

ELECTRICAL WIRING
COURSE CONTENTS -9TH CLASS

THEORY

Text	Scope
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Chapter No. 1

1. Geometrical & Technical Drawing
(06 periods)

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| 1.1. Introduction of drawing | <ul style="list-style-type: none">• Describe meaning, importance and uses of technical drawing |
| 1.2. Drawing Instruments | <ul style="list-style-type: none">• Describe drawing instruments, their construction, uses and cares. |
| 1.3. Basic and alphabet of lines | <ul style="list-style-type: none">• Describe the types of basic lines• Describe the types of alphabet of lines with their weight, shape and proper construction |
| 1.4. Geometrical construction | <ul style="list-style-type: none">• Describe angles, triangles, quadrilateral, polygons and circle elements |
| 1.5. Free Hand sketching | <ul style="list-style-type: none">• Describe the importance of sketching• Describe the procedure of sketching for shapes, geometric figures and models |
| 1.6. Multi view Drawing | <ul style="list-style-type: none">• Describe the concepts of orthographic drawing.• Describe the procedures to draw the Front, Side and Top Views |
| 1.7. Pictorial Drawing | <ul style="list-style-type: none">• Describe the procedure to draw the Isometric and Oblique drawing of simple shapes and models. |
| 1.8. Symbols | <ul style="list-style-type: none">• Describe the important electrical symbols |

Chapter No. 2

2. Fundamental of Electricity
(04 periods)

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| 2.1. Nature and generation of electricity
(General concept) | <ul style="list-style-type: none">• Describe the nature of electricity and list the methods of generation of electricity |
| 2.2. Matter and its state | <ul style="list-style-type: none">• Describe the matter and its states |
| 2.3. Atomic structure and ions | <ul style="list-style-type: none">• Describe the atomic structure and formation of ions |
| 2.4. Electric charge | <ul style="list-style-type: none">• Explain the charge and its kinds |
| 2.5. Electric current | <ul style="list-style-type: none">• Describe electric current and its units |
| 2.6. Electric potential | <ul style="list-style-type: none">• Describe e.m.f, potential difference, |

Text	Scope
2.7. Resistance	terminal voltage, their measurement and units
2.8. Conductance	• Describe the resistance and its units also reading of resistance by colour code
2.9. Laws of resistance	• Describe the conductance and its units • Describe the laws of resistance and solve simple problems.
2.10. Specific resistance	• Describe the specific resistance and its units
2.11. Ohm's Law	• Define and explain Ohm's law and describe its applications

Chapter No. 3

3. Magnetism (02 periods)

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| 3.1. Magnet and magnetic materials | • Describe the difference between magnetic and non-magnetic materials |
| 3.2. Properties of magnetic material | • Give detail of magnetic materials and their properties |
| 3.3. Nature of magnetic field | • Describe the shapes of magnetic field by using magnets of different shapes and nature |
| 3.4. Electro magnetism | • Explain how electro-magnetism is produced |
| 3.5. Flux and flux density | • Define flux, flux density and their units |

Chapter No. 4

4. Electrical Power and Energy (06 periods)

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|---------------------------------------|--|
| 4.1. Series circuit | • Describe series circuit its properties and applications |
| 4.2. Parallel circuit | • Describe parallel circuit its properties and applications |
| 4.3. Series parallel combined circuit | • Describe the behaviour of current, voltage and resistance in series parallel circuit |
| 4.4. Electric power | • Define electrical power, calculate the dissipation of power in electrical circuit and describe its units |
| 4.5. Electrical energy | • Explain electrical energy and its calculations |
| 4.6. Tariff for electrical loads | • Calculate the load and preparation of electrical bill according to given tariff |

Text	Scope
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Chapter No. 5

5. Batteries (03 periods)

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| 5.1. Cell and batteries | • Describe cells and their kinds |
| 5.2. Connecting cells in series/parallel | • Explain connections of the cells and batteries |
| 5.3. Charging of batteries | • Tell construction and describe the charging of batteries |

