Curriculum of Matric Tech

Plumbing and Solar Water Heating System-II

GRADE IX-X
2021

GOVERNMENT OF PAKISTAN

Ministry of Federal Education and Professional Training ISLAMABAD

In Collaboration with

National Vocational and Technical Training Commission.

List of Contents

1.Introduction:

Pakistan is a developing country with 5th largest population in the world. More than 60% 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, Govt. of Pakistan has emphasized to focus on Technical Scheme at SSC Level. For this, a stream of technical subjects has been selected including plumbing and solar water heating system as one of the elective subjects.

The construction industry, one of the leading industries in Pakistan, the Middle East and other parts of the world, offer a range of prosperous occupational areas, such as plumbing. Plumbers play a vital role in installing, repairing and maintaining pipes, fixtures and other plumbing used for water distribution and wastewater disposal in residential, commercial and industrial buildings. The increased use of solar energy has further added to the demand of Plumbers having the skills to install and maintain solar-thermal water heating systems. Thus, the ever-growing demand of industry has led to the design of this training Programme as a response to providing appropriate skills.

2.Rationale:

The construction industry is a profession that is increasingly getting attention in Pakistan, 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 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 plumbing and solar water heating system. Furthermore, this course will stimulate the learners towards entrepreneurship in the industry

Within this qualification relating to plumbing 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.

These programs have increased and continue to increase in popularity because they offer a valuable channel to engage with vulnerable groups via inclusive social activities, whilst positively impacting their lifestyle profiles.

Plumbing and Solar Water Heating System, Matric Tech (9th &10th)

3.Aims and Objectives:

Aims

The aim of this Programme is to make youth skillful who are competent to install, remove, check, repair, replace or service different types of bathrooms and kitchen fixtures, including solar water heating installations. In addition, this Programme aims to prepare youth to find employment in the construction industries or to enable them in becoming successful as entrepreneur in future.

Objectives:

After completion of training the trainees will be able to:

1. Identify plumbing materials, tools, equipment and fitting materials related to plumbing.
2. Handle plumbing related tools and equipment.
3. Identify and apply plumbing symbols.
4. Perform various bench work such as measuring, marking and filing.
5. Make various sizes of threads on galvanized iron pipes.
6. Join and connect G.I and PVC fittings.
7. Make various types of polyethylene fittings for joining the pipes.
8. Install various types of fixtures in private and public buildings.
9. Replace/repair and maintain the parts of installations and fixtures.
10. Prepare quantity estimates and costing.

Plumbing and Solar Water Heating System -II
(GRADE - IX)

Plumbing and Solar Water Heating System -II(IX)					
Chapter 1 (IX)					
Ch.1 Introduction to plastic pipes for Plumbing				**20 Periods (T= 10, P = 10)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Identify the different PVC pipes.	**The Students will be able to:** • Identify PVC pipes applicable to a specific plumbing project. • Receive and inspect pipes. • Observe basic principles for PVC pipes.	• ABS, PEX pipes are identified to a specific plumbing project. • Basic principles of PVC pipes are observed.	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Multimedia or LED TV with good sound system.	Classroom / Plumbing Lab
Purpose of PVC pipes.	**The Students will be able to:** • Monitor the uses of PVC pipes. • Observe the purpose of PVC pipes in water supply scheme. • Check the difference between PVC pipes.	• Basic uses of UPVC pipes are monitored • Differences between PVC and UPVC are observed.	03 Periods(T) 02 Periods(P) (03 Hours ,20 Min)	• Multimedia or LED TV with good sound system.	Classroom / Plumbing Lab
Identify the PPRC, PEX, ABS, HDPE pipes.	**The Students will be able to:** • Identify PPRC, PEX, ABS, HDPE pipes applicable to a specific plumbing project. • Check for safety hazards. • Receive and inspect pipes. • Observe basic principles for PPRC, PEX, ABS, HDPE pipes.	• PPRC, PEX, ABS, HDPE pipes are identified to a specific plumbing project. • Basic principles of PPRC, PEX, ABS, HDPE pipes are observed.	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Multimedia or LED TV with good sound system.	Classroom / Plumbing Lab

