

# SENIOR SCHOOL CURRICULUM

## 2017-18

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### ELECTRICAL TECHNOLOGY

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#### Introduction

After successfully completing the two years of Senior Secondary Vocational Course the student would have acquired relevant appropriate and adequate technical knowledge together with professional skills and competencies in the field of Electrical Technology so that he/she is properly equipped to take up gainful employment in this vocation.

Thus he/she should have acquired:

#### A. Understanding of

- (a) The relevant basic concepts and principles in basic science subjects (Physics, Chemistry and Mathematics) so that he/she is able to understand the different vocational subjects.
- (b) The basic concepts in engineering drawing.
- (c) The concepts, principles of working, maintenance, constructional details and functions of electrical motors, electrical appliances, measuring and testing instruments and electrical circuits.
- (d) Testing, installation, fault identification and repairing of electrical motors, appliances and instruments.
- (e) Different types of electrical wiring.

#### B. Adequate Professional Skills and Competencies in

- (a) Testing, installation, commissioning, fault location, repairing, servicing and major repairs of electrical motors, appliances and instruments.
- (b) Undertaking complete house wiring jobs, testing, location of faults and repairing of house wiring.

#### C. A Healthy and Professional Attitude so that He/She has

- (a) An analytical approach while working on a job.
- (b) An open mind while locating/rectifying faults.
- (c) Respect for working with his/her own hands.
- (d) Respect for honesty, punctuality and truthfulness.

**CLASS–XI**  
**ELECTIVE**  
**BASIC ELECTRICITY (787)**  
**THEORY**

*Time: 2 Hours*

*Marks: 40*

#### 1. Current Electricity

Electricity as a source of energy, Definition of Resistance, Voltage, Current, Power, Energy and their units, Relation between electrical, mechanical and thermal units, Factors affecting resistance of a conductor, Temperature co-efficient of resistance, Difference between AC and DC voltage and current.

**2. D.C. Circuits** **5**

Ohm's Law, Series – parallel resistance circuits, calculation of equivalent resistance, Kirchhoff's Laws and their applications.

**3. Electric Cells** **5**

Primary cell, wet cell, dry cell, battery, series and parallel connections of cells, Secondary cells, Lead Acid Cell, Discharging and recharging of cells, common charging methods, preparation of electrolyte, care and maintenance of secondary cells.

**4. Heating and Lighting Effects of Current** **5**

Joule's Law of electric heating and its domestic applications, heating efficiency, lighting effect of electric current, filaments used in lamps, and gaseous discharge lamps, their working and applications.

**5. Capacitors**

Capacitor and its capacity, Concept of charging and Discharging of capacitors, Types of Capacitors and their use in circuits, Series and parallel connection of capacitors, Energy stored in a capacitor.

**6. Electromagnetic Effects** **7**

Permanent magnets and Electromagnets, their construction and use, Polarities of an electromagnet and rules for finding them.

Faraday's Laws of Electromagnetic Induction, Dynamically induced e.m.f., its magnitude and induction, Static induction, self-induced e.m.f., its magnitude and direction, inductance and its unit. Mutually induced e.m.f., its magnitude and direction, Energy stored in an inductance.

Force acting on a current carrying conductor in magnetic field, its magnitude and direction, Torque produced on a current carrying coil in a magnetic field, Principles and construction of dynamo.

**7. A.C Circuits** **9**

Generation of A.C. voltage, its generation and wave shape. Cycle, frequency, peak value (maximum value), average value, instantaneous value, R.M.S. value, form factor, crest factor, phase, phase difference, power and power factor, A.C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance, Q factor of R.L.C. series circuits.

## **PRACTICAL**

*Time: 3 Hours*

*Marks: 60*

1. Verify that resistance of conductor is directly proportional to resistivity and length and inversely proportional to cross-sectional area of the conductor.
2. Verification of Ohm's Law.
3. Verification of temperature co-efficient of resistance:
  - (i) Positive for Tungsten and Nichrome and
  - (ii) Negative for carbon.
4. Study of series resistive circuits.
5. Study of parallel resistive circuits.

6. Study of series and parallel connection of cells in circuits.
7. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer.
8. To find heat efficiency of an electric kettle.
9. Charging and Discharging of a capacitor.
10. Verification of magnetic field of a Solenoid with .
  - (i) Iron core and
  - (ii) Air core.
11. Verification of Faraday's Laws of electromagnetic induction.
12. Verification of Torque development in a current carrying coil in magnetic field.
13. Study of R.L. series circuit and measurement of power and power factor.
14. Study of R.C. series circuit and measurement of power and power factor.
15. Study of R.L.C. series circuit and measurement of power and power factor.
16. Study of R.L.C. series circuit for calculation of inductive reactance, capacitive reactance, impedance and Q- Factor.

### **PRACTICAL GUIDELINES**

<b>Parameters</b>	<b>Marks</b>
Project / Practical Activities.	15
Viva Based on Project.	10
Practical File / Report or Portfolio.	10
Demonstration of skill Competency in Lab Activities.	25
<b>Total</b>	<b>60</b>

## **CLASS–XI ELECTIVE ENGINEERING SCIENCE (788) THEORY**

*Time: 2 Hours*

*Marks: 40*

- |           |  |          |
|-----------|--|----------|
| <b>1.</b> | <b>Dimensioning Techniques</b><br>Necessity of techniques, methods and principles, dimensioning of chamfered portions, hatched figures, countersunk holes, irregular figures, scales.                          | <b>4</b> |
| <b>2.</b> | <b>Principles of Projections – I</b><br>Third angle projections – principles of orthographic projections, three views of given object, six views, exercise in auxiliary views, centre line and extension line. | <b>5</b> |
| <b>3.</b> | <b>Sections</b><br>Importance, methods of representing, conventional sections of various materials, classification of sections, conventions.   | <b>4</b> |
| <b>4.</b> | <b>Pictorial and Isometric Views</b>   | <b>5</b> |

Isometric axis, oblique drawing axonometric views, pictorial view from two or three views, isometric views (introduction) and exercise, conical projections, tracing, blue printing and ammonia printing.

