

**ELECTRICAL WIRING**  
**COURSE CONTENTS - (10<sup>TH</sup> CLASS)**

**THEORY**

Text	Scope
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**Chapter No. 1**

**1. Rules and Regulations for wiring**  
**(04 periods/Weeks)**

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|--|---|
| 1.1. I.E.E. rules and regulations for wiring | <ul style="list-style-type: none"><li>• Describe all the rules and regulations required for electrical wiring and installation work</li></ul> |
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**Chapter No. 2**

**2. Introduction to A.C.**  
**(06 periods/Weeks)**

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| 2.1. AC and DC                             | <ul style="list-style-type: none"><li>• Differentiate between AC and DC</li></ul>                      |
| 2.2. Time period and frequency             | <ul style="list-style-type: none"><li>• Describe the terms time period and frequency</li></ul>         |
| 2.3. Maximum value of alternating quantity | <ul style="list-style-type: none"><li>• Describe maximum value of current and voltage</li></ul>        |
| 2.4. RMS value of sine wave                | <ul style="list-style-type: none"><li>• Describe RMS value of sine wave</li></ul>                      |
| 2.5. Self inductance                       | <ul style="list-style-type: none"><li>• Describe self inductance, and back emf</li></ul>               |
| 2.6. Mutual inductance                     | <ul style="list-style-type: none"><li>• Describe mutual inductance</li></ul>                           |
| 2.7. Eddy current                          | <ul style="list-style-type: none"><li>• Describe eddy currents ,their disadvantages and uses</li></ul> |
| 2.8. Principle of transformer              | <ul style="list-style-type: none"><li>• Describe transformer principle its kinds</li></ul>             |

**Chapter No. 3**

**3. Capacitor/Inductors**  
**(10 periods/Weeks)**

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|--|---|
| 3.1. Construction of capacitor           | <ul style="list-style-type: none"><li>• Describe the construction of a capacitor</li></ul>        |
| 3.2. Types of capacitors                 | <ul style="list-style-type: none"><li>• List types of capacitors</li></ul>                        |
| 3.3. Working of capacitor in A.C and D.C | <ul style="list-style-type: none"><li>• Describe working of capacitor in A.C and D.C</li></ul>    |
| 3.4. Capacitance of a capacitor          | <ul style="list-style-type: none"><li>• Describe capacitance of capacitor and its units</li></ul> |
| 3.5. Construction of inductor            | <ul style="list-style-type: none"><li>• Describe the inductor and its construction</li></ul>      |

Text	Scope
3.6. Inductor in A.C and D.C	<ul style="list-style-type: none"> <li>Describe the behaviour of inductor in A.C and D.C</li> </ul>
3.7. Uses of inductor	<ul style="list-style-type: none"> <li>Tell the uses of inductor (reactors, filters)</li> </ul>
3.8. Reactance of a capacitor and inductor	<ul style="list-style-type: none"> <li>Describe the reactance of capacitor and inductor and their formulae</li> </ul>
3.9. Impedance	<ul style="list-style-type: none"> <li>Describe impedance of AC circuits</li> </ul>
3.10 Power in A.C	<ul style="list-style-type: none"> <li>Describe the power in AC and concept of power factor, effective power, reactive power and apparent power</li> </ul>

### Chapter No. 4

#### 4. Generator/Motor (10 periods/Weeks)

4.1. Working principal of generator	<ul style="list-style-type: none"> <li>Describe a generator and its working principle</li> </ul>
4.2. Kinds of D.C generators	<ul style="list-style-type: none"> <li>List kinds of generator (series ,parallel and compound connection)</li> </ul>
4.3. Motor and its construction	<ul style="list-style-type: none"> <li>Describe a motor , its function and construction</li> </ul>
4.4. Kinds of motor (A.C & D.C)	<ul style="list-style-type: none"> <li>List the kinds of motor (A.C &amp; D.C)</li> </ul>
4.5. Working principle of AC single phase motor	<ul style="list-style-type: none"> <li>Describe the working principle of A.C single phase motor</li> </ul>
4.6. Universal/series	<ul style="list-style-type: none"> <li>Describe a universal/series motor</li> </ul>

