

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
- 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 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. 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 NITTTR, 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 (2nd 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 (4th 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 and 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 Bisiwajit 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 (2nd 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

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

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 سیدھ میں
8. Alternating Current	प्रत्यावर्ती धारा	تعمیدل کرنٹ - لے سی کرنٹ
9. Altimeter	ऊंचाई मापने का यंत्र	اُونچائی ماپنے کا آلہ
10. Alum	फिटकरी	پھٹکڑی
11. Ammeter	अम्मीटर	تجلی کا کرنٹ ماپنے کا آلہ - ایلمی میٹر
12. Ampere	ऐम्पियर	جلی کی طاقت کو ماپنے کی اکالی - ایمپیر
13. Amplification	प्रवर्धन	پرو دھن - ایمپلی کیشن
14. Amplitude	आयाम	ایام - ایمپلیٹیوڈ
15. Angle	कोण	زاویہ - کون
16. Angular velocity	कोणीय वेग	کوئیے ویگ
17. Angular Momentum	कोणीय संवेग	کوئیے سٹوئیگ
18. Annealing	तापानुशीतन	تاپ انوشٹین - انی ٹنگ
19. Anode	अनोड	الوڈ
20. Apex	शीर्ष, शिखर, शिखाग्र	اُونچائی - سب سے اُونچا
21. Apparent	स्पष्ट	صاف
22. Applied mechanics	अनुप्रयुक्त यंत्रिकी	اپلایڈ میکینک
23. Applied Science	अनुप्रयुक्त विज्ञान	اپلایڈ سائنس
24. Archimedes's Principle	आर्किमिडीज़ का सिद्धांत	آرک میڈیز کا اصول
25. Architecture	वास्तुकला, स्थापत्यकला	تعمیراتی سائنس - تعمیراتی کلا
26. Armature	आर्मेचर	آرمیچر
27. Atom	परमाणु	ایٹم
28. Automatic	स्वचलित	اپنے آپ چلنے والا
29. Axis	अक्ष	اکس
30. Axle	धुरी	دھرا - 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۔ بیرومیٹر
35. Base	आधार	بنیادی
36. Base Plate	आधार पट्टिका	بنیادی پلیٹ۔ آدھار پٹکا۔ بیس پلیٹ
37. Battery	बैटरी	بیٹری
38. Beaker	बीकर	بی کپر
39. Bending Moment	वंकन आधूर्ण	بنڈنگ مومینٹ جھکنے کی شکتی (طاقت) پیک
40. Blast Furnace	झोंका भट्टी	بلاسٹ فرنس۔ بلاسٹ بیٹی
41. Bleach	विरंजक	بلیچ۔ درجک
42. Boiler	उबालक	بواسیلر۔ اُبالنے والا۔ آبالک
43. Bridge	पुल	پل
44. Burette	ब्यूरेट	بیوریٹ۔ لیبارٹری میں استعمال ہونیوالی شیشے کی مالی
45. Callipers	कैलिपर्स	کیلیپرس
46. Calorie	कैलोरी	کیلوریہ۔ حرارت کی طاقت ماپنے کی یونٹ
47. Canal	नहर	نہر
48. Capacitance	धारिता	کے پے سیٹنس۔ دھارتا
49. Carburettor	कार्बुरेटर	کاربوریٹر
50. Cast Iron	ढलवा लोहा	کچی لوہا۔ کاسٹ آئرن
51. Catalyst	उत्प्रेरक	آپٹ پریٹرک
52. Cathode	कैथोड	کے کٹھوڈ
53. Centre of Gravity	गुरुत्वाकर्षण-केन्द्र	دھرتی کی طاقت کا مرکز
54. Centrifugal	उपकेन्द्रीय	مرکز سے دور کرنے والا۔ آپ کینڈریہ
55. Centripetal	अभिकेन्द्रीय	مرکز کی طرف لانے والا۔ ابھی کینڈریہ
56. Centroid	केन्द्रीय	مرکز
57. C.G.S. System	सी.जी.एस. पद्धति	سی جی ایس۔ 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	آولش۔ چارج۔ بھرنا
63. Choke	चोक	چوک۔ سلی کی پیو سب کو چلانے کیلئے دگایا جانوالا پرزہ
64. Chord, Major	गुरू स्वर-संघात	کارڈ میجر۔ لورڈ سورنگھات
65. Chord, Minor	लघु स्वर-संघात	کورد مائنر۔ چھوٹا سورنگھات
66. Circular	वृत्ताकार, वर्तुल	سرکولر۔ ورتا کار۔ ورتل۔ باہر سے جانیوالا