- 5. Working Drawing/ Details and Assembly** 4  
Principles of detailed and assembly drawing, detailed working drawing by actual measurement of a job already prepared practical exercise in drawing from detailed assembly and vice versa using actual job prepared in workshop.
- 6. Soldering and Brazing** 4  
General characteristics of soldering, brazing joints, processes and their characteristics, brief description of soldering and brazing tools equipment, types of solders and fluxes and their uses, soldering defects and their remedies, brazing materials, advantages and disadvantages of soldering and brazing.
- 7. Measuring Instruments** 6  
Construction and working principles of moving iron and moving coil voltmeters and ammeters, dynamometer type wattmeter, ohm meter, megger and induction type energy meter- their circuit connection and application for measurement of electrical quantities.
- 8. Electrical Engineering Drawing** 4  
Schematic and wiring diagram for domestic simple wiring, symbols used for different electrical devices and equipments.
- 9. Electrical wiring** 4  
Types of wiring – cleat wiring, casing and capping, C.T.S./T.R.S. wiring, metal sheath wiring, conduit wiring and concealed wiring – their procedure.  
Factors of selection of a particular wiring system, importance of switch, fuse and earthing of wiring system, types of faults, their causes and remedies.  
Types of earthing- plate earthing and Pipe earthing, their procedure and application.  
Methods of finding numbers of circuits and circuit distribution by distribution board system, loop in system of wiring connections IE rules related to wiring.

*BIS regulations, recommendations and NE pertaining to wiring installation IE regulation related to Earthing.*

## **PRACTICAL**

*Time: 3 Hours*

*Marks: 60*

1. Fitting Shop: Introduction to tools and measuring instruments, their safe keeping, safety precautions, practical exercises involving sawing, fitting, marking, squareness, chipping.
2. Description of work bench, work holding devices, care and maintenance of various tools used in fitting, fitting practice, checking by straight edge and tri square, specifications of files, precautions while filing, jobs on drilling and tapping.
3. Sheet Metal Shop: Description of tools and operations involved in sheet metal fabrication such as shearing, bending, joining (locked grooves, joint, riveting, soldering, brazing, exercise) like tray mug, funnel etc.
4. Measurement of resistance by ammeter and voltmeter method and Ohm meter.
5. Dismantling and reassembly of dynamo.
6. Calibration of ammeter, voltmeter and wattmeter with the help of standard meters.
7. Calibration of single phase energy meter with the help of standard wattmeter and stop watch.

8. Controlling lamps in series, parallel and series parallel.
9. Controlling lamps for two or three places.
10. Drawing schematic diagram to give supply to consumers.
11. Practice on casing and capping wiring.
12. Practice on cleat wiring.
13. Practice on CTS/TRS wiring.
14. Practice on metal sheet weather proof rigid PVC wiring.
15. Practice on conduit wiring.
16. Practice on concealed wiring.
17. Measurement of insulation resistance of wiring installation by megger.
18. Polarity test of wiring installation.
19. Testing of wiring installation.
20. Installation of pipe earthing for wiring installation.
21. Installation of plate earthing for wiring installation.

## **PRACTICAL GUIDELINES**

<b>Parameters</b>	<b>Marks</b>
Project / Practical Activities.	15
Viva Based on Project.	10
Practical File / Report or Portfolio.	10
Demonstration of skill Competency in Lab Activities.	25
<b>Total</b>	<b>60</b>

### **CLASS–XI**

## **GENERAL FOUNDATION COURSE (501)**

**(Common for Engineering & Technology Based Courses)**

*Time: 3 Hours*

*Marks: 100*

### **Part–I: (Compulsory to all Vocational Courses)**

*Marks: 50*

- |           |  |           |
|-----------|--|-----------|
| <b>A.</b> | <b>Business Management and Entrepreneurship</b>  | <b>30</b> |
|           | (a) <b>Entrepreneurship Orientation</b><br>Importance and relevance in real life: Emphasis on self employment.   | <b>5</b>  |
|           | (b) <b>Entrepreneurship Values and Attitudes</b><br>Innovativeness, Independence, Risk Taking, Analytical ability.   | <b>5</b>  |
|           | (c) <b>Entrepreneurial Motivation</b><br>Achievement Planning, personal efficacy, entrepreneurial goal setting.  | <b>5</b>  |
|           | (d) <b>Launching of a Business Venture</b><br>Identification of project, steps in setting up a business, information about various institutions providing assistance, project formulation. | <b>15</b> |
| <b>B.</b> | <b>Computational Skills</b>  | <b>10</b> |

- (a) Percentage, ratio & proportion, profit & loss, discount, simple and compound interest, population growth and depreciation of value of articles using logarithm. 6
- (b) Area and volume: rectangle, parallelogram, circle, cube, cone, cylinder & sphere. 4
- C. Environmental Education** 5
- (a) Environment and the society.
- (b) Environment properties risks in different economic enterprises, in use of raw materials, in processing / manufacturing and designing.
- (c) Poverty and environment.
- D. Rural Development** 5
- (a) Agriculture, the back bone of Indian Economy.
- (b) Rural development projects in India including Integrated rural development programme.
- (c) Agro based rural industries.
- (d) Community approach to rural development.

