

# WORK EDUCATION

# **SYLLABUS**

**FOR SUPW CLASSES IN KENDRIYA VIDYALAYAS**

**CLASSES COVERED: VI TO XII**

**SUBJECTS COVERED: ELECTRICAL / ELECTRONICS ENGINEERING**

## GIST

1. Prepared for all category of students
2. Both theory and practical classes are covered.
3. Safety rules for students have been taken care of.
4. Class room as well as outside activities is incorporated.
5. Lessons suitable only for school level students are incorporated.
6. Topics having general awareness and public utility are also covered.

### **Notes for the teachers**

1. Safety of the students is the matter of prime concern.
2. Do not leave the students alone for practical work.
3. Practical classes are to be taken in the block of two periods.
4. Theory and practical classes go alternatively.
5. All students are to be involved in practical works.
6. Group wise activities are to be done in the room.
7. Project works should be useful and displayed in the room/ out side for visitors

### **Notes for the Vidyalaya**

1. Periods are to be allotted as per the norms of KVS
2. Materials required for practical work are to be provided from the VVN of the Vidyalaya.
3. Outside trips as mentioned in the syllabus are to be organized by the Vidyalaya out of VVN funds.
4. Blocks of two periods are to be provided in the timetable for practical works.
5. As SUPW / W.E. Teacher is having Engineering qualification, apart from regular teachings, a he / she may also be involved in the **supervision** of maintenance of the Vidyalaya.
- 6.

***This syllabus is framed suitably for a Summer KV only;  
Winter KVs may convert the same according to their vacations.***

## Class VI ( THEORY)

1. Scope of Work Education

**April**

2. Safety Precaution while working on Electrical system

**July**

1. Identification of various types of electrical accessories and components

2. Awareness and recognition of Electrical appliances.

**August**

1. Precaution to be observed while carrying tools from one place to another

2. Electrical Tools and their uses

**September**

1. Study of accessories like Switch, holder, Plug sockets etc.

2. Identification of wire joints.

**October**

1. Line Tester—construction and uses

2. Assembling of a test lamp and its use.

**November**

1. Sources of Electricity

2. Study on electrical terms and their definition such as current , voltage etc.

1. Introduction to cell, battery and generator etc.

2. Assembling of a simple electrical circuit

**December**

7. Conductors and Insulators

**January**

8. Domestic appliances

**February / March**

## PRACTICAL FOR CLASS VI

1 Disassembling & assembling of a holder, know its part and re fit the same.

2 Disassembling & assembling of a switch know its part and re fit the same

3. Disassembling & assembling of the parts of a tester and refit the same

4 Assemble a simple circuit of a torch bulb, two cells and wire

5 Test an insulator with a series board and see the bulb is not glowing

6 Connect a bulb in a holder.

7 Make the Connection of a simple circuit with and see the bulb is glowing.

## Class VII (THEORY)

### 1. Introduction of Alternating Current & Direct Current

April

- Sources of AC & DC
- Use of AC & DC
- Static and dynamic electricity
- Brief idea of different kinds of Power generating stations viz. thermal, Hydroelectric, solar, nuclear etc.

### 2. Matter, molecule, atom

July

- Elements & compounds
- Atom
- Molecule
- Properties of atom, proton, neutron, electron.

### 3. Definitions of electrical terms

August

- Charge, kinds of charge, characteristics of charge, unit etc.
- Potential, potential difference ( brief idea only), unit, Voltmeter
- Current, flow of electron, unit, Ammeter. ( brief idea only)
- Resistance, unit, Ohm meter. ( brief idea only)

### 4. Electromagnet:

September

Making a simple circuit of electromagnet by using soft iron and copper wire.

### 5. CELL

October

- Primary Cell, Secondary cell.
- Different types of cells: Dry cell, Voltaic cell , Lead acid Battery, solar cell; chemical reactions in such cells, drawing etc.
- Difference between cell and battery

### 6. Electrical measuring devices and their uses

November

Idea of Electric Circuit

### 7. Phase, Neutral, Earth wire

December

- Open circuit, Closed circuit, short circuit diagram and explanation.
- Effects of short circuit

January

### 8. Phase Neutral & Earth Wire

Functions of Phase wire and neutral wire, way of returning of current Earth wire, Importance, how it save us from accidents ( Basic idea)

## 7. Effects of electric current

Heating effects, lighting effects, chemical effects etc.

February

## 8. Electrical symbols

March

- Symbols of basic electrical items and terms

## PRACTICAL FOR CLASS VII

1. Assembling of a simple circuit with one bulb, one holder and a switch
2. Assembling of two bulbs, two holders with controlled by a switch
3. Assembling of two bulbs, two holders controlled by two switches
4. Assembling of a bed switch connection.
5. **Learn P.A. System functioning and do assembly duty group wise.**
6. Assembling of a test lamp and know its importance
7. Observe the earth wire and see whether the bulb of a test lamp glows with phase wire and also with neutral wire.
7. Observe the inner components of a lead acid battery used for your School P.A. System.
8. Various types of wire joints.