67. Clock-wise	دکشیانا ورت	دائیں ہاتھ چلنے والا۔ دکشن ورت گلاک وائر
68. Coagulation	سکندن	کوآگولیشن۔ سکند
69. Coefficient of Expansion	پراسار گونا	کوآلیفیشن شڈ آف ایکشن۔ پراسار گونک۔ نمبر۔ پیلے نرٹ۔ نکایا لائنر۔ گونا
70. Coil	کونڈلی	کوآیل۔ کٹڈلی۔
71. Combustion	دھن	دھن۔
72. Compass	دیشا سچک	کمپاس۔ اطراف بتانے والا آلہ۔ دشا سچک۔
73. Compound	یوگیک	کمپاؤنڈ۔ یوگک۔
74. Concave	اوتل	کن وید۔ اوتل۔
75. Convex	اوتل	کن ویکس۔ اوتل۔
76. Concentrated (Solution)	(گاڈا، ساندیت (غول)	گھاڑھا مشرب۔ گھول۔ سولیوشن
77. Concrete	کंकریٹ	کنکریٹ۔ پتھر کا۔
78. Conduction	چالان	کنڈکشن۔ چالان۔
79. Conductor	چالاک	کنڈکٹر۔ چلانے والا۔
80. Cone	شंक	کون۔ شنکو۔
81. Connection	سمبندھ، جوڈ	جوڑ۔ تعلق۔
82. Constant (Adj.)	स्थिर, अचल, एकसमान	کنسٹنٹ۔ ساکن۔ اچل۔
83. Convection	سंवहन	کنوئکشن۔ مزبوطا۔ زور نہ ہونا۔ وزن نہ ہونا بات میں
84. Coulomb	कूलोम (विद्युत शक्ति की इकाई)	طاقت کی اکائی۔
85. Couple	बल युग्म	کپل۔ بل یگم۔ طاقت یگم۔
86. Crane	क्रेन	کرین۔ وزن اٹھانے والی مشین
87. Crystalline	खेदार	کرسٹلین۔
88. Dehydrate	निर्जल करना	بنیر پانی کے ہونا۔
89. Distil	आसहन करना	عرق نکالنا
90. Effervescence	बुदबुदाहट	بیداہٹ
91. Element	तत्व, मूलतत्व	ایلی مینٹ۔ یلب میں چلنے والی تار۔ توتو
92. Empirical Formula	मूलअनुपाती सूत्र	بنیادی انوپاتی سوتر۔
93. Equivalent Weight	तुल्यांकी-भार	جیم وزن۔ برابر وزن کا۔
94. Flame Test	ज्वाला-परीक्षण	فلیم ٹیسٹ۔ آگ کے شعلہ کا ٹیسٹ۔
95. Flash Point	प्रज्वलन-ताप	فلیش پوائنٹ۔ آگ کی گرمی
96. Flask	फ्लास्क	فلاسک۔ پانی کو گرم یا ٹھنڈا رکھنے والی بوتل
97. Spring Balance	कमानी तुला	سپرنگ دالر ترازو
98. Soluble	विलयशील	ولے شیل۔ سلو ایبل
99. Viscosity	गाढ़ापन	گھاڑھاپن
100. Volumetric Analysis	आयतनी विश्लेषण	ایلیٹی موازنہ۔ ولیمٹرک موازنہ / مقابلہ