### Part–II: Applied Physics

*Marks: 30*

1. **Units & Dimensions:** M.K.S. fundamentals & derived units, S.I. base units supplementary units and derived units, Dimensions of various physical quantities, uses of dimensional analysis. 2
2. **Surface Tension and Viscosity:** molecular forces, molecular theory of surface tension, surface energy, capillary action, concept of viscosity, coefficient of viscosity, principle and construction of viscometers. 2
3. **Vibrations:** Vibration as simple spring mass system, elementary and qualitative concept of free and forced vibrations, resonance. Effects of vibrations on building bridges and machines members. 3
4. **Heat:** Temperature and its measurement, thermoelectric, platinum resistance thermometers and pyrometers. Conduction through compound media and laws of radiations. 3
5. **Ultrasonics:** Productions of ultrasonic waves by magnetostriction and piezo-electric effect, application of ultrasonics in industry. 3
6. **Optics:** Nature of light, reflection and refraction of a wave from a plane surface. Overhead projector and Epidiascope. 3
7. **Electrostatics:** Coloumb's law, electric field, potential, electric flux, gauss theorem and the electric field, around a charged sphere, a long straight conductor and plane charged sheet, potential difference, and potential of a charged sphere and a point charge, principle of capacitor, capacitance of a parallel plate capacitor having a number of media, energy stored in capacitor and combination of capacitor. 4
8. **Electromagnetism:** Magnetic field around a current carrying conductor and its direction, concept of B & H and permeability, force experienced by a moving charge and current carrying conductor placed in a magnetic field. Magnetic field at the centre of a circular coil, straight conductor and solenoid. 4
9. **Nuclear Physics:** Nuclear fission and fusion, use of radio isotopes, the application of nuclear fission in nuclear power station, nuclear fuels, radiation hazard. 3
10. **Basic Electronics:** Semi conductors and their resistivity. Atomic structure of Ge & Si, P & N type materials, formation of P-N and N-P junctions, forward and backward raising working of semiconductor diode, and its application in half wave and full wave rectifiers, P-N-P and N-P-N transistors and their principles of working. 3

### PRACTICAL

*Time: 1 Hour*

*Marks: 20*

1. To determine the surface tension of a liquid by rise in capillary.
2. To determine the viscosity of a given liquid.
3. To determine the frequency of tuning fork using a sonometer.
4. To determine the frequency of AC main using sonometer.
5. Draw forward and reverse characteristics of P & N junctions.
6. To find resistivity of a given metal by using metre-bridge.
7. To compare e.m.f. of two cells by using a potentiometer.
8. To determine 'K' of a bad conductor.
9. To determine 'K' of a good conductor.
10. Time period of a cantilever.

**CLASS–XII**  
**ELECTIVE**  
**ELECTRICAL MACHINES (787)**  
**THEORY**

*Time: 2 Hours*

*Marks: 40*

**1. Single-Phase Transformer**

**8**

Types of transformer - step-up and step-down transformer, voltage and current transformer, auto-transformer. Construction, working principles and applications of different types of transformers, rewinding of transformers, cooling of transformers.

**2. D.C. Motors**

**12**

Types of motor - series, shunt, compound and universal, construction, working principles, characteristics, winding details and applications of different types of motors including fractional horse power, starting and starters for D.C. motors. Installation of D.C. motor and testing, speed reversal and speed control of D.C. motors, common faults, their causes, testing and repairs.

**3. Three Phase Induction Motors:** Principle, working & starting of three phase induction motor.

**4**

**4. Single Phase A.C. Motor**

**12**

Types of A.C. Motors – induction motor (Split phase and repulsion start), capacitor motor, shaded pole motor, universal motor, construction, working principles, special characteristics, winding details and applications of different types of fractional horse power motors. Starting and starters for different motors. Speed reversal and speed control of A.C. Motors, installation of A.C. motor and testing, common faults, their causes, testing and repairs, rewinding of fractional h.p. motors.

**5. Electrical Solders:** Types of Solders, flux and methods, techniques of soldering.

**4**

**PRACTICAL**

*Time: 3 Hours*

*Marks: 60*

1. To test and repair a defective cycle dynamo.
2. Dismantling, study and reassembling of a D.C. motor.

3. Measurement of resistance of series, shunt field and armature of a given D.C. motor and identification of terminals by multimeter.
4. Measurement of insulation resistance of armature and field.
5. Testing, fault finding and repair of a D.C. motor.
6. Overhauling of a D.C. motor.
7. Dismantling, study and reassembling of a D.C. motor starter.
8. To study D.C. series motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
9. To study D.C. shunt motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
10. To study D.C. compound motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
11. To study D.C. universal motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
12. Identification of semi-conductor devices.
13. To draw forward & reverse characteristics of given semiconductor diode.
14. Study of transistor circuits: (i) Common Base, (ii) Common Emitter, and (iii) Common Collector.
15. Study of a half-wave rectifier circuit with and without filter.
16. Study of a full-wave rectifier circuit with centre tap transformer with and without filter.
17. Study of bridge rectifier circuit with and without filter.
18. Study of transistor amplifier circuits: (i) Common Base, (ii) Common Emitter and (iii) Common Collector.
19. Study of (i) Voltage Transformer, (ii) Current Transformer and (iii) Auto-Transformer.
20. To rewind the given 230/12 v transformer.
21. Dismantling, study and reassembling of an A.C. motor.
22. Overhauling of an A.C. motor.
23. Dismantling, study and reassembling of an A.C. motor starter.
24. Testing, fault finding and repair of an A.C. motor starter.
25. Connecting, starting, running and reversing of a three phase squirrel cage induction motor.
26. Connecting, starting, running of a shaded pole motor.
27. Connecting, starting, running and reversing of a capacitor start/run motor.
28. Connecting, starting, running and reversing of an A.C. Universal motor.
29. Installation of D.C. motor.
30. Installation of A.C. motor.
31. Study of DOL starter for starting three phase induction motor.

## **MARKING SCHEME**

***Marks: 60***



**Note:**

1. The marks for sessional work will be awarded by the teacher concerned and included in the final award.
2. Students may be asked to perform any one of the experiments listed above.