**ELECTRICAL WIRING**  
**LIST OF PRACTICAL - 10<sup>TH</sup> CLASS**  
(180 Periods)

**Domestic Installations.**  
(Batten & PVC pipe wiring)

1. Kitchen installation
2. Bed room installation.
3. Drawing room installation
4. Stair case installation(using two way switch)
5. Hall installation.
6. Tumbler-bell installation.
7. Indicator bell installation.
8. Installation of two fluorescent tube in series using single chock.
9. K. W. H meter and main switch + fuse installation
10. Wiring test methods
  - Leakage or Insulation Test
  - Polarity Test
  - Continuity Test

## ELECTRICAL WIRING LIST OF EQUIPMENTS & INSTRUMENTS, HAND TOOLS AND CONSUMABLE MATERIALS

### Equipments and Instruments

1. A.V.O. meter
2. Tough tester
3. Energy meter
4. Electric tester
5. Megger
6. Standard wire of gauge
7. Watt meter
8. Frequency meter
9. A.C single motor
10. Electric drill machine 13mm

### Hand Tools

- |     |                                |                |         |
|-----|--------------------------------|----------------|---------|
| 1.  | Screw driver                   | 180mm          | 12 Nos. |
| 2.  | tester                         | 75mm(3")       | 12 Nos. |
| 3.  | Steel rule                     | 300mm(12")     | 06 Nos. |
| 4.  | Measuring tape                 | 3meter(10 fit) | 06 Nos. |
| 5.  | Try square                     | 150mm (6")     | 06 Nos. |
| 6.  | Marking gauge                  | 180mm(7")      | 12 Nos. |
| 7.  | Combination pliers             | 150mm(6")      | 12 Nos. |
| 8.  | Insulation remover             | 150mm(6")      | 12 Nos. |
| 9.  | Side cutter                    | 150mm(6")      | 12 Nos. |
| 10. | Long nose pliers               | 75mm(3")       | 12 Nos. |
| 11. | Electrician Knife              | 200mm(8")      | 12 Nos. |
| 12. | Cold chisels                   | 150mm(6")      | 06 Nos. |
| 13. | Firmer Chisels                 | 250grams       | 06 Nos. |
| 14. | Hammer cross pan and ball pans | 50mm(2")       | 06 Nos. |

15.	Mallet	50mm(2")	06 Nos.
16.	Hack Saw	300mm(12")	06 Nos.
17.	Electric soldering iron	100 watts	06 Nos.
18.	File set(Half round ,Round ,Triangle ,Rasp cut)		01 each
19.	Bench vice	4"	02 Nos.
20.	Vernier calipers	150mm(6")	06 Nos.

### Consumable Material

(For a group of five student)

	Qty.	
1.	Batten $\frac{1}{2}$ x $\frac{1}{2}$ ", $\frac{1}{2}$ x $\frac{3}{4}$ ",	20ft
2.	PVC conduits $\frac{1}{2}$ x $\frac{3}{4}$ , (10ft length)	04 Nos.
3.	PVC bend $\frac{1}{2}$ "	02 Nos.
4.	PVC bend $\frac{3}{4}$ "	02 Nos.
5.	PVC saddle $\frac{1}{2}$ "	12 Nos.
6.	PVC saddle $\frac{3}{4}$ "	12 Nos.
7.	PVC junction box 2-Way	$\frac{1}{2}$ "--- $\frac{3}{4}$ " each
8.	PVC junction box 3-Way	$\frac{1}{2}$ "--- $\frac{3}{4}$ " each
9.	PVC junction box 4-Way	$\frac{1}{2}$ "--- $\frac{3}{4}$ " each
10.	Batten clips, 1", 1 $\frac{1}{2}$ , 2"(each)	01pkt
11.	Nails Assorted $\frac{1}{2}$ " Nos.17	100gm
12.	Wooden boxes 4*4"	06 Nos.
13.	Wooden boxes 8*10"	06 Nos.
14.	Wooden boxes 4*7"	06 Nos.
15.	Fuse kit kat 15amp	02 Nos.
16.	Circuit breaker 15 amp	01 No.
17.	Single way switch piano 5amp.	04 Nos.
18.	Single way switch surphase type 5amp	04 Nos.
19.	Two way switch	02 Nos.
20.	Lamp holder surphase type	03 Nos.
21.	Socket 3 pin	01 No.
22.	Bell push button	03 Nos.
23.	Bell indicators	03 Nos.
24.	Electric bells	02 Nos.
25.	Florescent tube complete fitting 20 watts, 40 watts	02 Nos.
26.	Electric cable 3/0.029, (Red +Black)	01roll(each)
27.	Soldering wire	05m
28.	Intercom system	01set

## REFERENCE BOOKS FOR TEACHERS

- Jadeed Electrical Engineering (Urdu Edition): By Muhammad Saeed Baig
- Workshop Practice In Electrical Engineering (English Edition): By M..L.Gupta
- Electrical Engineering (English Edition) (Objective Type): By P.L. Kapur

## GENERAL RECOMMENDATIONS

### *Text Book*

1. The textbook should be fully illustrated based on approved national curriculum.
2. The language used should be Urdu/English. Script should be simple and easy. Examples should be chosen from every day life wherever possible.
3. There should be uniformity in terminology in textbooks. For this purpose a glossary of uniform terminology based upon S.I. Units should be prepared and provided.
4. The Technical Terms/Terminology should not be translated as such and these should be directly written in Urdu.
5. Objective type as well as descriptive test items should be provided at the end of each chapter, which should serve as guideline for students and teachers.
6. The experiments suggested in the curriculum should be dealt with in detail in a separate Practicals' Manual. The experiments should be prescribed in an open-ended manner.
7. Since curriculum development is a continuous process, a follow-up committee should be formed to check its proper implementation and evaluation.

### *Practical Manual*

In order to maintain a uniform standard of practical activities throughout the country, Practical Manual should be prepared for the purpose. This manual should cover all the practicals in the trade indicating Title of practical, material, Tools & Instruments, Procedure, figure(s), Readings/ output data/result/conclusions and safety precautions etc. The final practical examination should be based on the activities prescribed in the curriculum.

### *Teacher's Guide*

In order to provide direction in the planning of academic activities, the Trade teacher needs some resource material to bank upon. A teacher's guide giving essential background information, knowledge, lesson schemes, objectives, teaching methodologies, motivation, conducting practical, assessment procedures etc. be prepared for the purpose and provided to the Trade teachers.

### *Workshop*

1. In order to facilitate the students to develop desired skills and competencies, it is recommended that practical activities should be carried out individually, where possible.
2. The workshop should be fully equipped as stipulated in the Curriculum. Provision should be made in school budget to purchase/replace latest tools and equipments to update the workshop.
3. Recommended consumables should be provided for practicals in reasonable quantity.

### *Evaluation of Curriculum*

It is recommended that provincial curriculum evaluation committees should be formulated on permanent basis comprising curriculum experts, teacher trainers, working technical teachers, experts, subject specialists and educationists to evaluate the shortcomings and achievements of the curriculum. The committees will be expected to remain in contact with the teachers to obtain feedback for decision making.