## Class VIII ( THEORY)

### 1. Safety rules

April

- Electrical safety rules
- Electrical Shock and its treatment
- First aid to be observed in case of Electrical Shock

### 2. Fuse

July

- Function
- Types of fuse, use and their diagram
- Importance of fuse
- Possible accidents with out a fuse.

### 3. House Wiring ( Part A )

August

- Types of wiring
- Materials required for wiring
- Connection from Energy meter to switch board via distribution board and main switch.

September

4. Identification and study of various types of resistors  
Study of Measuring Instruments.
5. **Series Parallel Connection** Octobe
- Series connection resistance /Bulb
  - Parallel connection of Resistance / Bulb
6. Electronics : **Atomic structure** November
- Proton, neutron, Electron -- Properties
  - Orbits of electrons
  - Flow of electron (Why are the metals good conductor of electricity)  
(Why are the insulators poor conductors of electricity?)
  - Study of Electronic Components
7. **Work, Power and Energy** December
- Definition, unit, practicality
  - Potential and kinetic energy
8. January
- Sources of energy: Fossil fuel, biogas, solar, hydel etc
  - Description of Hydro electric power station
  - Solar energy : Scope of use & problems.
9. Study of Semi Conductor device
10. **Magnet** February
- Types,
  - Use
  - Properties
11. Electromagnet March
- Electromagnet, difference between magnet and electromagnet

## PRACTICAL FOR CLASS VIII

1. Practical on electric safety rule, shock treatment and first aid.  
**(Perform skit in the morning assembly on the above topic)**
2. Learn the replacement of a fuse in a domestic circuit.
3. Connection of three bulbs in series and learn its properties
4. Connection of three bulbs in Parallel and learn its properties
5. Learn to calculate the value of a resistor by seeing its color code.
6. Hang a magnet and learn why it remains in N-S direction
7. Draw the magnetic lines of force with the help of a bar magnet and a compass.
8. **Visit to a nearby substation and learn the items over there.**

## **Class IX ( THEORY)**

### 1. **Safety device**

April

- Fuse (already in lower class)
- Circuit breakers (Earth leakage Circuit breaker, Miniature circuit breaker)
- Isolators ( Two poles & Four poles)

### 2. **Earthing**

July

- Importance
- Use
- Types of earthing, diagrams

### 3. **Electromagnetism**

August

- Faraday's law of Electromagnetism
- Fleming's left hand rule
- Fleming's right hand rule

### 4. **Motor and Generator**

September

- **Motor:** principle, types, uses
- **Generator:** Principles, types and use

### 5. **House wiring (Part B)**

October

- Basic principle of switch board connections
- Why a switch is to be connected in phase wire only and never in neutral wire



6. **Switch Boards**

November

- Connection of Switch board of following types:
  - a) One load, one switch
  - b) Two loads, two switches
  - c) One load, two switches
  - d) Two loads, one switch
  - e) Bed switch
  - f) Fuse in a switch board
  - g) Tube light connection

7. **Bulbs / Tubes**

( In brief)

December

- Basic principle
- Types of bulb
- Domestic and Industrial bulbs
- Power saving bulbs i.e. CFL
- Tube lights

8. **Electrical Instruments**

December

- Ammeter: principle, use and types
- Voltmeter: principle, use and types
- Multi meter: importance, Principle, use and types

9 **Electronics**

January

a) **Soldering Iron**

- Working Principle
- Types , use

b) **Basic electronics materials**

- Resistors: functions & use, Color code
- Capacitors: functions & use
- LED : Function & use

10. Diodes and their characteristics

February

**Transistors**

- Working Principle
- Types , use

March

## 11. Ohm's law

- Explanation of Ohm's law

### PRACTICAL FOR CLASS IX

1. Identify the objects needed for house wiring
2. Do the practical switch board connection of :
  - a) One load, one switch
  - b) Two loads, two switches
  - c) One load, two switches
  - d) Two loads, one switch
  - e) Bed switch
  - f) Fuse in a switch board
  - g) Tube light connection
3. Measure Current by using an ammeter
4. Measure voltage by using a voltmeter.
5. connect all the components of a normal tube light fittings.
6. Do soldering on a practice board and join two wires.
7. Identify different electronics items like resistors, capacitors, transistors etc
8. Visit to a near by industry and see various types of bulbs & lighting accessories.

### Class X ( Theory)

1. **Thermal Power Station** April
  - Working Principles
  - Schematic Diagram
  - Places where thermal power houses are located
2. **Nuclear Power Station** April
  - Working Principles
  - Schematic Diagram
  - Places where thermal power houses are located
3. **Electrical Fundamentals** July
  - Potential
  - Potential Difference
  - Current
  - Resistance
  - Resistivity
  - Properties of specific resistance
  - Calculation of resultant resistance in a circuit
4. **Transformer ( Basic idea)**

- Principle
- Construction
- Types
- Uses

July

5 **House Wiring**

August

Switch Board suitable for: (ahead of previous class)

- Multiple switches with multiple loads
- Multiple switches and plugs points
- Incorporation of fuse
- Incorporation of Indicator
- Incorporation of regulator
- Quiz burger cum light switch board

6. **Electronics**

September

- **Integrated circuit ( IC )** : Principle Types , and use
- **A simple battery eliminator:** Principle, use and construction
- **Simple Electronics Circuits** : Principles, types & Construction

7. **Renewable sources of energy:**

October

- Types of renewable sources of energy
- Importance of exploration of non conventional sources of energy
- Importance of reduce reuse and recycle.