## **DISTRIBUTION OF MARKS**

- |           |   |           |
|-----------|---|-----------|
| <b>1.</b> | <b>Sessional Work</b>   | <b>10</b> |
|           | (a) All listed practical performed.   |           |
|           | (b) Maintenance of proper records pertaining to sessional and On-Job-Training.  |           |
| <b>2.</b> | <b>Experiment(s)</b>  | <b>40</b> |
|           | (a) List of material/tools/equipment.   |           |
|           | (b) Circuit/connection diagram (wherever diagram is not applicable then these marks should be clubbed with performance of experiments). |           |
|           | (c) Performance of experiment(s).   |           |
| <b>3.</b> | <b>Viva Vioce</b>   |           |
|           | (a) Question related to the experiment assigned.  |           |
|           | (b) Question related to the remaining experiments.  |           |

## **CLASS–XII ELECTIVE ELECTRICAL APPLIANCES (788) THEORY**

*Time: 2 Hours*

*Marks: 40*

- |           |   |          |
|-----------|---|----------|
| <b>1.</b> | <b>Electric Room Heater:</b>  | <b>2</b> |
|           | Construction and working principle of reflector type room heater, common defects, testing and repairs.  |          |
| <b>2.</b> | <b>Electric Iron</b>  | <b>2</b> |
|           | Types of electric iron – ordinary type and automatic / thermostat control type – construction and working principles of electric irons. Common defects testing and repairs.   |          |
| <b>3.</b> | <b>Electric Stove</b>   | <b>3</b> |
|           | Types of electric stoves- coiled type, covered type, hot plate, grill/oven, cooking range – construction and working principle of electric stoves, common defects, testing and repairs, induction heater, OTG & microwave oven. |          |
| <b>4.</b> | <b>Electric Toaster</b>   | <b>3</b> |
|           | Types of toasters – ordinary and automatic. Construction and working principle of electric toasters. Common defects, testing and repairs.   |          |
| <b>5.</b> | <b>Immersion Heater and Geyser</b>  | <b>2</b> |
|           | Construction, working principle and use of immersion heater. Common faults – their causes, testing and repairs. Construction, working principles and use of geyser and thermostat, common defects, their                        |          |

causes, testing and repairs. Testing and installation of geyser. Precautions in using immersion heater and geyser.

- 6. Electric Kettle and Coffee Percolator** 2  
Working principle and use of electric kettle (all types) and coffee percolator. Common faults, their causes, testing and repair.
- 7. Electric Room Heater** 2  
Construction and working principle of blower type room heater. Heat convector – common defects, their causes, testing and repair.
- 8. Electric Fans** 2  
Types of fans – ceiling fan, pedestal fan, table fan, bracket fan, exhaust fan, construction, working principles. Characteristics and applications of electric fans. Common faults, their causes testing and repairs, installation of all purpose fan and exhaust fan.
- 9. Electric Mixer, Grinder and Blender** 3  
Construction, working principles, characteristics and applications of electric mixer, grinder and blender. Common faults, their causes, testing and repairs, servicing, maintenance and over.
- 10. Electric Washing Machine** 2  
Construction, working principles, special features and applications of washing machine, Common faults, their causes, testing and repair, repairing, servicing, maintenance and overhauling of washing machine.
- 11. Hair Dryer/Curler** 2  
Construction and working principles of hair dryer/curler, Common faults, their causes testing and repair.
- 12. Room Cooler** 2  
Construction and working details of room cooler, desert cooler, Common cooler faults, their causes, testing and repair, Installation of room cooler/desert cooler.
- 13. Vacuum Cleaner** 2  
Construction and working principles of vacuum cleaner, common faults, their causes, testing and repair.
- 14. Emergency Light and Voltage Stabilizer** 3  
Construction and working principles of emergency light and voltage stabilizer (manual and automatic), Common faults – their causes, testing and repair.
- 15. Electric Hand Drill** 2  
Construction and working principles of electric hand drill, common faults, their causes, testing and repair.
- 16. Electric Motor Used in Domestic Appliances** 4  
Split phase, capacitor start, capacitor-run, shaded-pole motors, two speed motors, reverse motors, universal motors, components testing, trouble shooting, and servicing.
- 17. Basic Occupational and Safety Practices** 2  
Safety signs, lighting and handling loads, moving heavy equipments, Electrical safety- safety practices- first aid, Practice safe methods- lifting and handling of heavy objects, Rescue a person from live wire, Artificial respiration- Nelson’s arm and Schafer’s Method.

## **PRACTICAL**

***Time: 3 Hours***

***Marks: 60***

1. Dismantling reassembling of reflector type room heater.
2. Testing and repair of reflector type room heater.
3. Dismantling and reassembling of electric iron (i) ordinary type and (ii) automatic thermostat control type.
4. Testing and repair of electric iron (i) ordinary type and (ii) automatic / thermostat control type.
5. Dismantling and reassembling of electric stove (i) coiled type, (ii) covered type- (a) hot plate, (b) grill or hot case.
6. Testing and repair of electric stove (i) coiled type, (ii) covered type – (a) hot plate, (b) grill or hot case.
7. Dismantling and reassembling of cooking range/oven.
8. Testing and repair of cooking range/oven.
9. Dismantling and reassembling of electric toaster:  
(i) Ordinary, (ii) semi automatic, (iii) automatic with thermostat.
10. Testing and repair of electric toaster:  
(i) Ordinary, (ii) semi automatic, (iii) automatic.
11. Dismantling and reassembling of geyser: (i) instant, (ii) storage.
12. Testing and repair of geyser: (i) storage, (ii) instant.
13. Dismantling and reassembling of electric kettles (all types) and coffee percolator.
14. Testing and repair of: (i) electric kettle (all types) and (ii) coffee percolator.
15. Connection of fluorescent tube-lamp circuit.
16. Testing and repair of: (i) table lamp, (ii) night lamp, (iii) fluorescent tube light.
17. Testing and repair of: (i) electric bell, (ii) buzzer, and (iii) door chimes.
18. Controlling lamp from two or three place.  
(Stair case wiring and godown wiring)
19. To control one lamp with one switch on batton/conduit wiring.
20. To control one lamp and one socket with separate switches on batton/conduit wiring.
21. To prepare series/parallel testing board.
22. To connect fan regulator with a ceiling fan.
23. To fit MCB in a circuit in place of fuse.
24. Measurement of insulation resistance of wiring installation by meggar.
25. Polarity test of installation.
26. Earth testing and measurement of earth resistance.
27. Identification of faults of wiring, installation and rectification.
28. Testing, fault finding, repair and overhauling of blower type room heater and heat connector.
29. Testing, fault finding, repair and overhauling of electrical fans.
30. Testing, fault finding, repair and overhauling (i) electric mixer, (ii) grinder, and (iii) blender.
31. Testing, fault finding, repair and overhauling of washing machine.
32. Testing, fault finding, repair and overhauling of hair dryer.