Purpose of PPRC, PEX, ABS, HDPE pipes	**The Students will be able to:** • Monitor the uses of PPRC, PEX, ABS, HDPE pipes • Observe the purpose and classification of PPRC, PEX, ABS, HDPE pipes • Check the difference between PPR and PVC pipes • Observe the advantages and disadvantages of PPRC, PEX, ABS, HDPE pipes.	• Basic uses of PPRC, PEX, ABS, HDPE pipes are monitored • Differences between PPR and PVC are observed.	03 Periods(T) 02 Periods(P) (03 Hours ,20 Min)	• Multimedia or LED TV with good sound system.	Classroom / Plumbing Lab
Chapter 2 (IX)					
Ch.2 Works Place Safety				**24 Periods (T = 8, P = 16)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Introduction to industrial safety.	**The Students will be able to:** • Learn the concept of Industrial safety • Industrial pollution effect on environment and humans.	• Visit of nearby industries. • Demonstrate industrial pollution and its effects.	02 Periods(T) 04 Periods(P) (04 Hours ,00 Min)	• Multimedia or LED TV with good sound system.	Classroom / Plumbing Lab
Safety regarding Power Tools	**The Students will be able to:** • State use of Power Tools. • Not remove covering of machines • Not to repair a machine during working. Loose clothing and carelessness factors.	• Demonstration of machines working/visit of machine shop. • Demonstration of machines safe guard. • Demonstration of loose clothing and carelessness in machine shop	02 Periods(T) 04 Periods(P) (04 Hours ,00 Min)	• Multimedia or LED TV with good sound system.	Classroom / Plumbing Lab
Industrial safety symbols.	**The Students will be able to:** • Learn about safety symbols and there uses in industry	• Learning and demonstration of safety symbols Making play cards of safety symbols.	02 Periods(T) 02 Periods(P) (02 Hours ,40 Min)	• Multimedia or LED TV with good sound system.	Classroom / Plumbing Lab

Safety regarding Construction Site.	**The Students will be able to:** • Know safety regarding construction Sites such as high-rise building, deep execution and moving machines.	• Visit of a nearby construction Sites. • Demonstrate and learn about fixing of safety belts.	01 Periods(T) 03 Periods(P) (02 Hours ,40 Min)	• Multimedia or LED TV with good sound system.	Classroom / Plumbing Lab
First aid	**The Students will be able to:** • Introduction of first aid • Importance of first aid. • First aid in case of accident. • First aid in case of electric socks.	• Demonstration First aid in case of accident. • Demonstration in case of electric socks.	01 Periods(T) 03 Periods(P) (02 Hours ,40 Min)	• Multimedia or LED TV with good sound system.	Classroom / Plumbing Lab
Chapter 3 (IX)					
Ch.3 Plumbing Layout Drawing				**20 Periods (T = 4, P = 16)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Prepare to make sketches and drawings.	**The students will be able to:** • State types of drawings. • State key features to be recorded • Identify and follow Work health and safety (WHS) requirements on site. • State Tools and equipment required for inspection and measurement and for producing the drawings. • State PPEs for safety and serviceability.	• Draw symbols of Building elements • Draw symbols of plumbing fittings • Draw symbols of water supply fixtures. • Draw Symbols of Sanitary fixtures • Draw Symbols of Gas fixtures.	02 Periods(T) 06 Periods(P) (5 Hours ,20 Min)	• Multimedia or LED TV with good sound system. • Drawing instruments. • Face Mask.	Class Room / Drawing Lab
Create simple sketches and drawings.	**The students will be able to:** • Inspect area and record required measurements.	• Draw layout plan of water supply and Sanitary for residence • Draw layout plan of Gas for residence.	02 Periods(T) 06 Periods(P) (05 Hours ,20 Min)	• Multimedia or LED TV with good sound system. • Drawing instruments.	Class Room / Drawing Lab