### *Methodology of Instruction*

Following methods of teaching may be used in technical education as considered appropriate by the teacher:

1. Project Method
2. Illustration Method
3. Investigation Method
4. Demonstration Method
5. Practice/Drill Method
6. Lecture Method
7. Assignment Method
8. Discussion (Questions & Answers) Method
9. Visit to industry
10. Tutorial

### *Characteristics of Technical Teachers*

For effective instruction, the desirable qualities of competent technical teachers should be:-

- a) Good manager, facilitator, and counsellor
- b) Educational background and industrial experience
- c) Mastery of instructional techniques
- d) Competence in the subject
- e) Resourcefulness and creativeness
- f) Ability to develop good personal relationship with students
- g) Knowledge of performance evaluation procedures

### *Promotional Activities*

During education various co-curricula activities develop and promote interest, positive attitudes and commitment. Following activities may be utilized to promote Vocational and Technical Education:

1. Technical club
2. Bulletin Board
3. Exhibition corner

4. Display of Projects
5. Quiz Contests
6. Technical & Science exhibition
7. Technical & Science Fair
8. Technical & Science Olympiad etc.

### ***Assessment of Student Achievement***

The procedure in vogue for evaluation is the examination. It is however, suggested that in addition to annual examination, the teachers should also evaluate class work on completion of each lesson/unit followed by periodic tests in the subject. Besides periodic and annual tests, skill standards prepared by National Training Bureau should be used at the end of the year.

For the purpose of class-room appraisal, individual as well as group technique may be used. The tests should comprise both short answer and objective type questions. Assessment should focus knowledge, skills, competencies, and application of concepts and ability to use the techniques and tools. It is therefore, suggested that a comprehensive scheme of knowledge, skills, competencies etc. be prepared to assess students' achievements. Rigorous efforts are needed to prepare such items. Standardized test items, be prepared for the use of the examining Boards and also for the classroom teachers.

It is to be kept in mind that students study habits are influenced by the teacher's method of testing. It is therefore, suggest that examination should be a meaningful activity.

### ***Recommended Scheme of Studies***

Each vocational subject is being divided into two parts – theory and practical, of 50 marks each. Geometrical and Technical Drawing is included as an essential part of the engineering trades. Questions of 20 % marks will be from Geometrical and Technical Drawing and the rest of the examination will be of 80% marks covering the whole theory and practical course of the respective trade.

Relative Marks distribution in Examination is as under:

Theory Paper: 50	(i)	Trade	40 Marks
	(ii)	Geometrical & Technical Drawing	10 Marks
Practical Paper: 50	(i)	Trade	40 Marks
	(ii)	Geometrical & Technical Drawing	10 Marks
Total:100			

In the examination, the level of learning abilities to be tested may be taken as:

*Knowledge* – The ability to recall facts, nomenclature, classifications, practical techniques, laws and theories, straight-forward calculation and computation.

*Comprehension* – The ability to translate data from one form to another (verbal into mathematical, tabular or graphical and vice versa) to interpret or deduct the significance of data, and to solve problems.

*Application* – The ability to apply knowledge, experience and skill to new situations presented in a novel manner.

In the theory examination paper such questions may be set which facilitate to test learning abilities related to *Knowledge, Comprehension* and *Application*..

The questions asked may provide the students an opportunity to give reasoned arguments, to apply his knowledge to the theoretical and practical problems, or to interpret given data and apply in the situation described thereby.

In the practical examination, the student will be required to perform a practical, to use tools and equipment, to observe and tabulate data, perform calculations and draw graphs, to locate fault, to make physically required circuits, to troubleshoot and repair desired circuit/unit etc.

In the practical examination, the level of competencies and skill to be tested may be taken into five categories as:

*Imitation* - The ability to observe skill and attempt to repeat it.

*Manipulation* - The ability to perform skill according to instruction rather than observation.

*Precision* - The ability to reproduce a skill with accuracy, proportion, and exactness.

*Articulation*- The ability to combine more than one skill in sequence with harmony and consistency.

*Naturalisation* – The ability to comprehend one or more skills with ease and adapt automatically with limited physical or mental exertion.

*Use of Tools* - The skills and competencies to use tools and equipment.

Approximate percentage of marks allotted to each of the above abilities may be:-

<i>Knowledge</i> .....	20 %
<i>Comprehension</i> .....	25 %
<i>Application</i> .....	15 %
<i>Skills and competencies</i> .....	40 %