33. Testing, fault finding, repair and overhauling of room cooler/desert cooler.
34. Testing, fault finding, repair and overhauling of vacuum cleaner.
35. Testing, fault finding, repair of emergency light and voltage stabilizer (manual and automatic).
36. Testing, fault finding, repair and overhauling of electric hand drill machine.
37. Testing, fault finding, repair and overhauling of motors used in domestic appliances.
38. Winding/re-winding of electrical motor used in domestic appliances.
39. To test the given fan with the help of Meggar insulation resistance tester for:
  - (i) Insulation resistance between body of the fan and winding.
  - (ii) Continuity of windings – starting and running.
40. To study emergency light circuit.

## **PRACTICAL GUIDELINES**

<b>Parameters</b>	<b>Marks</b>
Project / Practical Activities.	15
Viva Based on Project.	10
Practical File / Report or Portfolio.	10
Demonstration of skill Competency in Lab Activities.	25
<b>Total</b>	<b>60</b>

## **CLASS–XII**

### **GENERAL FOUNDATION COURSE (501)**

**(Common for Engineering & Technology Based Courses)**

*Time: 3 Hours*

*Marks: 100*

#### **Part–I: (Compulsory to all Vocational Courses)**

*Marks: 50*

#### **A. Business Management and Entrepreneurship**

**30**

##### **Management of Business**

Elementary treatment/exposure to basic conceptual frame work of the topic listed below:

- |                            |          |
|----------------------------|----------|
| (a) Basic Function.        | <b>6</b> |
| (b) Marketing Management.  | <b>6</b> |
| (c) Financial Management.  | <b>6</b> |
| (d) Production Management. | <b>6</b> |
| (e) Personnel Management.  | <b>6</b> |

#### **B. Computational Skills**

**10**

- |   |          |
|---|----------|
| 1. (a) Solution of linear equations and their application to problem of commercial mathematics.                                   | <b>5</b> |
| (b) System of linear equations and in equation in two variables. Applications in formation of simple linear programming problems. |          |

2. Statistics: Raw data, bar charts and Histogram; Frequency Tables; Frequency Polygon; Ogive; Menu, Median and Mode of ungrouped and grouped data; Standard Deviation; Introduction to Mortality tables; Price Index etc. Introduction to Computers. 5

**C. Environmental Education & Rural Development 10**

1. **Environmental Education 5**

- (a) Modernisation of agriculture and environment, irrigation, water logging, use of fertilisers, pesticides, soil erosion, land degradation (desertification and deforestation), silting and drying of water resources.
- (b) Rational utilisation, conservation and regeneration of environmental resources (soil, air, water, plant, energy, minerals).

2. **Rural Development 5**

Principles and goals of rural development, major problems/constraints in rural development in India.

**Part–II: Applied Chemistry**

**Marks: 30**

1. **Structure of Atom:** Rutherford model of the structure of atom, Bohr's theory of electrons, quantum numbers and their significance, de-Broglie equation and uncertainty principle, electronic configuration of 1 to 30 elements. 3
2. **Periodic Properties of Elements:** Periodic law, periodic table, periodicity in properties like atomic radii and volume, ionic radii, ionization energy and electron affinity. Division of elements into s.p.d. and f blocks. 3
3. **Chemical Bonds:** Electrovalent, covalent and coordinate bond and their properties. Metallic bonding (electron cloud model) and properties (like texture, conductance, luster, ductility and malleability). 3
4. **Fuel and their Classification:** Definition, characteristics, classification into solid, liquid and gaseous fuel. petroleum and brief idea of refining into various fractions and their characteristics and uses. Calorific value of fuel, Gaseous fuels- preparation, properties, composition and use of producer gas, water and oil gas. 3
5. **Water:** Impurities in water, methods of their removal, hardness of water, its types, causes and removal, disadvantages of hard water in boilers, pH value and its determination by calorimetric method. 3
6. Problems based on Gravimetric and Volumetric Analysis. 3
7. **Metals:** Cast iron and its properties, effect of sulphur, silicon and phosphorus as impurities in cast iron. Elementary knowledge of heat treatment of steels - hardening tempering annealing, normalizing and case hardening. 3
8. **Alloys:** Definition, classification and necessity for making alloys. Composition, properties and uses of following alloys: Brass, Bronze, Gun-metal and Duralumin. Effect of carbon, nickel, chromium, manganese on steel. 3
9. **Corrosion:** Its meaning, theory of corrosion, prevention of corrosion by various methods using metallic and non-metallic coatings. 3
10. **Plastic and Polymers:** Plastic-thermo-plastic and thermo-setting. Introduction of Polythene. P.V.C. Nylon, synthetic rubber and phenol-formaldehyde resin, their application in industry. 3

