office/Open Office)

### a) Introduction to PowerPoint

- How to start PowerPoint
- Working environment: concept of toolbars, slide layout, templates etc.
- Opening a new/existing presentation
- Different views for viewing slides in a presentation: normal, slide sorter etc.



- b) Addition, deletion and saving of slides
  - c) Insertion of multimedia elements
    - Adding text boxes, importing pictures, movies and sound, tables and charts etc.
  - d) Formatting slides
    - Text formatting, changing slide layout, changing slide colour scheme
    - Changing background, Applying design template
  - e) How to view the slide show?
    - Viewing the presentation using slide navigator, Slide transition
    - Animation effects etc.
8. Working with Data Processing (MS Office/Open Office)
- a) Understanding different data types
  - b) Creation of table, entering data in a table and modify it.
  - c) Retrieve data with query:
    - Create a pivot table, customizing a pivot table, statistical analysis of data
    - Exchange data with other application: embedding objects, linking to other applications, import, export document.
9. Internet and its Applications
- a) Log-in to internet, introduction to search engine  
Browsing and down loading of information from internet
  - b) Creating E-Mail Account
    - Log in to e-mail account and Log out from e-mail account
  - c) Managing E mail
    - Creating a message
    - sending, receiving and forwarding a message
    - attaching a file
    - Deleting a message

### **INSTRUCTIONAL STRATEGY**

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts,

peripherals, connectors etc. and proficient in making use of MS Office/Open Office in addition to working on internet. The student should be made capable of working on computers independently. This subject should be taught with the help of LCD projector, while teaching a group.

### **RECOMMENDED BOOKS**

1. Fundamentals of Computer by E Balagurusamy, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Fundamentals of Computer by Sumita Arora by Dhanpat Rai and Co , New Delhi
5. Computers Today by SK Basandara, Galgotia Publication Pvt Ltd. Daryaganj, New Delhi.
6. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
8. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
9. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar
11. Basics of Information Technology, by Ishan Publications, Ambala
12. Information Technology for Management by Henry Lucas, 7<sup>th</sup> edition, Tata McGraw Hill Education Pvt Ltd , New Delhi

## 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)

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

The following shops are included in the syllabus.

1. Carpentry and Painting shop-II
2. Plumbing Shop
3. Welding shop -II
4. Electric shop -II
5. Machine shop or Electronic shop-II
6. Sheet Metal Shop -II

### Note:

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Automobile Engineering, Wood Technology, Food Technology, Quantity Surveying and Public Health Engineering will do **Machine Shop** instead of Electronic shop- II
2. The branches e.g. Electronics and Communication Engineering, Instrumentation and Control, Computer Engineering, Information Technology, and Medical Electronics will do **Electronic shop-II** instead of Machine shop.
3. The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

### 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 at least one utility job with and without lamination.

- 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, 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 Polishing on wooden items.

## **2. Plumbing Shop**

- 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 dyes for threading, selection of drills, taps and reamers 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)  
Job III Preparation of a job by filing on non-ferrous metal up to an accuracy of  $\pm 0.2\text{mm}$   
Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow, tee, union, socket, stopcock, taps, etc

## **3. Welding Shop – II**

- 3.1 Introduction to gas welding, spot welding and seam welding and welding techniques. 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 on simple jobs.
- 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 of preparing a job on spot/seam welding machine.
- 3.3 Demonstration and use of TIG and MIG Welding equipment

## **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 connection.  
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 series 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 Testing Single phase/three phase electrical motor by using voltmeters, ammeter, clip on meter, tachometer etc.
- Job V Reversing the rotation of a motor.

## 5. Machine Shop

Introduction to various machines used in machine shop. Demonstration of Lathe, Milling Machine Shaper, Slotter, Radial drilling machine, Surface grinder and CNC machine

- Job-1 Exercise on simple turning and facing
- Job-II Exercise on taper turning
- Job-III Marking and drilling practice on mild steel piece

**OR**

## 5. Electronic Shop- II

- 5.1 Demonstrate the jointing methods on general purpose PCB boards mounting and dismantling as well as uses of the items mentioned below:
- Various types of single, multi-cored insulated screened power, audio video, co-axial, general purpose wires/cables
  - Various types of plugs, sockets connectors suitable for general purpose audio and video use, 2 and 3 pin mains plug and sockets, RF Plugs and Sockets.  
Banana-plugs, and sockets, BNG, RCA, DIN, UHF, Ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.
  - Various types of switches such as: normal/ miniature toggle, slide, push button, piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way Master Mains Switch.
  - Various types of protective devices such as : Wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.
  - Materials: Conducting, insulating and magnetic materials.
  - Single beam simple CRO, Single Generator and function-Generator, function of energy knob on the front panel.
  - Regulated power supply-fixed and variable voltage, single output as well as dual output.
- 5.2 Identification and familiarization with active and passive components; colour code and types of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED,

LCD, UJT, FET, Coils, relays, reed relays, transformers, Linear and Digital ICs, Thyristors, etc.

5.3 Demonstrate the following:

1. To make perfect solder joints and soldering on PCBs
2. To remove components/wires by unsoldering.
3. To assemble components on boards, chassis, tape strips.
4. Various laying methods of cables
5. Exposure to modern soldering and de-soldering processes
6. Field visits to relevant work-places
7. Identification of active and passive components
8. Use of Multimeter and testing of active and passive components.

Job I Cut, bend, tin components, leads, inserts and solder components (capacitor, diodes, transistor, IFT, ICs etc) on a PCB.

Job II De-solder, remove and clean all the components, wires from a given equipment, a PCB or a tap strip using the following:

Job III Soldering Iron

Job IV Temperature Control Soldering Iron

Job V De-soldering Pump

Job VI De-soldering Strip

Job VII Wiring of a small circuit on a PCB/tag strip involving lacking, sleeving and use of identifier tags

## 6. Sheet Metal Shop-II

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

6.2 Introduction to soldering and brazing.

6.3 Introduction to metal spinning 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 Spinning a bowl/cup/saucer

Job IV Visit to a sheet metal industry e.g. coach builders etc.

### RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Choudhary. 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; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapooan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technoogy by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi