Curriculum of Matric Tech

Industrial Electrician

GRADE IX
2020

GOVERNMENT OF PAKISTAN

Ministry of Federal Education and Professional TrainingISLAMABAD

In Collaboration with

National Vocational and Technical Training Commission

Contents

Introduction

Pakistan is a developing country with 5th largest population in the world. 64% of our population is below 30 years of age which makes it second youngest country in South Asia. This "youth bulge" provides unique challenges as well as opportunities for the country's social and economic development. The only remedy is to develop youth of Pakistan through education and training. To control the increasing un-employment, promoting entrepreneurship (self-employment), alleviate poverty and provide skilled manpower for industrial/economic growth, The Govt. of Pakistan has decided to introduce Technical Scheme at SSC Level. For this a stream of technical subjects has been selected including Industrial Electrician as one of the elective subjects.

The curriculum of Industrial Electrician is designed to produce middle level human resource work force equiped with knowledge, skills and attitudes related to the field of construction technology so as to meet the demand of such workforce in the country and aboard to contribute in the national streamline of poverty reduction of Pakistan.

Electrician is a trade person specializing in electrical wiring of buildings, stationary machines and related equipment. Electricians may be employed in the installation of new electrical components or the maintenance and repair of existing electrical infrastructure. Electricians may also specialize in wiring and cables. Electricians work in a variety of settings, including homes, industries, schools, hotels, workshops and hospitals-any type of facility that needs electricity to function.

Working conditions for electricians vary by specialization. Generally an electrician's work is physically demanding such as climbing ladders and lifting tools and supplies. Occasionally an electrician must work in a cramped space or on scaffolding, and may frequently be bending, squatting or kneeling, to make connections in awkward locations. Electricians may spend much of their days in outdoor or semi-outdoor noisy and dirty worksites. Industrial electricians may be exposed to the heat, dust, and noise of an industrial plant. Power systems electricians may be called to work in all kinds of adverse weather to make emergency repairs.

Rationale

The Trade of Industrial Electrician is a profession that is increasingly getting attention in Pakistan because of the population growth and the resultant immense opportunities in the construction technology not only among the youth seeking to enter the industry but also among adults who wish to polish their skills to develop a career out of it.

On completing the course/curriculum, students should have acquired a set of knowledge and concepts, and have developed a range of technical, personal, interpersonal, organizational and generic skills, that can be applied in various contexts, both within and related to trade of electrician and construction technology domain. Furthermore, this course will stimulate the learners towards entrepreneurship in the industry.

Within this qualification relating to Industrial Electrician interventions in schools, there are important interventions that integrated within school settings. The purpose of this qualification is to strengthen connections between schools and trade, and drawing on the concept of the sociotechnical network, theories the interactions between the relevant market and school contexts.

Industrial Electrician, Matric Tech (9th & 10th)

Aims and Objectives

The specific objectives of developing these qualifications are as under:

- Provide students with a smooth transition to work.
- Develops job-readiness & enhance students' trade-specific employable skills and provide opportunities for the development of new skills.
- Provide students with the opportunity to obtain from Level II -IV technical training certification or equivalent in a given trade.
- To set high profile standard professions for the industry to generate standard outputs.
- To validate an individual skill, knowledge and understanding regarding relevant occupations.
- Provide flexible pathways and progressions in training and assessment field.

Objectives

After completing this, the students will be able to:

- Perform routine skilled and semi-skilled tasks to carry out a variety of electrical/electronic installations
- Repair of electrical equipment, facilities and system.
- Perform maintenance jobs and assist other team members in the assigned preventive maintenance.
- Awareness to PV Solar system

GRADE IX

Ch#01 Occupational Health, Safety and Environment		30 Periods 10 =(T), 20 = (P)			
Theme/Content	**Student Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**

• Importance of health and safety
• Hazards
• Risk Assessment
• PPE,S
	the student will be able to:
	• explain the importance of health and safety
	• understand the safety symbols
	• define hazards at workplace
	• define various types of hazard (chemical, electrical)
	• describe risk assessment process
	• steps of risk assessment
	
	   o identify the hazards
	   o define who might be harmed and why?
	   o evaluate the risk and decide on the precautions
	   o record your findings and implement them
	   o review your assessment and update if necessary.
	• explain ppe's
		• Visit Power lab of your institute, identify potential hazards. List PPE available and required to work there.
		• Recognize the required tools, equipment ,PPE' and consumable materials
		• Check working /functioning of the tools/equipment ,PPE' sand materials for insulation
		• Use Personal protective Equipment (PPE) and Ensure safe handling of Equipment
		• Identify any potential hazards and take appropriate action to minimize the risk.
			Periods (T)Periods(P)	ICT Resources Computer, printer, Stationary, PPE's, Screw driver set. Multi meter	Classroom/ Labs

Theme/Content	Student Learning Outcome	Activities/Practical	Duration	Tools	Workplace
Observing Occupational Safety and Health (OSH)	• describe health and safety regulations • explain health and safety precautions, regulations/guidelines • deal with problems and ensure in time reporting of the problems to the concerned authority.	• Demonstrate working on 400V live circuit using appropriate PPE. • Demonstrate first aid procedure for any victim of electric current • Perform cleaning and storing of tools/equipment after use. • Demonstrate the use of Personal Protective Equipment . • Keep work area clean and clear of obstructions. • Perform cleaning and storing of tools/equipment after use.	Periods (T) Periods(P)	ICT Resources Computer, printer, Stationary, PPE's, Screw driver set. Multi meter,	Class room/Lab
Fire Extinguisher	• define fire extinguisher • explain the types of fire extinguisher and their uses	• Check the expiry date of Fire extinguisher • Operate Fire Extinguisher • Perform cleaning / storing of tools,l/equipment	Periods (T) Periods(P)	Fire Extinguish er	

Ch#2 Communication Skills		36 Periods 12 =(T), 24 = (P)			
Theme/Content	**Student Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Working in Team	The Student will be able to: • Treat team members with respect and maintain Positive relationships to achieve common organizational goals	• Make a team of 5 students; check the wiring of class room and lab. Discuss the problems in team. Make a report for the incharge Maintenance.	Periods (T)Periods(P)	ICT Resources Computer, printer, Stationary	Classroom/ Lab

	• Provide work related information to team members and identify interrelated work activities to avoid confusion • Adopt communication skills appropriate to work activities and company procedures	• Identify problems and resolve them through discussion and mutual agreement			
Dealing with Clients	The Student will be able to: • Collect and confirm work requirements from clients using appropriate communication procedures • Provide clear information to clientsabout work requirements including costs and time needed to accomplish the task • Negotiate with clients regarding wages, time, labor requirements etc	• Make a team of five members, two of them are service provider and remaining three are clients. • Client requires some wiring in his office. The Service provider should discuss about the types of cable, cost and quality. Service provider and client should negotiate on the cost.	Periods (T) Periods(P)	ICT Resources Computer, printer, Stationary	Class room/lab
Basic IT Skills	• Create folders and files and learn major commands of operating system/windows • Type text and use major commands such as printing, editing, creating tables, header footer, footnotes, table of contents and page number etc. • Generate reports for clients using	• Make a Detail invoice for client and send it to him along with your company profile made in Power point, by email as per demand of Client received through email . • Save the Invoice in a separate folder in your PC for further work.	Periods (T) Periods(P)	ICT Resources Computer, printer, Stationary	Classroom/ Labs

	appropriate computer applications	• Prepare invoice in excel and word both formats.			
	• Use internet for sending/receiving emails and connecting through social or other media	• Send a small presentation (Power Point) of your company along with this invoice.			

Ch#3. Technical Drawing		36= Periods 12=(T), 24= (P)			
Theme/Content	Student Learning Outcome	Activities/Practical	Duration	Tools	Workplace
• Introduction of drawing • Drawing Instrument • Basic and Alphabet of lines	students will be able to: • describe meaning, importance and use of technical drawing • describe drawing instruments, their construction, use and handling. • describe the types of basic lines • describe the types of alphabet of lines with their weight, shape and proper construction.	• Identify drawing instruments • Draw basic lines and alphabets of drawing lines	Periods (T) Periods(P)	• Drawing instruments • Pencils • Rubber • sharpener	Classroom / Labs
• Geometrical Construction • Free Hand sketching • Multi view Drawing • Pictorial Drawing	• describe angles, triangles, quadrilateral, polygons and circle elements • describe the importance of sketching • describe the procedure of sketching for shapes, geometric figures and models • describe the	• Draw different types of circles, angles, quadrilaterals, triangles, polygons • Sketch geometrical shapes and models • Draw front, side and top view of simple model. • Draw simple isometric/ Pictorial drawing	Periods (T) Periods(P)	• Drawing instruments • Pencils • Rubber • sharpener	

	procedure to draw the front, side and top view of an object • describe the procedure to draw the isometric and pictorial drawings of simple shape and models.				

Ch#4. Measuring Instruments		15= Periods 5=(T), 10= (P)			
Theme/Content	**Student Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
• Measuring system • Moving Iron Instruments • Moving Coils instruments • Electro-dynamic instruments • Multimeters (digital, Analog)	Students will be able to: • Describe the measuring systems • Explain moving iron system • Explain advantages and disadvantages of moving iron system • Explain electro-dynamic system and its advantages and disadvantages	• Identify the measuring instruments • Perform measurement with the help of multimeter • Select the measuring range of selector scale • Reset the scales	Periods (T)Periods(P)	• Multimeters	Classroom/ Labs

Ch#5. Electrical Wiring(Domestic)		48 Periods 10 =(T), 38 = (P)			
Theme/Content	**Student Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
• Type of wiring • Electrical Wiring diagram • Install Electrical Wiring • Types of Cables • Types of Cable joints • insulation of joints • Types of insulating material	students will be able to: • explain the single-phase wiring. • describe interpretation of wiring diagram • describe types of cables and their specifications • explain different types of cable joints • describe the types of insulation material • explain the importance of insulation materials • explain installation techniques of electrical wiring. • understand the cable joints making techniques. • understand the cable joints insulation techniques	• Mark locations of the electrical points, PVC/steel conduit / trunk according to the wiring diagram. • Install electrical wiring as per drawing. • Demonstrate making of different cable Joints (Straight Joint, T Joint, Cross Joint, Married Joint) • Insulate cable joints	Periods (T) Periods(P)	required stationary, plier set, cutter, insulation tape, cables of different size, standard wire gauge (SWG)	Classroom/Labs

• Types of Wiring testers(Phase tester, Test lamp, AVO Meter, Megger) • Main board preparing and connection.	• explain interpretation of electrical drawing/wiring diagram. • describe the testing equipment for wiring test. • understand procedure for connection of main board with wiring • understand techniques for preparing of series test board • define various types of wiring testers (phase tester, test lamp, AVO meter, megger)	• Perform Electrical wiring of (Kitchen, bedroom, Drawing room) • Perform electric wiring of hotel point circuit. • Perform the electrical wiring of multi storey electric bell circuits. • Perform the electrical wiring of stair case circuit. • Identify various types of of wiring testers (Phase tester, Test lamp, AVO Meter, Megger • Apply various types of wiring testers(Phase tester, Test lamp, AVO Meter, Megger) • Prepare main boards • Connect main board with wiring • Prepare a series test board	Periods (T)Periods(P)	Insulation remover, wire cutter, Plier set, insulation tape, Earth tester, Standard wire guage (SWG), multi meter Star set	Classroom

• Electrical Wiring Test (continuity test, polarity test, short circuit test, insulation test)	• describe importance of electrical wiring test
	• explain types of electrical wiring test
	• explain techniques of testing equipment/ instruments
		• Identify the testing equipment as per requirement of job.
		• Perform the following electrical wiring tests.
		  1. continuity test
		  2. polarity test,
		  3. short circuit test
		  4. insulation test
		• Perform Earthing test.
			Periods (T)Periods(P)	AVO meter Earth tester Meggar	

Assessment and Evaluation

Assessment is the practice of collecting evidence of student learning. It aims at improving learning and teaching as well as recognizing the achievement of students. It determines students 'progression through their learning experiences and enables them to demonstrate that they have achieved the intended learning outcomes. The assessment is aligned with curriculum aims, design and learning processes.

Evaluation is an integral part of teaching-learning process. It involves gathering information through various assessment techniques, making valuable judgment and sound decisions. Assessment provides information and teaching about students' achievement in relation to learning objectives. With this information, the teacher makes informed decisions about what should be done to enhance the learning of students or to improve teaching methods. Assessment must be:

- mainly open-ended, allowing for discussion and revision of new understanding.
- tolerant of divergent thinking of students and promote the notion of no ''one right answer''.
- presented in alternative mode, not just paper-and-pencil responses to limiting questions.
- designed to foster analysis, comparison, generalization, prediction, and modification according to the grade and development level.
- capable of promoting collaboration and team effort in demonstration of competence.
- ongoing and cumulative, showing growth over time.

Formative (Internal) Assessment

Internal assessment refers to the assessment practices employed as part of the learning and teaching process. It is an ongoing process throughout the session and uses Test — Feedback — Adjust cycle repeatedly to improve students' performance and efficiency in learning and teaching. In designing internal assessment for the subject, teachers should maintain a proper balance between the formative and summative functions of assessment. It should be comprehensive to cover all the objectives as per curriculum. A diversity of assessment modes should be adopted so that students are given opportunities to develop and demonstrate the full range of learning outcomes of the curriculum, including those of knowledge, skills and values and attitudes.

Methods for Internal/Formative Assessment

Following tasks can help in formative assessment.

- Assignments
- Quizzes

- Tests
- Group discussions
- Oral/multimedia presentations
- Worksheets
- Online interactive activities
- Role play
- Demonstration
- Practical exercises

Feedback on students' work in all the above tasks must be prompt, effective, and efficient assessment should have questions setting that specifically help in finding out knowledge, understanding and skills.

Summative /External Assessment

Summative assessment will be managed by concerned Board of Intermediate and Secondary Education. It will be composed of two parts.

1) Theory Assessment /Written examination: The theory examination is suggested to consist of a wide variety of questions. Its overall weight age should be 40 %. It should be based on the curriculum rather than textbook. The assessment should be designed to examine the candidate's understanding of the whole syllabus and should test the range of abilities according to Bloom Taxonomy.

2) Practical Assessment/Practical examination: This is designed to test Practical skills of students. Its overall weight age should be 60%. It will comprise of written exam (10%), practical (70 %) and viva/oral exam (20%).

A standards-referenced approach will be adopted for grading and reporting student performance. The purpose of this approach is to recognize what each student can do the in the subject at the end of the 2-year secondary school level education. The performance of each student will be matched against a set of performance standards, rather than comparing to the performance of other students. It makes the implicit standards explicit by providing specific indication of individual student performance. Descriptions will be provided for the set of standards.

Guidelines for Writing a Textbook

A textbook is an important teaching and learning resource and one of the most extensively used resources in classrooms. To reflect national needs and aspirations the needs and aspirations, the textbooks should be written in accordance with this curriculum. This curriculum meets not only the general aims and objectives but also fulfills the specific requirements of the individual subject. As the textbook serves as a framework for teaching, the author/authors should consider the following features:

- A textbook must include an introduction to the textbook, explaining how to use the textbook
- The textbook must be in line with the National Curriculum, covering all SLOs of each theme or concept.
- Content and illustrations must be culturally, contextually and age appropriate.
- All text and material must be accurate, up-to-date and error-free.

- The continuity of the concepts, their integration and logical development should be ensured.
- Horizontal and vertical overlapping of the concepts should be avoided.
- The textbook should be informative and interactive with questions to be put at suitable intervals to provoke the students to think.
- The language used should be simple, clear, straight forward, unambiguous, and easily comprehensible by the students of the level.
- Simple questions may be asked within the chapter, which requires students to recall, think, and apply what they have just learnt as well as to reinforce the learning of the concepts and principle.
- The examples and applications should be from everyday life and be supportive of our cultural values.
- Photographs and illustrations should be clear, labeled, and supportive of the text. Tables, flow charts and graph may be given wherever needed.

- Key points at the end of each chapter should provide a summary of the important concepts and principles discussed in the chapter.
- End-of-the-Chapter exercises must include a variety of assessment styles based on levels of Bloom's Taxonomy. These should encourage students to think, develop skills, and use information for a variety of purposes.
- Textbooks should be free from all kinds of biases including, gender, religion, occupation, social background etc.
- To make the students self-learner use of IT based resources may be encouraged. Relevant internet links and other online resources may be included.
- Glossary of the new vocabulary must be included.

Guideline for planning and writing a chapter

The textbook author may decide the titles of each chapter and can choose to cover students' learning outcomes (SLOs) from any themes in developing the content of the chapter. The textbook author must also keep in mind that a number of SLOs cannot be addressed in the text (as if this is done it would lead students to simply memorize the text and not serve the

realization of the curriculum). These SLOs could be realized through questions and practical activities within and at the end of the chapter exercises.

- Learning outcomes must be given at beginning of each chapter.
- Decide on key ideas, facts, concepts, skills, and values that can be developed.
- Illustrations must clearly convey the desired concept.
- Activities must demand from students to do inquiry and problem solving according to grade level.
- Ensure that the content is up to date, accurate and developmentally appropriate.
- Contents must be in line with chapter outcomes.
- Language must be consistent, culturally appropriate, and grammatically correct (as if talking to a group).
- Language must engage and hold reader's attention.
- Recall previous learning, where possible.
- Structure the writing so that the sentence is simple, paragraphs deal with single ideas etc.
- Interesting information in the form of tidbits, fact file, point to ponder   etc.   must   be given.
- Write a summary/concept map at end of each chapter, reviewing key knowledge and skills.
- End-of-chapter exercises
- Recall and integrate previous learning
- Engage students and develop their creativity
- Move from lower to higher order thinking
- Focus on multiple intelligences
- Keep the text contextually relevant in line with local teaching andlearning.
- Provide website links for further research

Guidelines for Writing Learner Workbook

Workbooks are books that contain writing activities and exercises that build upon each chapter in the textbook. Workbook exercises help students to develop conceptual understanding of the concepts dealt with in the text, to develop skills and to apply knowledge to new situations. Basic features of a workbook A workbook should have:

- Various exercises and activities for each chapter, topic, subtopic.
- Exercises and activities that will enable student to develop and practice the content knowledge, skills and higher order thinking.
- Accurate and variety of exercises.
- Clear illustrations/ examples/ explanations to show what students are supposed to do, and/or what product looks like.

- Exercises and activities with a variety of purposeful, stimulating, challenging and innovative items to encourage students to review and practice the knowledge and skills they have learnt.
- Exercises that include both constructed and restricted response items.
- Activities, which requires readily available, acceptable, and affordable materials and resources.

Basic Requirements for Lab (Tools/Equipment)

S.No.	Items
1.	AC & DC Motors
2.	Am-meter
3.	BatteryCharger
4.	Battery CleaningKit
5.	BearingPuller
6.	Bench Vice
7.	Cable / Wire Gauge
8.	Cable Cutter
9.	Cable Knife
10.	Celltester
11.	Chisel
12.	Circuit Boards
13.	Clamp Meter
14.	Combination Plier Set
15.	Disk Grinder
16.	Duct Rod
17.	Earth Tester
18.	Files (set)
19.	Fillergauge
20.	Flux
21.	Generator
22.	Gloves
23.	Hand electricGrinder
24.	Hacksaw
25.	Hammer
26.	Handsaw
27.	Holesaw
28.	Hydrometer
29.	IR Temperature Gun

30.	L Scale
31.	Lugs Punching Machine (Hydraulic
32.	Lux Meter
33.	Magnetic Conductor
34.	Insulation Resistance Tester
35.	Micron Meter
36.	Multi-meter
37.	OTDR Meter
38.	Overall Combination
39.	Phase Sequence Meter
40.	Philips ScrewdriversSet
41.	Ring SpannerSet
42.	Safety Belt
43.	Safety Goggles
44.	Safety Helmet
45.	Safety Shoes
46.	Set of Nose Pliers
47.	Set of Screw Drivers
48.	SolderingIron
49.	SolderingLead
50.	Specific GravityChart
51.	Splicing Machine
52.	Spring tension checkingmeter
53.	Tachometer
54.	Testlamp
55.	Thermometer
56.	Thimble Press Plier
57.	TorqueWrench
58.	Transformer
59.	Voltmeter
60.	Wire Striper
61.	PLC system with all peripheral
62.	Software for PLC programming
63.	Desktop Computers for PLC systems
64.	Training Gadgets(e.g. conveyer belt, lift Elevator, traffic signal etc)