**PRACTICAL**

**Time: 1 Hour**

**Marks: 20**

1. To find the strength in grams per litre of the given solution of sodium hydroxide with the help of standard oxalic acid solution.
2. Find the strength in grams per litre of given sodium hydroxide solution with the help of standard sodium-carbonate solution and intermediate solution of an acid.
3. Determine the strength of oxalic acid solution in grams per litre using standard oxalic acid and intermediate solution of potassium permanganate.
4. Determine the total alkalinity in ppm in the given sample of water using standard sulphuric acid.
5. To find the amount of chloride ions present in water using silver nitrate solution (potassium chromate as indicator).
6. Estimate the amount of copper in the given sample of copper sulphate or copper alloy solution using a standard solution of sodium thiosulphate.
7. Estimate the amount of ash in the given sample or coal or coke or charcoal.
8. Estimate the amount of moisture in the given sample coal or coke.
9. Study the reaction of dilute and concentrated acid with any two metals (irons, copper, zinc, magnesium).
10. To arrange Mg, Zn, Fe, Pb, Sn, Cu according to their activity by studying the interaction of these metals with their salt solutions.
11. To determine the pH value of water.

### **LIST OF EQUIPMENTS, TOOLS AND INSTRUMENTS**

- |     |   |  |
|-----|---|--|
| 1.  | Work Bench 1.8 m × 1.2 m and 1.5 m × 1.5 m, Heavy duty legs 7.5 cm × 7.5 cm with one 2.5 cm thick top of Shisham and hard wood with spirit polish.  |  |
| 2.  | Bench Vice – 1 No.      2 No.      3 No.      4 No.      Size<br>6 each      6 each      2 each      2 each   |  |
| 3.  | Pipe Vice : 2 Nos., size - 1 No.  |  |
| 4.  | Hammers Ball Pien, 100 gms. <span style="float: right;">6 each</span><br>Ball Pien, 0.25 kg. <span style="float: right;">6 each</span><br>Ball Pien, 0.5 kg. <span style="float: right;">4 each</span><br>Ball Pien, 1 kg. <span style="float: right;">2 each</span><br>Ball Pien, 2.5 kg. <span style="float: right;">1 No.</span> |  |
| 5.  | Mallets of wood different size. <span style="float: right;">6 each</span>   |  |
| 6.  | Hammers of Plastic head (Plastic Mallets) of different size. <span style="float: right;">3 each size</span>   |  |
| 7.  | Micrometer 0 to 25 mm Japanese Mitutoyo. <span style="float: right;">2 No.</span>   |  |
| 8.  | Inside Micrometer 5 to 30 mm Japanese Mitutoyo. <span style="float: right;">2 No.</span>  |  |
| 9.  | Depth gauge 20 cm Mitutoyo. <span style="float: right;">1 No.</span>  |  |
| 10. | Try Square 15 cm Japanese or English. <span style="float: right;">6 No.</span>  |  |
| 11. | Marking Blocks Adjustable. <span style="float: right;">2 sets</span>  |  |
| 12. | V. Block 7.5 cm one set with clamp. <span style="float: right;">2 sets</span>   |  |
| 13. | Surface plate 45 cm × 45 cm. <span style="float: right;">1 No.</span>   |  |
| 14. | Centre Punch 10 cm length. <span style="float: right;">10 No.</span>  |  |
| 15. | Wire gauge SWG. <span style="float: right;">1 No.</span>  |  |

16.	Files of different length, grade and shapes Length (10 cm to 30 cm), Grade Bastered, smooth dead smooth. Shapes flat, Round, Half round, Triangular, Square, knife edge, Mill file, wooden file (Rasp file). 6 each	
	Needle files of different shapes.	3 each
17.	Cold Chiesel 15 cm to 20 cm. Taparia/Jhalani or other standard make.	6 Nos.
18.	Drills High speed steel 0.5 mm to 6 mm, 1/6. I.T. Make 6 mm to 18 mm, 1/4 <sup>3</sup> to 3./4 <sup>3</sup> .	3 + 3 set 1 + 1 set
19.	Crimping Tools.	2 No.
20.	Diamond Tip Glass Cutter.	2 No.
21.	Hand Reamers 20 mm or other required size.	1 No.
22.	Tap sets with handle 1/8 <sup>3</sup> to 3/8 <sup>3</sup> BSW. Tap set with handle 3/16 <sup>3</sup> to 3/8 <sup>3</sup> BSF. Tap sets with handle 0 <sup>3</sup> to 10 <sup>3</sup> BA.	1 Set 1 Set 1 Set
23.	Dies sets with stocks 1/8 <sup>3</sup> to 3/8 <sup>3</sup> BSW. Dies sets with stocks 3/16 <sup>3</sup> to 3/8 <sup>3</sup> BSF. Dies sets with stocks 0 <sup>3</sup> to 10 <sup>3</sup> BA.	1 Set 1 Set 1 Set
24.	Screw Driver Non breakable handle Assorted.	2 Set
25.	Philips Head Screw Driver – Set of 10 Nos.	2 Sets
26.	Pliers – Combination Insulated 15 cm, Long Nose, 15 cm, Side Cutting, Pliers 15 cm, Flat Nose 15 cm, Round Nose 15 cm. Bend Nose 15 cm.	10 Nos. each 2 No
27.	Round Nose Seal Remover Pliers 20 cm.	2 No.
28.	Adjustable Wrench 25 cm – 30 cm.	2 each
29.	Pipe Wrench 25 cm – 2.5 cm.	2 Nos. each
30.	Pipe type spanner set of 8 – Spanners – SURA make.	1 Set
31.	Double End open spanner set of 12 spanners.	2 Sets
32.	Ring Spanners set of 24 spanners. Make Jhalani / Taparia.	1 Set
33.	Box Spanner – set of 24 spanners. Make Jhalani / Taparia or imported.	1 Set
34.	T. spanner set from 4 No. to 13 No.	2 Set
35.	Allen Key set – Set of 12 pcs.	1 Set
36.	Bearing/Pulley Puller.	1 No.
37.	Grease Gun manual Operated.	1 No.
38.	Oil cane.	1 No.
39.	Oil Stove.	1 No.
40.	Blower Stove	.
41.	Scissor 20 cm.	6 Nos.