	• Create Suitable views and simple sketches and drawings using standard drawing conventions. • Create standard Sectional drawings of structural elements. • observed sustainability principles and concepts in undertaking work process.			• Face Mask • Measuring tape.	
Notate and process drawings.	**The students will be able to:** • Record information on the drawing with symbols and abbreviations. • Label according to organizational administration and quality procedures.	• Notate plan of water supply and Sanitary for residence • Notate layout plan of Gas for residence • Notate layout plan of sanitary for residence.	01 Periods(T) 03 Periods(P) (02 Hours ,40 Min)	• Multimedia or LED TV with good sound system • Drawing instruments. • Face Mask • Measuring tape.	Class Room / Drawing Lab
Chapter 4 (IX)					
Ch:4 Measuring, marking and Cutting Plastic pipes				**16 Periods (T = 06, P = 10)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Measure plumbing pipes, fittings and fixture	**The students will be able to:** • Select appropriate measuring tool for plumbing work • Ascertain the functionality & correctness of the instrument. • State the support interval for different dia. PPR & PVC pipes • Measure internal and internal diameters.	• Measure the length of pipes. • Measure the angles on ground and fittings-bends etc. • Measure the internal and external dia. of given fittings, PPR and PVC pipes Measure the angles of bends, elbow etc.	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• PPEs • Measuring tape. • Marking tool • PPR heater • Cloth Duster • Pencils • Angle measuring tools • Inside and outside calipers. • Vernier calipers	Class Room / Plumbing Lab

	• Select appropriate pipe, fitting and fixture. • Measure length of selected pipe.				
Marking of Pipes and fixtures	**The students will be able to:** • Mark the pipe for cutting as per drawing. • Mark the position of fixture on site for its installation.	• Mark the specified length on pipes. • Mark the position of Basin and Shower as per given drawing.	02 Periods(T) 04 Periods(P) (04 Hours ,00 Min)	• PPEs • Measuring tape. • Marking tool • Cloth duster • Pencils • Angle measuring tools	Class Room / Plumbing Lab
Cutting of pipes	**The students will be able to:** • Select appropriate tool for cutting of pipes. • Observe WHS requirements in cutting the pipes. • Cut the pipes and deburr it.	• Cut the PPRC pipes of given size. • Cut the PVC pipes as per drawing. • Cut the ABS pipes as per drawing. • Cut the HDPE pipes as per drawing.	02 Periods(T) 05 Periods(P) (03 Hours ,20 Min)	• PPEs • Measuring tape. • Piper cutter • Hacksaw • Deburrer	Class Room / Plumbing Lab
Chapter 5 (IX)					
Ch:5 Jointing fittings and water supply fixtures with plastic pipes				**28 Periods (T = 10, P = 18)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Jointing plastic Pipes	**The students will be able to:** • Select appropriate heater for supplied pipes and fitting. • Fix and remove required diameter heating sockets with heater. • State the system of supply of water- dead end (tree), radial, grid iron and circular system • Heat the pipe and fitting observing WHS requirements. • Join pipes and cool the joint.	• Join the PPRC pipes for dead end system. • Join the ABS pipes for radial system • Join the PVC pipes for grid iron system. • Join the PEX pipes for circular system	06 Periods(T) 12 Periods(P) (12 Hours ,00 Min)	• PPEs • Drill machine • Screw wrench • Screw driver • Chisel • Hammer • Steel Tape • PPR heater set • Spanner set	Class Room / Plumbing Lab

	• Jointing of plastic Pipes.				
Installation of fixtures with plastic pipes.	**The students will be able to:** • Mark the location of fixtures as per plan. • Select appropriate installation mechanism. • Install the fixtures observing WHS requirements	• Install the bib cocks, T-stop cock, non-return valve, Shower rose, instant Geyser, Mixers with plastic pipes.	04 Periods(T) 06 Periods(P) (06 Hours ,40 Min)	• PPEs • Drill machine • Screw wrench • Screw driver • Chisel • Hammer • Steel Tape • PPR heater set • Spanner set	Class Room / Plumbing Lab
Chapter 6 (IX)					
Ch.6 Installation of fixtures				**29 Periods (T = 12, P= 17)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Identify installation requirements.	**The students will be able to:** • Access, read and determine water service installation requirements from job specifications, relevant Australian Standards, codes, manufacturers' instructions and jurisdictional requirements. • Obtain, interpret and follow workplace, work health and safety (WHS) and environmental requirements.	• Prepare separate list of equipment required for each activity for installation of fixture.	03 Periods(T) 02 Periods(P) (3 Hours ,00 Min)	• Steel Tape • Scaffold • Marking tools	Class Room / Plumbing Lab
Prepare for work.	**The students will be able to:** • Create a materials list and collect materials. • Select and check serviceability of appropriate tools and equipment including personal protective equipment (PPE).	• Prepare materials' list for fresh water fixture of given drawing. • Prepare materials' list for sanitary fixture of given drawing. • Prepare materials' list for appliances of given drawing.	02Periods(T) 02 Periods(P) (2 Hours ,40 Min)	• PPEs • Steel Tape • Scaffold	Class Room / Plumbing Lab

Install sanitary fixtures and test pipe system.	**The students will be able to:** • Set out and install pipework and connection points according to drawings, relevant specifications, local Standards, codes and jurisdictional requirements. • Test installed pipework according to relevant local Standards, codes, manufacturers' instructions and jurisdictional requirements. • Install the fixtures observing WHS requirements	• Install sink • Install Urinal wall type • Install Geiser • Install Shelf and looking mirror	6 Periods(T) 12 Periods(P) (12 Hours ,00 Min)	• PPEs • Drill machine • Screw wrench • Screw driver • Chisel • Hammer • Pipe wrench • Steel Tape	Class Room / Plumbing Lab
Clean up.	**The students will be able to:** • Clear the work area and dispose of, reuse or recycle materials in accordance with state or territory legislation and workplace requirements. • Clean tools and equipment, check for serviceability and report any damage, and store and secure.	• Clean the work area for each activity.	1 Periods(T) 1 Periods(P) (01 Hour, 20 Min)	• PPEs • Brooms/ Duster • G.I Tray	Plumbing Lab
Chapter 7 (IX)					
Ch.7 Quantity Calculation				**28 Periods (T = 15, P = 13)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Read Plans	**The students will be able to:** • Access, read and determine requirements from plumbing plans and specifications.	• Read the given plan of plumbing system of a house and enlist the quantities of each and every fitting and fixtures separately	02 Periods(T) 02 Periods(P) (2 Hours ,40 Min)	• Scale cards • Pencil • Calculator	Class Room

	• Identify amendments to ensure plans and specifications are the most current version • Confirm drawing conventions used and their application.				
Mensuration of plane figures	**The students will be able to:** • Know and understand the simple formulas for solution of triangles. • Know and understand the simple formulas for solution of quadrilaterals. • Know and understand the simple formulas for solution of circle. • Apply the above formulas to calculate numbers, length and areas of simple plane figures.	• Perform calculations for working out number, area and length of triangles, quadrilaterals and circle.	04 Periods(T) 05 Periods(P) (6 Hours ,00 Min)	• Scale cards • Pencil • Calculator	Class Room
Calculate quantities for domestic plumbing system	**The students will be able to:** • Determine type of materials. • Calculate dimensions of required materials. • Calculate the quantities of materials for plumbing system	• Calculate the quantities of materials required from the given plumbing plan of small house.	05 Periods(T) 03 Periods(P) (5 Hours ,20 Min)	• Scale cards • Pencil • Calculator	Class Room
Prepare list of required materials for commercial building plumbing system	**The students will be able to:** • Read the drawing of commercial building. • Calculate the quantities of materials from the	• Calculate the quantities of materials required from the given plumbing plan of small house.	04 Periods(T) 03 Periods(P) (4 Hours ,40 Min)	• Scale cards • Pencil • Calculator	Class Room

	help of given plumbing plan.				
Chapter 8 (IX)					
Ch.8 Personal and professional development				**15 Periods (T = 06, P = 9)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
CV & Resume Writing	**The students will be able to:** • learn the importance of cv in job application • create and format CV/resume	• Create a CV with the help of teacher	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Computer system with MS office	Classroom
Job Portals	**The students will be able to:** • access and register email account on various online job portals • search job as per job description and title	• Register on online job portals, follow job hunting procedure and steps to apply for an advertised job.	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Computer system with internet connection	Classroom
Introduction to e-commerce	**The students will be able to:** • familiarize oneself with online travel e-commerce websites • learn about hotel websites • learn about freelancing websites	• Create a travel booking on any online travel website • Create an account on any freelancing website	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Computer system with internet connection	Classroom

Plumbing and Solar Water Heating System -II
(GRADE - X)