Chapter No. 6

6. Simple measuring instruments (03 periods)

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|----------------------------------|---|
| 6.1. Measuring system | • Describe the measuring system |
| 6.2. Moving iron instruments | • Explain moving iron system and its advantages and disadvantages |
| 6.3. Moving coils instruments | • Explain moving coil system and its advantages and disadvantages |
| 6.4. Electro-dynamic instruments | • Explain electro-dynamic system and its advantages and disadvantages |

Chapter No. 7

7. Wiring methods (06 periods)

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|-------------------------------------|---|
| 7.1. Wiring methods | • List kinds of wiring methods (PVC conduit, concealed & open type) and PVC duct wiring |
| 7.2. Material for electrical wiring | • Give detail of the material used in wiring |
| 7.3. Testing of electrical wiring | • Describe the use of electrician tools |
| 7.4. Estimation for wiring | • Describe polarity test |
| 7.5. Kinds of wires and cables | • Open circuit test |
| 7.6. Earthing | • Earth leakage test |
| | • Estimate the wiring material |
| | • Describe the kinds of wires and cables |
| | • Describe earthing methods |
| | • Describe importance of earthing |
| | • Give detail of components of earthing system |

ELECTRICAL WIRING
LIST OF PRACTICAL - 9TH CLASS
(180 Periods)

1. Geometrical & Technical Drawing

- 1.1 Draw basic lines and alphabet of drawing lines.
- 1.2 Draw different types of angles, triangles, quadrilateral and polygons
- 1.3 Draw elements of circle
- 1.4 Sketch geometric shapes and models
- 1.5 Draw Front, Side and Top views of simple wooden model
- 1.6 Draw simple Isometric and Oblique Drawings of simple models
- 1.7 Draw the different symbols relating to electrical wiring field.

2. Basic Requirements for Electrical work

- 2.1 To do work according to general workshop rules and regulations.
- 2.2 To do work according to drawing and sketches
- 2.3 Listing of tools according to jobs
- 2.4 Listing of correct sequence of operation for the job.
- 2.5 Working to safety regulations
- 2.6 Working to I.E.E regulations and general electricity rules
- 2.7 Elementary first aid including artificial respiration

3. Cable joints

- 3.1 Identification and use of common hand tools
- 3.2 Care of tools and equipments
- 3.3 Identification of cables and wires w. r t conductors and insulation
- 3.4 Trimming of cables (using electrician knife/ insulation remover)
- 3.5 Simple straight joint
- 3.6 Married joint
- 3.7 T- joint
- 3.8 Soldering of joint

4. Basic Electric Circuit

(Loose wiring)

- 4.1 Identification of electrical symbols
- 4.2 To control one lamp with one switch.
- 4.3 To control one lamp and socket.
- 4.4 To control three pin socket with one switch
- 4.5 Preparation of series test board.
- 4.6 To control 3 lamps with three switches in parallel
- 4.7 To control a bell with one push button
- 4.8 To control a bell and lamp in series (bell indicator circuit).
- 4.9 Fluorescent tube light connection.(Test with series board).

- 4.10 Two-way switch circuit (stair circuit).
- 4.11 To control two lamps in series and two lamp in parallel by two-way switch.
- 4.12 To control fan with regulator / dimmer.

5. **Identification of measuring Instruments**

- 5.1 Identification of am-meter and its application.
- 5.2 Identification of volt-meter and its application.
- 5.3 Identification and using of tong tester.
- 5.4 Identification of ohm-meter and its application.
- 5.5 Identification and use of watt-meter.
- 5.6 Identification and connection of energy meter.

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

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|-----|--------------------------------|----------------|---------|
| 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 ½ x ½ ", ½ x ¾ ",	20ft
2.	PVC conduits ½x ¾, (10ft length)	04 Nos.
3.	PVC bend ½ "	02 Nos.
4.	PVC bend ¾ "	02 Nos.
5.	PVC saddle ½ "	12 Nos.
6.	PVC saddle ¾ "	12 Nos.
7.	PVC junction box 2-Way	½ "--- ¾ " each
8.	PVC junction box 3-Way	½ "--- ¾ " each
9.	PVC junction box 4-Way	½ "--- ¾ " each
10.	Batten clips, 1", 1 ½ , 2"(each)	01pkt
11.	Nails Assorted ½ " 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 %