2.2. APPLIED MATHEMATICS - II

L T P
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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.

$$\text{Four standard limits } \lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}, \quad \lim_{x \rightarrow 0} \frac{\sin x}{x}, \quad \lim_{x \rightarrow 0} \frac{a^x - 1}{x}, \quad \lim_{x \rightarrow 0} (1+x)^{1/x}$$

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)-

$$\text{Evaluation of } \int_0^{\pi/2} \sin^n x \, dx, \quad \int_0^{\pi/2} \cos^n x \, dx, \quad \int_0^{\pi/2} \sin^m x \cos^n x \, dx$$

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. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
10. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi
11. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
12. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
13. 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
Total	80	100

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 Kirchhoff'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

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
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
	Total	64	100

2.4 BASIC ELECTRICAL ENGINEERING

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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
	Total	64	100

2.5 BASIC ELECTRONICS

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RATIONALE

This subject gives the knowledge of fundamental concepts and principles of basic electronics and aims at providing the students with basic understanding of various types of materials such as conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers, significance and use of filters in rectifiers, basic structure and working principle of tunnel diodes, LEDs, varactor diodes, LCD; working of transistors in various configurations; fundamental knowledge of FETs and MOSFETs etc. and their applications. The teacher should give emphasis on understanding of concepts by explaining the various terms used in the subject. Practical exercises have been included in order to reinforce various concepts. Industrial/field exposure must be given by organizing industrial visit.

DETAILED CONTENTS

1. Introduction (3 hrs)
 - 1.1 Brief history of development of electronics
 - 1.2 Active and passive components
 - 1.3 Concept of current and voltage sources, constant/Ideal voltage and current sources, their graphical representation. Conversion of voltage source into current source and vice-versa
 - 1.4 Difference between Practical/actual voltage source and constant/Ideal voltage source
2. Semi conductor physics: (09 hrs)
 - 2.1 Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Germanium (Ge) and Silicon (Si), covalent bonds
 - 2.2 Concept of intrinsic and extrinsic semi conductor, process of doping.
 - 2.3 Energy level diagram of conductors, insulators and semi conductors; minority and majority charge carriers.
 - 2.4 P and N type semiconductors and their conductivity, effect of temperature on conductivity of intrinsic semi conductors.
3. Semi conductor diode: (12 hrs)
 - 3.1 PN junction diode, mechanism of current flow in PN junction, forward and reverse biased PN junction, potential barrier, drift and diffusion currents, depletion layer, concept of junction capacitance in forward and reverse biased condition.
 - 3.2 V-I characteristics, static and dynamic resistance and their value calculation from the characteristics.

- 3.3 Application of diode as half-wave, full wave and bridge rectifiers. Peak Inverse Voltage(PIV) rating, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC and RC filters.
- 3.4 Types of diodes, characteristics and applications of Zener diodes. Zener and avalanche breakdown.
4. Introduction to Bipolar-transistors: (12 hrs)
 - 4.1 Concept of a bipolar transistor, its structure, PNP and NPN transistors, their symbols and mechanism of current flow; Current relations in a transistor; concept of leakage current
 - 4.2 CB, CE, CC configurations of a transistor; Input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; Current amplification factors. Comparison of CB, CE and CC Configurations
 - 4.3 Transistor as an amplifier in CE Configuration; concept of dc load line and calculation of current gain and voltage gain using dc load line.
5. Transistor biasing Circuits: (06 hrs)
Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.
6. Single stage transistor amplifier: (10 hrs)
Single stage transistor amplifier circuit, ac load line and its use in calculation of current and voltage gain of a single stage amplifier circuit. Explanation of phase reversal of output voltage with respect to input voltage. H-parameters and their significance.
7. Field effect Transistors (12 hrs)
Construction, operation and characteristics of FETs and their applications.
 - 7.1 Construction, operation and characteristics of a MOSFET in depletion and enhancement modes and its applications.
 - 7.2 C MOS - advantages and applications
 - 7.3 Comparison of JFET, MOSFET and BJT.
 - 7.4 FET amplifier circuit and its working principle. (Excluding Analysis).

LIST OF PRACTICALS

1. Identification and testing of electronic components such as resistor, inductor, capacitor, diode, transistor and different types of switches used in Electronic circuits

Measurement of resistance, capacitance and Inductance using multimeter and comparison of resistance with colour code values
2. Familiarization with operation and use of the following instruments.
Multi-meter, CRO, Signal generator, LCR meter, Regulated Power Supply by way of taking readings of relevant quantities with their help.

3. Plotting of V-I characteristics of a PN junction diode and to calculate its static and dynamic resistance
Plotting of V-I characteristics of a Zener diode and finding its reverse breakdown voltage
4. Measurement of the voltage gain, input and output impedance in a single stage CE amplifier circuit.
5. Fabrication of: (a) Half-wave rectifier circuit using one diode (b) Full-wave rectifier circuit using two diodes and (c) Bridge-rectifier circuit using four diodes
6. Observation of the wave shapes for the following rectifier circuit
 - a) Half-wave rectifier
 - b) Full-wave rectifier
 - c) Bridge-rectifier
7. Plotting of the wave shape of full wave rectifier with
 - a) Shunt capacitor filter
 - b) Series inductor filter
 - c) RC filter
8. Plotting of input and output characteristics and calculation of parameters of transistors in CE configuration.
9. Plotting of input and output characteristics and calculation of parameters of transistors in CB configuration.
10. Plotting of V-I characteristics of a FET based amplifier.
11. Measurement of the Q-point and observation of variation of Q-point by:
 - a) increasing the base resistance in fixed bias circuit.
 - b) changing out of bias resistance in potential divider circuit.
12. Measurement of voltage gain, input and output impedance and band width by plotting frequency response curve of a single stage amplifier using CE configuration at different loads.
13. Measurement of voltage gain of FET on an amplifier circuit

INSTRUCTIONAL STRATEGY

The aim of this subject is to provide the knowledge of the fundamental concepts related to basic electronics. The teacher should give more emphasis on understanding of concepts and the measuring of various terms used in the subject. The students be made familiar with diodes, transistors, resistors, capacitors, inductors etc. and various measuring instruments such as Multi-meter, CRO, Signal generator, LCR meter, Regulated Power Supply etc. Practical exercises should be included to reinforce the various concepts. Practical applications of semiconductor diodes, transistors, field effect transistors etc must be elucidated to the students.

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd., New Delhi.
2. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
3. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
4. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Education Pvt Ltd., New Delhi.
5. Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi
6. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
7. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill Education Pvt Ltd., New Delhi.
8. Basic Electronics – Problems and Solutions by Albert Malvino and David J. Bates; Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi.
9. Basic Electronics by J.S. Katre, Sandeep Bajaj, Tech. Max. Publications, Pune.
10. Analog Electronics by DR Arora, Ishan Publications, Ambala City.
11. Analog Electronics by JC Karhara, King India Publication, New Delhi
12. Electrical Devices and Circuits by Rama Reddy, Narosa Pulishing House Pvt. Ltd., New Delhi
13. Electronic Devices and Circuits by Dharma Raj Cheruku and Battula Tirumala Krishna: Pearson Education (Singapore) Pvt Ltd., Indian Branch, 482 F.I.E Patparganj, Delhi- 110092
14. Basic Electronics by JB Gupta, SK Kataria and Sons, New Delhi
15. Grob's Basic Electronics- A text Lab Manual (Special Indian Edition) by Schultz, Tata McGraw Hill Education Pvt Ltd, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction	03	05
2	Semi Conductor Physics	09	15
3	Semi Conductor Diode	12	20
4	Introduction To Bipolar-Transistors	12	20
5	Transistor Biasing Circuits	6	5
6	Single Stage Transistor Amplifier	10	15
7.	Field Effect Transistors	12	20
	Total	64	100

2.6 DESK TOP PUBLISHING (DTP) FUNDAMENTALS

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RATIONALE

This course will enable the students to familiarize with the features and use of application packages such as Page Maker, Corel Draw or any other equivalent latest package(s). They will develop skills in handling the software.