Plumbing and Solar Water Heating System -II (X)					
Chapter 1 (X)					
Ch.1 Introduction to Solar Water Heating				**10 Periods (T= 05, P= 5)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Basics of solar water heating system	**The students will be able to:** • Define solar water heating • State purpose of solar water heating system • Describe importance of solar water heating system • State the parts of solar water heating system. • Applications of solar water heating system	• Prepare basic flow diagram of existing solar water heating system	03 Periods(T) 02 Periods(P) (03 Hours ,20 Min)	• Multimedia or LED TV with good sound system • Face Mask • Hand kerchief.	Class Room / Plumbing Lab
Merits and demerits of solar water heating system	**The students will be able to:** • Describe benefits of solar water heating system • Describe disadvantages of solar water heating system	• Group discussion regarding benefits of solar water heating system	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Multimedia or LED TV with good sound system • Face Mask • Hand kerchief.	Class Room / Plumbing Lab
Chapter 2 (X)					
Ch.2 Fundamentals of Solar Water Heating				**10 Periods (T = 04, P = 06)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Solar thermal energy	**The students will be able to:** • Define light and heat energy • Define solar thermal energy • Describe basic function of domestic solar water heating	• Group discussion regarding basic function of solar water heating	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Multimedia or LED TV with good sound system • Face Mask • Handkerchief	Class Room / Plumbing Lab
Types of solar water heating system	**The students will be able to:** • Explain different types of solar water heating systems and their merits & demerits.	• Group discussion about merits and demerits of each system	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Multimedia or LED TV with good sound system • Face Mask	Class Room / Plumbing Lab

	• Analyze the water discharge level for domestic and commercial Water Heating Systems			• Hand kerchief	
Chapter 3 (X)					
Ch.3 Components of Solar Water Heating System				**20 Periods (T = 08, P = 12)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Parts of typical solar water heating system	**The students will be able to:** • Understanding the function and use different parts of solar water heating system • Importance of alternate electrical and gas arrangement.	• Recognize different parts of solar water heating system. • Group discussion about different parts of solar water heating and their functions	04 Periods(T) 06 Periods(P) (06 Hours ,40 Min)	• Multimedia or LED TV with good sound system • Face Mask • Hand kerchief	Class Room / Plumbing Lab
Solar thermal collector	**The students will be able to:** • Understand and identify types of collectors • Know about the frame and storage tank of hot water • Storage and expansion vessels	• Identify different types of collectors. • Group discussion the functions of collectors.	04 Periods(T) 06 Periods(P) (06 Hours ,40 Min)	• Multimedia or LED TV with good sound system • Face Mask • Hand kerchief	Class Room / Plumbing Lab
Chapter 4 (X)					
Ch:4 Planning for solar water heating				**20 Periods (T = 08, P = 12)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Estimation of water quantity	**The students will be able to:** • Estimate the requirement of water • Factors affecting efficiency of system	• Calculate the requirement of water for different number of persons • Group discussion of factors affecting efficiency of system	04 Periods(T) 06 Periods(P) (06 Hours ,40 Min)	• Multimedia or LED TV with good sound system • Face Mask • Hand kerchief	Class Room / Plumbing Lab
Calculation of thermal requirements	**The students will be able to:** • Differentiate between domestic and commercial use	• Group discussion about thermal requirements of domestic and commercial use	04 Periods(T) 06 Periods(P) (06 Hours 40 Minutes)	• Multimedia , projector, or LED TV with good	Class Room / Plumbing Lab

	• Set the flow and exit of water.	• Analyze the water discharge level for domestic and commercial Water Heating Systems		sound system • Face Mask • Hand kerchief	
Chapter 5 (X)					
Ch:5 Installation and commissioning of Solar Water Heating System				**75 Periods (T = 25, P = 50)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Installation requirements	**The students will be able to:** • Estimate materials required for plumbing works • Estimate the materials required for solar system.	• Calculate materials required for plumbing works • Calculate the materials required for solar system.	02 Periods(T) 08 Periods(P) (06 Hours ,40 Min)	• Multimedia or LED TV with good sound system • Face Mask • Hand kerchief	Class Room/ Plumbing Lab
Tools, equipment and instruments for installation	**The students will be able to:** • State the tools required for installation • Select place for installation of solar water heater system.	• Select the place for installing solar water heater in groups • Identify and select tools and equipment required for installation	06 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Magnetic needle • Water measuring utensils • Ladder • Measuring tape • Watch • sprit level • extension leads • flexible spanner • pressure gauge • oil • drill machine with bits • thermometer • plier • knife • pipe cutting saw • pipe wrenches	Class Room / Plumbing Lab