42.	Sheet cutter 25 cm Blade length.	2 Nos.
43.	Rawl Plugs.	5 Sets
44.	Wooden saw 30 cm to 45 cm.	10 Nos.
45.	Adjustable Hacksaw.	10 Nos.
46.	Fix Hacksaw.	10 Nos.
47.	Junior Saw.	2 Nos.
48.	Wooden Chisels (Sathari)/(Chaurasi).	10 each
49.	Electrician Knife.	20 Nos.
50.	Photo cutter (9 <sup>3</sup> and 1 <sup>3</sup> ).	1 each
51.	Poker.	
52.	Scale 15 cm and 30 cm stainless steel Japanese make.	10 each
53.	Wooden Planer Wood.	10 Nos.
	Steel Planer (Anant Make).	5 Nos.
54.	Wooden Planner for Design for one sided for groove with accessories.	2 Sets
55.	Phase or Neon tester (Taparia).	20 Nos.
56.	Morce Taper Socket 2.3 for drill machine.	1 No
57.	Soldering Iron 35 Watts to 120 Watts, 35 Watts and 65 Watts (make Raj/Toni).	10 Nos. each
	120 Watts (Raj/Toni make).	2 Nos.
	15 Watts.	10 Nos.
58.	Thermocouple prone type for temp.control.	2 Nos.
	Thermocouple rod type for temp.control.	2 Nos.
59.	Bimetallic relay (Faridge and other relays).	2 Nos.
60.	Thermostat for refrigerator, for Geysers, for Hot case.	2 Nos. each
61.	Dynamo D.C. small (Cycle Dynamo).	5 Nos.
62.	Universal motor – 1/4 HP and 1/2 HP.	1 No. each
63.	Soldering Iron stand.	20 Nos.
64.	Demonstrational Transformer Ratio 1 : 1.	
	230/230 V with 25%, 50%, 85.6% voltage tapping on both side.	3 Nos.
65.	Air Break Contractor.	2 Nos.
66.	Voltage Transformer 440 V/110 V.	2 Nos.
67.	Current transformer 5/100 amps.	2 Nos.
68.	Auto Transformer 0 to 270 V 15 amps.single phase AE.	2 Nos
69.	Electrical Sprayer Pilot – make 800 gram capacity.	1 No.
70.	D.O.L. Starter – Make GEC, Cromptom, Kirlosker, ABB upto 5 HP 3.	3 Nos.
71.	Star Delta Starter – Manually operated upto 15 HP.	2 Nos.
72.	Star Delta Starter – Semi Automatic upto 15 HP.	2 Nos.
73.	Star Delta Starter – Fully automatic with additional accessories upto 10 HP.	2 Nos.
74.	Torch of 4 cells portable.	2 Nos.
75.	Flourescent Tube Fixture with choke and starter complete.	10 Nos.



76.	Heating Element of different types used in industrial closed type Heating elements as Round Kettle and type other shapes.	
77.	3 Phase Reversing switch L & T, other best make.	2 each type
78.	Rotary Switches of different types as AGI make R 416, R 316, R 216, 216 K, 216 KF, RT 415, R 415 F, R 415	D. 2 Nos. each
79.	I.C.T.P. and I.C.D.P. Main switches.	4 each
80.	Distribution Boards.	2 Nos.
81.	Bus Bar.	2 Nos.
82.	Old Ceiling fan with complete parts.	4 Nos.
83.	Old Table fan with complete parts.	4 Nos.
84.	Exhaust fan with complete parts.	4 Nos.
85.	Old Shaded pole Motor 1/2 HP.	4 Nos
86.	Different types of Centrifugal Switch Assembly complete make Crompton/GEC etc.	4 Nos. each
87.	Single Phase capacitor start capacitor run Motor.	2 Nos.
88.	Single Phase 1440 RPM old motor with complete parts.	2 Nos.
89.	A.C. Induction squirrel cage 3 phase motor 1440 RPM old with complete parts.	2 Nos.
90.	Hand drill Machine 6 mm capacity.	10 Nos.
91.	Electrical Gun drill machine-portable 6 mm max. capacity High speed with accessories	1 No.
92.	Electrical Gun drill machine portable 12 mm capacity low speed with accessories.	1 No.
93.	Bench Drill machine pillar type capacity upto 12 mm or 18 mm Taper Drill and 9 mm Drill chuck capacity with all accessories and Drill chuck with key with motor single phase or 3 phase 1 HP as per facility of electricity available in the lab.	
94.	Bench Grinder 1 HP 220 V, Single Phase, Three Phase power 2880 RPM with one smooth and one medium grinding wheel of Carborundum.	1 No.
95.	Electrical Welding machine upto 250 AMP.capacity single phase 250 Volt AC supply oil filled tank type or air cooled type with all accessories as screen, welding lead and holder, earth clamp etc.	1 Set
96.	Winding Machine for Motor coil winding Hand operated.	2 Nos.
97.	Winding Machine for Transformer winding hand operated single coil.	1 No.
98.	D.C. Motor series – 1 HP, D.C. Motor Shunt-1 HP RMP 1500. D.C. Motor Compound – 1 HP RMP 1500.	1 No. 1 No.
99.	A.C. Motor, Single Phase, condenser Start Motor 1/2 HP and 1 HP.	1 each
100.	Single phase condenser run motor Fractional H.P.	3 Nos.
101.	Three Phase Induction Motor 2 HP, 410 V, 1450 RMP.	1 No.
102.	Shade Pole Motor 1/2 HP, 1/4 HP or small.	2 each
103.	Demonstrational AC Single phase Squirrel cage induction conden Run F.H.P. Motor all terminal of Motors. Condenser mounted on Bakelite plate of 12 mm thickness fitted with motor on separate Mild Steel Channels.	2 Nos.
104.	Demonstrational type A.C. Single phase squirrel cage induction condenser start Motor 1/2 HP terminals of running winding, starting winding, condenser and centrifugal switches, mounted on bakelite 12 mm thick plate fitted with motor on separate mild steel channels.	2 Nos.

