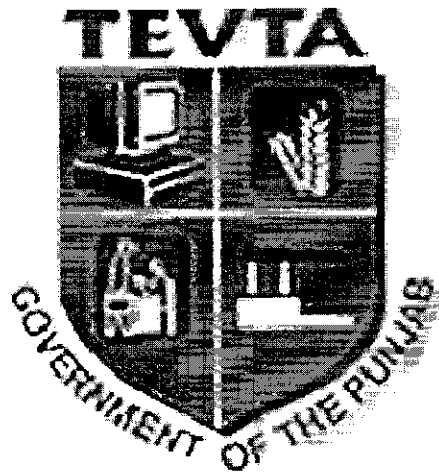


GOVERNMENT OF THE PUNJAB
**TECHNICAL EDUCATION & VOCATIONAL
TRAINING AUTHORITY**

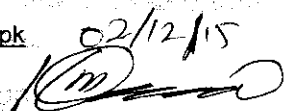


CURRICULUM FOR
Water Treatment Technician
(03 - Months Course)

Evaluated December, 2015

CURRICULUM SECTION
ACADEMICS DEPARTMENT

96-H, GULBERG-II, LAHORE
Ph # 042-99263055-9, 99263064
gm.acad@tevta.gop.pk, manager.cur@tevta.gop.pk

02/12/15


TRAINING OBJECTIVES

In order to achieve standards of water treatment process skilled staff is required to run such plants in both industrial and domestic sectors.

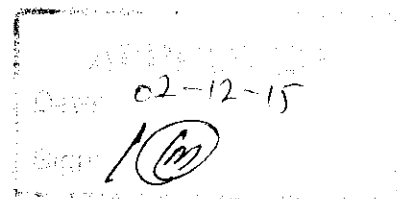
This training program will provide opportunity to the participants who are desirous to equip themselves with such theoretical knowledge and practical skill which will help them for employment and to meet the need of the national industry as well as domestic job market.

This curriculum is developed by considering the requirement of the local market to reduce the shortage of semi-skilled workers in the area.

At the end of the course a trainee will learn about water treatment principles, best practices, processes, equipments, use of different procedures, operation & maintenance, testing & troubleshooting etc.

CURRICULUM SALIENTS:

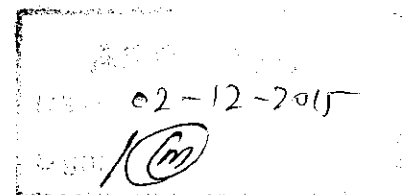
Entry Level	Matric with Science
Total duration of course	03 Months
Total Training Hours	400 hours
Weekly Hours	40 Hours per week (maximum)
Training Methodology	Practical: 80%
	Theory: 20%
Medium of instruction	Urdu / English



KNOWLEDGE PROFICIENCY DETAILS:

On successful completion of this course, the trainee would have attained the following knowledge:-

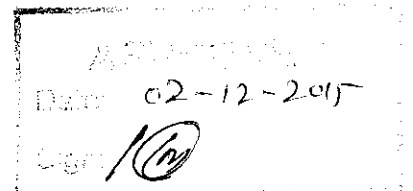
1. Define Water Chemistry and Basic Properties
2. Explain Water born impurities and contaminants including micro-organism
3. Interpret Health Impact of Water Contaminants
4. Describe Water Quality Standards and Regulations
5. Handling and use of chemicals to be used in Water Treatment Processes
6. Understand the treatment equipments & plants, their Operations & Maintenance
7. Recognize the Conventional Water Treatment Technologies e. g Reverse Osmosis, Ion Exchange, Distillation & etc.
8. Identify Wastewater Treatment and Rejected Water



SKILL COMPETENCY DETAILS:


On successful completion of this course, the trainee would have attained the following skills:-

1. Apply Water Chemistry and Properties
2. Eliminate Micro-Organisms and Other Contaminants found in water.
3. Demonstrate the causes of taste and odors in water.
4. Deal with the problems associated with high level of the chemicals constituents: chlorides, iron, manganese, nitrates, and sulphates
5. Implement Federal and State Regulations for Water Quality
6. Use Treatment Technologies used in Water Treatment
7. Align Filters, Housings, Parts of RO Plant & Distillation Plant
8. Perform Plants Troubleshooting.
9. Demonstrate Procedure & Operations Treatment Plants
10. Apply Safety Measures and Identifications
11. Clean the Equipment for Next Batch Preparation
12. Test the Quality Check of the Water and Resulting Products
13. Demonstrate Wastewater and Rejected Water Treatments




CURRICULUM DELIVERY STRUCTURE

	Curriculum Delivery	Make Up Session	Revision	Final Test	Total
WEEK	1-10	11	12	13	13
	10	1	1	1	

Date: 02-12-2015
 Sign: 

SCHEME OF STUDIESWater Treatment Technician
03-Months

Sr. No.	Main Topics	Theory Hrs.	Practical Hrs.	Total Hrs.
1.	Basic Water Treatment Theory	8	--	8
2.	Water Quality Standards	6	--	6
3.	Water Impurities (e.g Micro-organisms & others)	8	16	24
4.	Water Treatment Conventional Processes	8	32	40
5.	Other / Advanced Treatment Processes	8	32	40
6.	Disinfection	6	8	14
7.	Mechanical, Electrical, Instruments & Control Equipments	4	56	60
8.	Operation & Maintenance Procedures	--	60	60
9.	Troubleshooting	--	32	32
10.	Safety	8	20	28
11.	Testing Procedures & Quality Control	8	48	56
12.	Waste Water Treatment	10	8	18
13.	Documentation/Record Keeping	6	8	14
Total		80	320	400

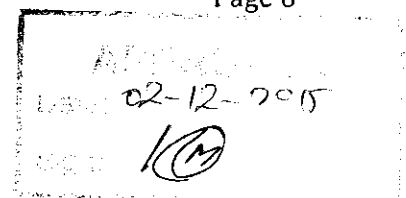
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DETAIL OF COURSE CONTENTS

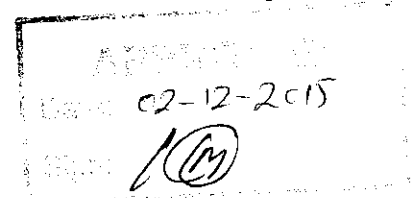
Water Treatment Technician

03 Months

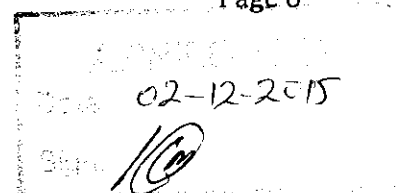
Sr. No.	Detail of Topic	Theory Hrs.	Practical Hrs.
1.	Basic Water Treatment Theory 1.1 Water Chemistry & Basic properties 1.2 Water Classification by Source 1.3 Water Physical, Chemical & Biological Characteristics 1.4 Water Terminology, Glossary and Unit, Formula Conversion Table	8	--
2.	Water Quality Standards 2.1 National & International Drinking Water Standards 2.2 Industrial Process Water Criteria (Food & Beverages, Pharmaceuticals, Hospitality, Chemical industry, Textile, etc.)	6	--
3.	Water Impurities (e.g Micro-Organisms & Others) 3.1 Sources of Contamination in Water 3.2 Nature of Micro-Organisms (Bacteria, Protozoa, Viruses, Algae) 3.3 Inorganic and Organic Impurities 3.4 Health Impacts	8	16
4.	Water Treatment Conventional Processes 4.1 Screening 4.2 Coagulation, Flocculation & Sedimentation 4.3 Hardness Removal 4.4 Water Softening (Lime Soda, Ion Exchange, etc.) 4.6 Media Filtration	8	32




	4.7 Distillation		
5.	Other / Advanced Treatment Processes 5.1 Membranes Processes (e.g Micro Filtration, Ultra Filtration, Nano Filtration, Reverse Osmosis) 5.2 Advanced Oxidation Processes (AOPs) 5.3 Carbon Adsorption 5.4 Aeration	8	32
6.	Disinfection 6.1 Chlorination 6.2 Ultraviolet Radiation (UV) 6.3 Ozonation	6	8
7.	Mechanical, Electrical, Instruments & Control Equipments 7.1 Columns 7.2 Vessels / Housings 7.3 Pumps & Motors 7.4 Chemical Dosing Pumps 7.5 Filters (Cartridge ,Bag, etc) 7.6 Membranes 7.7 Feed / Treated Water storage Tanks 7.8 Ozonator 7.9 Meters (pH, Rota, ORP, Conductivity, etc) 7.10 Totalizers 7.11 Ultra Violet Lamp 7.12 Electrical Control Panel (PLC base)	4	56
8.	Operation & Maintenance Procedures 8.1 Plant Operation (Manual / Automatic Plants) 8.2 Startup & Shut Down Procedure 8.3 Full Scale Plant Operation 8.4 Filter Cleaning Procedure	--	60



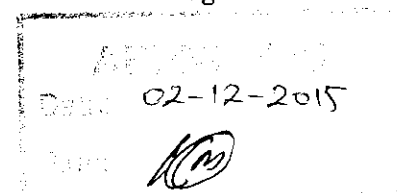
	8.5 Membranes Cleaning system 8.6 Flushing Procedure 8.7 Anti Scalant Dosing Procedure 8.8 Microbial Biocide & Acid Dosing		
9.	Troubleshooting 9.1 Early or Delay 9.2 Malfunctioning in Equipments	---	32
10.	Safety 10.1 Responsibility for Safety 10.2 Personal injuries –First Aid 10.3 Plant Safety 10.4 Precautions for Electrical Maintenance 10.5 Chemical Handling & Storage 10.6 Safety Practices in Work Area 10.7 Fire Protection	8	20
11.	Testing Procedures & Quality Control 11.1 Determination of pH, TDS, Total Hardness) 11.2 Determination of Flow Measurement (Flow meter, V-Notch, Rota Meter) 11.3 Determination of Color, Temperature & Odor 11.4 Demonstration of Jar Test on Water Sample 11.5 Determination of Hydroxide alkalinity 11.6 Determination of P,M and OH alkalinity 11.7 Determination of Sulphite, Phosphate 11.8 Determination of Bacteria 11.9 Determination of Chlorine, Total and free 11.10 Determination of Arsenic 11.11 Determination of Fluoride 11.12 Determination of Iron 11.13 Determination of BOD and COD	8	48



12.	Waste Water Treatments 12.1 Introduction 12.2 Sources of Wastewater 12.3 Preliminary Treatments 12.4 Primary Treatments 12.5 Secondary Treatments 12.6 Tertiary / Advanced Treatments 12.7 Rejected Water Treatment	10	8
13.	Documentation/Record Keeping 13.1 Purpose 13.2 Record Systems 13.3 Maintenance Log Book (Daily, Monthly, etc) 13.4 Sample Record Worksheets 13.5 Water Analysis Report Sample 13.6 Process & Instrumentation Diagram - P &ID	6	8
TOTAL		80	320

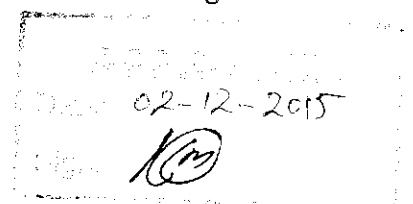
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Sr. No.	LIST OF PRACTICALS
1.	Determination of pH
2.	Determination of Color, Temperature in water sample
3.	Determination of Flow Measurement (Flow meter, V-Notch, Rota Meter)
4.	Determination of Solids (TDS, TSS, VSS)
5.	Demonstration of Jar Test on Water Sample
6.	Demonstration of Total Hardness (Carbonate , Chloride etc)
7.	Determination of Alkalinity (Hydroxide, Phenolphthalein & Methyl orange)
8.	Determination of Turbidity of Water sample
9.	Determination of Dissolved Oxygen in water sample
10.	Determination of Coliform Bacteria
11.	Determination of BOD and COD
12.	Determination of inorganics(Iron, Fluoride, Arsenic etc)
13.	Preparation of Different Chemical Reagents
14.	Preparation Standardization of Acid-Alkali Solutions



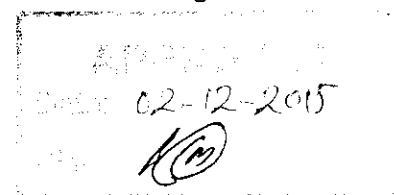
LIST OF LAB

- Wastewater Lab / Chemistry Lab / Water Lab

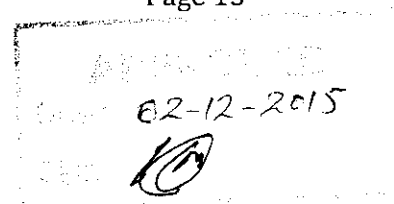


LIST OF TOOLS, MACHINERY & EQUIPMENT

Sr. No.	Nomenclature of Equipment /Tools	Quantity
1.	Columns Specification: Various Sizes e.g. 1- 5 inch in diameter & 2 – 3 feet Length	02 Nos.
2.	Vessels / Housings Specification: For 1 & 5 Micron Filter	02 Nos.
3.	Filter (Cartridge & Bag) Specification: Rating 1 & 5 Micron with 10", 20" length	1+1+1
4.	Water Pumps Specification: Flow rate: 1- 5 L /Hr, Power: 220 Volts	01 No.
5.	Chemical Dosing Pump Specification: 1- 3 L / Hr, PVDF/PVC Head	01 No.
6.	Reverse Osmosis Plant Specification: Flow rate: 1 -75 GPD, Storage Tank Capacity: 4. 5 Gallons. Power 220 Volts	01 No.
7.	Distillation Plant Specification: Batch size,Flow:0.1 – 20 L, Power 220 Volts	01 No.
8.	Conductivity Meter Specification: Measuring Range: (0.00~20.00) μ S/cm, operation condition: 5 ~ 35 °C	01 No.
9.	pH Meter & TDS Meter Specification: 0 – 14 pH, Accuracy : \pm 0.1 pH, 0 – 1000 TDS	01 No.