Installation of Solar water heating system	**The students will be able to:** • State the stepwise procedure of water heating installing system • Define auto controller. • State the procedure of installing auto controller • State the instructions for first time running of solar water heating system • State the procedure of checking of solar water heating system	• Draw and mark layout of solar water heating system • Install solar water heating system as per layout • Install auto-controller • Practice of test run • Checking the whole system • Practice of uninstalling and reinstalling of whole system	17 Periods(T) 39 Periods(P) (33 Hours ,20 Min)	• Magnetic needle • Water measuring utensils • Ladder • Measuring tape • Watch • sprit level • extension leads • flexible spanner • pressure gauge • oil • drill machine with bits • thermometer • plier • knife • pipe cutting saw • pipe wrenches	Class Room / Plumbing Lab
Chapter 6 (X)					
Ch.6 Health and Safety for Solar Water Heating System				**16 Periods (T = 08, P= 12)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Introduction of safety for solar heating system.	**The students will be able to:** • Learn safety concept of solar water heating systems. • Learn Importance of safety for a solar water heater. • Learn about Handling of glass parts • and safety of electric and electronic parts	• Demonstrate handling of glass parts of solar water heater. • Demonstrate safety of electric and electronic parts of SWH.	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Complete solar water heater system	Class Room / Plumbing Lab
Introduction and importance of pressure relief	**The students will be able to:**	• Demonstrate PRV and temperature relief device.	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• PRV and temperatur	Class Room / Plumbing Lab

valve and temperature relief device.	• Learn about function and importance of pressure relief valve and temperature relief device.	• Practice on working of PRV and temperature relief device.		e relief valve	
Maintenance and safety consideration	**The students will be able to:** • Learn about preventing scaling and corrosion. • Learn about periodic inspection • Describe hazards associated with solar water heating installation and maintenance.	• Practice on old scaling corrosion tubes. • Insulation practice on pipes and wires.	02 Periods(T) 03 Periods(P) (03 Hours 20 Minutes)	• Old parts of solar water heater • Tools for removal of scaling and corrosion.	Class Room / Plumbing Lab
Freezing and overheating hazards.	**The students will be able to:** • Learn about freezing phenomena in a solar water heater. • Learn about over heating of SWH • Learn about use of antifreeze solution.	• Practice on antifreeze solution and its testing on low temperature. • Testing of heat control device for prevent overheating.	02 Periods(T) 03 Periods(P) (03 Hours ,20 Min)	• Complete SWHS with extra anti freezing solution and heat control device.	Class Room / Plumbing Lab
Chapter 7 (X)					
Ch.7 Soft Skills				**25 Periods (T = 14, P =11)**	
Theme/Content	**Students' Learning Outcome**	**Activities/Practical**	**Duration**	**Tools**	**Workplace**
Introduction to soft skills	**The Students will be able to:** • know the basic soft skills • understand the importance of soft skills in daily life • apply soft skills for academic and professional success	• Group Discussion and model presentation on soft skills	02 Periods (T) 02 Periods (P) (02 Hour ,40 Min)	• Multimedia or LED TV with good sound system	Classroom
Personal Development	**The Students will be able to:** • learn the personal and professional aspects of life.	• Role play to enhance self-awareness, self-confidence and self-image	2 Periods (T) (01 Hour ,20 Min)	• Multimedia or LED TV with good sound system	Classroom

	• understand the importance of self-image. • develop self-confidence				
Interpersonal and Communication Skills	**The Students will be able to:** • know model of communication. • realize importance of active listening and responding. • understand effective communication. • identify obstacles in communication.	• Role play, group exercises through listening audio or video documentaries. • Dialogue amongst students to reflect verbal and non-verbal communication.	2 Periods (T) 1 Period (P) (02 Hours)	• Multimedia or LED TV with good sound system	Classroom
Teamwork and leadership	**The Students will be able to:** • know the importance of teamwork in a professional environment. • understand the concept of teamwork and leadership.	• Organize a welcome party/ birthday party and/or a national event	2 Periods (T) 1 Period (P) (1 Hours ,20 Min)	• Multimedia or LED TV with good sound system	Classroom
Time Management	**The Students will be able to:** • Know the concept of better time management. • observe time management in daily life • understand professional and personal time management.	• Arrange Outdoor Tour to a nearest venue observing time management • Schedule the tasks.	02 Periods (T) 03 Period (P) (03 Hours 2,0 Min)	• Multimedia or LED TV with good sound system	Classroom
Attention to detail	**The Students will be able to:** • Understand guidelines of attention to details. • understand the advantages of attention to detail in work and studies. • give attention to details to perform their tasks in an effective manner.	• Practically apply the 5 methods of attention to detail. • Through different exercises enhance the attention to detail skill.	02 Periods (T) 02 Periods (P) (2 Hours ,40 Min)	• Multimedia or LED TV with good sound system	Classroom