8. **Magnetic effect of electric current**

November

**PRACTICAL WORKS FOR CLASS X**

- Do the practical switch board connection of:
  - Multiple switches with multiple loads
  - Multiple switches and plugs points
  - Incorporation of fuse
  - Incorporation of Indicator
  - Incorporation of regulator
  - Quiz burger cum light switch board
- Make a Battery eliminator by stepping down it to 230V AC to 6/9/12 V DC.
- Make any Electronic circuit by using an Integrated Circuit (IC)
- Visit to a nearby power station and understand its functioning (in any month between April to October)**

## Class XI

1. Resistance , color code
  2. resistance in series and parallel
- July
- 
1. Lay out diagram of a domestic supply  
Or, Block diagram of an audio Amplifier
- August
- 
1. Study of Fluorescent Tube light  
Complete details of all components and circuit  
Or assembling of a regulator power supply circuit using transistor / zener diodes.
- September
- 
1. Detailed study on series and parallel circuit
    - a) properties & formulas
    - b) Assembling a series & parallel circuit and mixed circuit using bulbs and resistors
- October
- 
1. Study on Public Address system and its installation
    - a) Study of units and sub units of the system
    - b) Demonstration
    - c) Connections used with microphone and loud speakers.
- November
- 
- Detailed study on all Electrical measuring instruments.
- December
- 
1. Soldering Practice
    - a) Soldering of Electrical & Electronics components.
    - b) Precautions to be observed while doing soldering
- January
- 
1. Dismantling, fault analyzing, rectifying and reassembling of domestic appliances
- February

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**Class XII**

1. Study on Electrical motors
  - a) Basic principals
  - b) Working method
  - c) Construction

April

Or, Assembling of a rectifier circuit using diodes and associated components.

1. Study on appliances having Induction motors
  - a) Table fan
  - b) Ceiling fan
  - c) Exhaust fan
  - d) Room cooler etc.

July

Or, assembling of a filter circuit having Capacitors and inductors.

1. Study on Electrical Generators
  - a) Basic principals
  - b) Working method
  - c) Construction

August

Or, Working principle and Block diagram of a simple transmitter circuit.

1. Working Principle of fans and regulators  
To study the parts of fans and regulators –their testing and repairs
- Or, Working Principle and Block diagram of a Radio receiver.

September

1. Multi-meter
  - a) Detailed Study to measure various Electrical quantities
  - b) Types of Multi-meters

October

1. Study on Transformer
  - a) Basic principals
  - b) Working method
  - c) Construction

November

Or, Study & Assembling of various types of Logic Circuits.

December  
/ January

1. Career Counselling and Guidance  
To learn various options after Class XII
2. Soldering and soldering practice to solder Electrical & Electronics Components.

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## NON ELECTRICAL WORKS ( OPTIONAL)

As KVS is recruiting Electrical / Electronics Diploma / Graduate Engineers for the post of W.E. / SUPW Teachers, the syllabus is prepared according to the concerned chapters only.

However, besides the above, a few non –electrical topics may also be taught to the students based on :

- a) **Availability of local resources / Experts**
- b) **Skill of the teacher**
- c) **Ability of students**
- d) **Need of time and place**

**A few such non electrical items are given below :**

1. *Paper works/ design*
2. *Origami*
3. *Can / Bamboo works*
4. *Wood works*
5. *Clay molding.*
6. *Envelop / paper bags /duster making*
7. *Candle making / wax moulding*
8. *Chalk making*
9. *Detergent powder / soap making*
10. *fabric works*
11. *fancy designs*
12. *Greetings Card making.*
13. *Making flower pot*
14. *Calendar / dater making*
15. *Wall hanging and decorative items*
16. *Agarbati stand and other similar useful items*
17. *Flower making with stocking cloth or others*
18. *ThermoCol design*

## **PROJECTS**

**Projects should be**

1. Useful
2. Less expensive
3. Enjoyable and educative.
4. Using locally / easily available materials and resources
5. Without disturbing the study hour of the students.

**At least one project to be given in a Term**

### **Evaluation:**

Evaluation of the students' performance in all respects viz. Theory, Practical and Project is compulsory

#### **The evaluation system is as under :**

1. Evaluation is to be done thrice in a year ( Term wise)
2. Marks of the tests are to be converted to Grades.
3. The grade should include the assessment result of Theory, Practical and project.
4. The grades allotted are as under :

Terms	Theory (Oral)	Practical	Projects
<b>First term</b>	9 point grades	9 point grades	9 point grades
<b>Second Term</b>	9 point grades	9 point grades	9 point grades
<b>Third Term</b>	9 point grades	9 point grades	9 point grades

- Teacher should ensure 100% result.
- At the end of each term the total mark is to be converted to grades and to be submitted to the Examination Deptt.
- The record of the assessment is to be displayed in the Teachers' Diary too.