10.	Jar Test Apparatus Specification: Jar Tester with SS Rods, 10 - 300 rpm speed, Timer Function.	01 No.
11.	COD Digestion Apparatus Specification: Temperature range: Above ambient to 150 C, Display: Digital 12 mm rod LED, Heater rating: 750 Watts.	01 No.
12.	Lab Oven: Specification: Temperature: 250 °C, Thermostat, SS walled, Work on 220 /230 volts A.C etc.	01 No.
13.	Ozonator Specification: Flow rate 0.5 – 7 GPH preferably with flow meter, 220 Volts	01 No.
14.	Ultra Violet Lamp: Specification: Flow Rate: 1 GPM, Regular Lamp: UVS-11W	01 No.



Sr. No	List of Consumable / Replaceable / Spares	Quantity
1.	Water Test Kit	01 No.
2.	Installation & Fitting Kit	01 NO.
3.	Pretreatment Chemicals ,Anti Scalant, Disinfectants, Resin, Filters etc	Quantity depend upon raw water quality & quantity
4.	Ultra Violet lamp (Spare)	01 No.

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REFERENCE BOOKS

1. Principles of Environmental Engineering and Science by Mackenzie L Davis; Susan J Masten.
2. Standard Methods for the Examination of Water and Wastewater, 1998, 14th Edition.
3. Wastewater Engineering - Treatment and Reuse Metcalf & Eddy (4th edition) 2004.
4. Quality Assessment Water and Wastewater Technology, Hammer, Mark. J, 2012.
5. Fundamental of wastewater engineering by Riff at, 2013.
6. Membrane Technology in Water & wastewater Treatment, Hills .P, 2000.
7. Pharma Guide
8. British Pharmacopeia
9. Us Pharmacopeia
10. ISO Standards (ISO 22000)
11. Standard Operating Procedures for Water Treatment and Distillation Plant (in-house)
12. Any other related material available on interne

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MINIMUM QUALIFICATION OF INSTRUCTOR

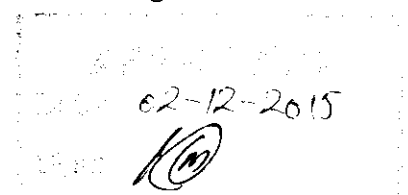
B.Sc Chemical Engineering/ Environmental Engineering/Sciences or relevant subject with 03 years' experience of working in the industry /teaching

Or

Any chemist with MSc Chemistry / Pharm D degree and teaching experience of 03 years

Or

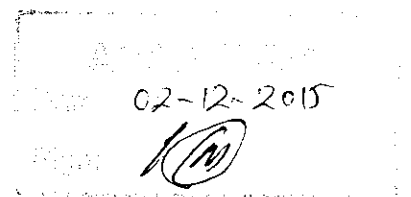
DAE with minimum 05- years' experience of Water treatment of working in the industry/ teaching



EMPLOYABILITY OF PASS-OUTS:

The pass-outs of this course can find jobs / employment opportunities in the following sectors / areas.

1. Pharmaceutical, Food & Beverages, Breweries Industries
2. Mineral Water Production Industries
3. Domestic Water Filtration Plant Installation & Repair Industries
4. Hospitality (Hotel, Restaurants, Swimming Pool) Industries
5. Private water & wastewater treatment consultant Companies
6. NGOs (Working in Areas of Water Treatment)
7. Boilers Feed Water, Textiles, Hospitals, Automobile, and Battery, Fertilizers
8. Oil & Gas Sector



Curriculum Evaluation Committee

- | | |
|--|-----------------|
| Dr. Irfan Ahmad Sheikh,
1. Assistant Professor, College of Earth &
Environmental Science, University of the Punjab,
Lahore, Pakistan | Convener |
| Miss Nabeela Firdous
2. Ex-Deputy Manager, Water Engineering &
Management Services (Pvt) Ltd. Lahore | Member |