Attitude, behavior, and customer care	**The Students will be able to:** • learn the concepts of attitude and behavior • understand the impact of positive and negative attitude in daily life.	• Through different scenarios practically apply the principles of customer care and positive attitude. • Exercise and deal with problematic and angry persons by conducting role plays.	02 Periods (T) 02 Periods (P) (02 Hours ,40 Min)	• Multimedia or LED TV with good sound system	Classroom

5.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%.

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.

6.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.

7.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 and learning.
- Provide website links for further research.

8. 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.

9. Basic Requirements for Plumbing Lab (Tools/Equipment):

1. Adjustable wrench 6",8",12"
2. Pipe Bender Machine Hydraulic complete set
3. Chisel set
4. Trowel
5. Electric Drill machine (hammering with healti)3/4"
6. Die (Ratchet), Die Fix 1/2,3/4,1,2
7. Tape and Die.
8. Extension board 10-meter 2 core
9. First Aid box
10. Gloves lather, rubber
11. Safety goggles Plastic, glass
12. Hand Electric Grinder Electric Wall Cutter
13. Grip plier 10"
14. Hammer 250gm,500gm,1000gm,1500gm,2000gm
15. Hand bit ¼", 3/8"
16. Helmet ABS Material
17. Hacksaw 12" with blade
18. Spirit Level 6",12",8"
19. L-key set Star L key Set
20. Measuring tape 3meter ,10 meter
21. Pipe wrench ,10",12",14",18"
22. Plier
23. Long nose plier.
24. Pipe cutter (½"- 2")

25. PPRC Heater 750W to 1000W
26. PPR cutter
27. G.I cutter.
28. Tubing cutter.
29. Safety boots (Shoes)
30. Screw driver set (6”,8”,10”,12”)
31. Spanner set (6mm to 24mm)
32. Line testing pump (leakage) (Hand type)
33. Tools box iron+3 draws
34. Torch Chargeable
35. Vice with iron stand(2nos)
36. Compass Spring type 8”
37. Solar Water Heater (Complete Set) Different denominations with different types i.e., pressurized and gravity based thermosyphon.
38. Water Filling Pumps Centrifugal pump ½” Reciprocating 1/2
39. Pipe Insulation Material
40. Caulking tools.
41. Ladle
42. Melting pot.
43. Bench Vice 5” with bench
44. Oil Can
45. Center Punch
46. Hand bit tool
47. Wire Brush
48. Broom.
49. Vernier caliper.
50. Hand grinder.
51. Pipe Reamer
52. Gi Pipe (½”,3/4”,1”)
53. Gi fitting ½”,3/4”,1” (Elbow, tee, socket etc.)
54. PPRC pipe 25mm,32mm
55. PPRC fitting 25mm,32mm
56. PVC pipe 2”,3”,4”
57. UPVC 2”,3”,4”
58. P trap 4”
59. Solution PVC
60. All types of valves ½”,3/4”,1”
61. Plastic Pipe ½”,3/4”,1”

10.Curriculum Development Committee :

The following members participated in the Curriculum development Committee:

SN.	Name	Designation	Organization
1.	Engr. Azhar Iqbal	Principal	GCT, Raiwind Road, Lahore.
2.	Mr. Imtiaz Awan	Sr. Instructor	, GCT Rasul, Mandi Bahauddin.
3.	Mr. Amjad Rafique	Principal,	GCT Rasul, Mandi Bahauddin.
4.	Engr. Arsalan Hameed Khan	Assistant Manager	P & P Department, LWMC, Lahore.
5.	Engr. Rebab Maria Mehmood	Site Engineer,	IMC, Lahore.
6.	Mr. Adnan Shaukat	Instructor,	FIT, Rawalpindi.
7.	Mr. Inam Ul Haq	Instructor,	CTTI, Islamabad.
8.	Muhammad Nasir Khan	DACUM Facilitator	Islamabad.