Note: Since this is a practical oriented subject, there will be no theory paper. It is suggested that the teacher should explain the following topics during the practical classes itself.

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Introduction
Overview of Desk Top Publishing (DTP), Introduction of various keys in the keyboard and their functions.
2. Page Maker
Document needs, creating a document, editing and formatting a document, saving and printing a document, inserting text and graphics, inserting columns, fonts and styles, integrating images and graphics from a drawing package in the document, making transparencies, elements, frame option, arrange text, image control, expert tracking, indent/tabs, styles, type styles, layout, tool bar (page setting)
3. Corel Draw
 - 3.1 Introduction, exploring Corel Draw screen, using dialog boxes, using roll ups, create/open file, save file, import/export files, print file
 - Use of ribbon bar, use of tool box, select object, shaping objects using zoom tool, filling objects, outline objects, use of line tool
 - Setting up new drawing, setting multi-page document, undo/redo mistakes, repeat, cut, copy, paste, delete, duplicate, clone
 - Insert object, paste special, copy attributes from select all, drawing objects, selecting objects
 - Page setup, insert/delete page, use of layers, roll up, grid and scale set up, guideline set up
 - 3.2 Formatting objects
 - Arranging objects: align, order, group, ungroup
 - Arranging objects: combine, break apart, weld, intersection, trim, separate
 - Mode edit: to line, to curve, stretch, rotate, align, convert to curves
 - Creating special effects: Transform roll up, clear transformation, add perspective, envelope roll up

- Creating special effects: blend roll-up, extrude roll up, counter roll up, power line, power-clip clear effects
- Working with text: Character, paragraph text, frame, setting of tabs, indents, bullets, spacing in paragraph text

LIST OF PRACTICALS

1. Using windows explorer and other windows elements
2. Creating and opening a document in page maker
3. Formatting and editing a document
4. Saving and printing a given document
5. Insertion of text and graphics in a given document from external source
6. Using columns utility, to give the document column look
7. Using various fonts and styles to make a document more beautiful
8. Use of page maker to make transparencies
9. Saving and printing a file that has been created
10. Formatting a given file by using undo/redo, repeat, cut, copy, paste, delete, duplicate and clone utilities
11. Inserting objects in the drawing, aligning, ordering, grouping and ungrouping of those objects
12. Use of combine, break apart, weld, intersection, trim and separate tools in a given drawing
13. Use of mode edit tools i.e. to line, to curve, to stretch, and rotate
14. Creating special effects i.e. transform roll-up, envelop roll up, add perspective, extrude roll up, contour roll up, power line, power clip, clear effects
15. To insert character and paragraph text in a drawing and frame, setting of tabs, indents, bullets and spacing in paragraph text
16. Filling of text to a given path, aligning it to base line, straighten text and edit text
17. Using tools such as spell checker, and thesaurus
18. Using find and replace text utility and type assist
19. Adding various symbols to a drawing and creating different pattern

INSTRUCTIONAL STRATEGIES

This subject is completely practical oriented. Stress is to be given to impart hands on experience to the students. With this subject, the students will be able to create, edit, format and print a document with the help of page maker, corel-draw etc.

RECOMMENDED BOOKS

1. Desk Top Publishing From A to Z by Bill Grout and Osborne; McGraw Hill
2. DTP (Desk Top Publishing) for PC user by Houghton; Galgotia Publishing House Pvt. Ltd., Daryaganj, New Delhi

2.7 GENERAL WORKSHOP PRACTICE - II

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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:

a) Various types of single, multi-cored insulated screened power, audio video, co-axial, general purpose wires/cables

b) 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.

c) 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.

d) 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.

e) Materials: Conducting, insulating and magnetic materials.

f) Single beam simple CRO, Single Generator and function-Generator, function of energy knob on the front panel.

g) 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 lapping, 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 Jeyapoovan; 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