105. Demonstrational Model for study of Transistor circuits (circuit fitted on sun mica 3 mm board with proper terminals I. common base, II. common emitter, III. common collector. 2 Nos.
106. Demonstrational Model for study of Transistor Amplifier circuit I common base II common Emitter III common collector. Circuit fitted on sun mica board with proper Terminals. 2 Nos.
107. Solenoid coil of copper wire (HTP) Highly insulated bobin (Formula R of coil) made of mica and bakelite operating on 220 V. Copper Wire 29 SWG, length of coil at least 10 cm with two terminals mounted on side of coil. Coil will be fixed on 12 mm ply and sunmica table or 2 mm sunmica Board with 50 cm wooden or plastic rule and Core Material Free Cutting Grade Steel, Cost Iron, Copper, Brass, Aluminium, Carbon Steel one each. 2 Nos.
108. Apparatus for comparison of Aluminium and copper conductivity, resistivity and magnetic field strength. Design-table bedsize 45 cm × 30 cm of 12 mm ply with sunmica/bakelite sheet 3 mm fitted with identical coils (one copper coil wounded and one coil aluminium wounded gauge and turn of wire will be same operating on 220 V one metre rule of wood or plastic will be fitted with screws on both side of coil. Both coils having two terminals on side for connection, core will be permanently fitted inside the coil, core material wrought iron/free cutting grade of steel. 2 Nos.
109. Two heating coils wounded on china clay or procelain rod one coil Ureka/Constantan and one Nichrome wire of same gauge and same wire of length fitted on 30 cm × 38 cm board of bakelite and asbestos sheet fitted on 12 mm Ply board with brass terminal insulated for connection. 2 Nos.
110. Half wave rectification model with filer circuit condenser 25 V 1000 MFD transformer 12–0–12 V I amp. output, one 50 VAC Diode 5408 and 6 terminals, fitted on sunmica board with lead and plug. 2 Nos.
111. Full wave rectification model with center gap earth and filter circuit. Condenser 25 V/1000 Mfd., Transformer 12–0–12 V Amp. output, two Diode 5408–50 VAC, 6 Terminal fitted on Sunmica Board with lead and plug.
112. Full wave rectification model with full wave rectifier bridge (Bridge of 4 Diode) and II Filter Circuit Transformer 12–0–12 V 1 Amp.output, 4 Diode (No. 5408) 50 VAC Condensor 25 V/1000 Mfd. II Filter Circuit with two condensor and choke of 1 Amp. capacity 6 terminal fitted on Sunmica Board with lead and plug.

## **B. Measuring Instruments**

1. Ammeter MI type 0–5–10 Amps. 4 Nos.
2. Ammeter MC type 0–1–5 Amps. 2 Nos.
3. Voltmeter MI type 0–300 Volts. 4 Nos.
4. Voltmeter MI type 0–600 volts 2 Nos.
5. Voltmeter MC type 0–300 volts. 2 Nos.
6. Voltmeter MC type 0–15 volts. 4 Nos.
7. Watt metreDynameter type 0–300 5 amp./10 amp. 2 Nos.
8. Energy meter 230 V, 5 amps. 2 Nos.
9. Insulation megger – 500 volts. 2 Nos.
10. Earth tester. 1 No.
11. Neon tester. 2 Nos.
12. Multimeter. 2 Nos.
13. Clip on meter. 2 Nos.
14. Growler inside and outside. 1 No.

15.	Phase sequence indicator.	2 Nos.
16.	Frequency meter Pointer type.	1 No.
17.	Frequency meter digital type.	1 No.
18.	Power factor meter.	1 No. each
	(i) Dimmerstat 230/0–270 V 4 amp.	
	(ii) Rheostat (a) 1 amp. 50 ohm, (b) 10 amp. 8 ohm.	
	(iii) Variable Single Phase Inducter 5/10 amps.	
	(iv) Capacitor 50 MF, 400 Volts.	
19.	Conduct Pipe Tee.	6 Nos.
20.	Bulbs 60 Watts.	1 Dozen

### **C. Consumable Material**

1.	P.V.C. wire 3/22.	4 coils
2.	Wooden Batten 12 mm × 18 mm.	100 meter each size
3.	Casing Copping (Standard Size).	100 meter
4.	Link Clips Standard size.	2 Gross
5.	Nail Standard size 12 mm.	1 Kg
6.	Wooden screws standard size.	4 Dozen each size
7.	Round Blocks standard size.	1 Gross
8.	Wooden Board standard size.	2 Dozen each size
9.	Insulation Tape.	1 Dozen
10.	5 Amps Switch.	2 Dozen
11.	15 Amps Switch.	1 Dozen
12.	Batton Holder.	2 Dozen
13.	Pendant Holder.	1 Dozen
14.	Angle Holder.	1 Dozen
15.	5 Amps 2 way switch.	1 Dozen
16.	Intermediate Switch.	6 Nos.
17.	5 Amps 3 pin plug.	2 Dozen
18.	15 Amps 3 pin plug.	1 Dozen
19.	5 Amps 3 pin shoe.	1 Dozen
20.	15 Amps 3 pin shoe.	1 Dozen
21.	Electric Press Connector.	6 Nos.
22.	Piano Type Switch Saps.	1 Dozen
23.	Conduit Pipe 18 mm, 25 mm.	50 each
24.	Junction Box	.
25.	Conduit Pipe Tee.	6 M Nos.
26.	Bulbs 60 Watts.	1 Dozen
27.	Grease.	2 Kg.

- 28. Lubricating Oil.
- 29. Insulating Varnish.

5 Litre

