1	Name of Course	**C.C.in Operator Chemical Plant (307102)**
2	Max.Nos. of Student	25 Students
3	Duration	6 Months
4	Type	Full Time
5	Nos Of Days / Week	6 Days
6	Nos Of Hours /Days	7 Hrs
7	Space Required	Laboratory = 1000 Sq feet Class Room = 200 Sq feet **TOTAL = 1200 Sq feet**
8	Entry Qualification	**S.S.C.+ Any Course in Chemical Group of MSBVEE**
9	Objective Of Syllabus/ introduction	Awareness of Safety precautions Knowledge of Engineering skill, use of tools in assembly Awareness of Chemical Plant. Awareness of Maintenance in Chemical Plant. Awareness of Instrumentation. Awareness of Basic Fitting, Turning & Machining.
10	Employment Opportunity	The trainee will either to be able to take up jobs with agencies which Develop, Maintain, Repair Chemical Plant. Work as or with working experience will be in a position to start his own independent Business.
11	Teacher's Qualification	Diploma in Chemical Engg. With 3 year Teaching experience in Operator Chemical Plant.
12	Training System	Training System Per Week

Theory	Practical	Total
12 Hours	30 Hours	42 Hours

13 Exam. System

Sr. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks
1	**30710211**	Operator Chemical Plant	TH-I	3 hrs	100	35
2	**30710221**	Basic Refrigeration & Air Conditioning & Laboratory Technician.	PR-I	3 hrs	100	50
3	**30710222**	Operator Chemical Plant	PR-II	6 hrs	200	100
		TOTAL			**400**	**185**

SYLLABUS

Operator Chemical Plant

Practical - II	Theory - I
Introduction to safety equipment and their uses etc. Awareness of First aid, fire fighting equipments & hydrant system, MSDS, PPEs.	Importance of safety & general precautions observed. In the workshop. Role of maintenance mechanic in the chemical Indus-tires. Course contents, duration. Rules pertaining facilities available in the institute medical library and gymkhana.
Physics (1) To study triangular and parallelogram of (2) Determination of efficient of static friction using inclined plan (3) Determination of mechanical advantage. Velocity ratio & % efficiency of simple (4) Determination of acceleration due to gravity by simple pendulum (5) Determination of young's modules by Searle's apparatus	Objectives procedure apparatus required explanation & calculation involved in the experiments.
(l) Determination of coefficient opf expansion of solid and liquid. (2) Determination of co-efficient of thermal conductivity of metal rod (3) Determination of rotation constant of optically active substance by polarimeter.	Objectives procedure apparatus required explanation & calculation involved in the experiments
(1) To study of Ohm's Law and Kirchoffs Law about current and Voltage (2) To study of electric Cell using series and parallel connections. (3) Determination of specific resistance using Wheat stone's bridge (4) Verification of Faraday's 1st Law of electrolysis. (5) Determination of mechanical equivalent of heat using electrical method.	Objectives procedure apparatus required explanation & calculation involved in the experiments.
Chemistry Separation of mixture by distillation	Objectives procedure apparatus required explanation & calculation involved in the experiments.
Preparation of following (a) Soap (b) Nitrobenzene (c) Aniline (d) Copper sulphate (e) Ferrous ammonium & sulphate	Objectives procedure apparatus required explanation & calculation involved in the experiments.
To study the allotropic forms of sulphur.	Objectives procedure apparatus required explanation & calculation involved in the experiments.
To study of properties of mixture (Fe+S) and	Objectives procedure apparatus required

compound(Fes)	explanation & calculation involved in the experiments.
To study action of pure and salt water on metal and alloys.	Objectives procedure apparatus required explanation & calculation involved in the experiments.
To study action of acids and bases on metals alloys.	Objectives procedure apparatus required explanation & calculation involved in the experiments.
To study the corrosion of metal.	Objectives procedure apparatus required explanation & calculation involved in the experiments.
Volumetric analysis. Qualitative analysis (Inorganic) (Simple with out interfering radicals). Determination of flash point.	Objectives procedure apparatus required explanation & calculation involved in the experiments.
Use and maintenance of lagging materials such as glass wool, thermocol etc.	Lagging materials, types and uses.
(1) Installation of venturimeter orifice meter and Rota meter. (2) Determination of viscosity of liquids by viscometer.	Procedure of installing venturimeter orifice and rotameter precautions to be observed.
To Determine Reynolds's number at different velocities.	Procedure of installing venturimeter orifice and rotameter precautions to be observed
Determine friction losses in a straight pipe fitting, valve.	Procedure of installing venturimeter orifice and rotameter precautions to be observed
To calculate overall heat transfer co-efficient for a cell and tube heat exchange.	Procedure of installing venturimeter orifice and rotameter precautions to be observed
To find rate of evaporation of vertical tube of evaporator.	Procedure of installing venturimeter orifice and rotameter precautions to be observed
Separation of a liquid mixture by distillation using Packed tower.	Procedure of installing venturimeter orifice and rotameter precautions to be observed
Flooding velocity experiment using a packed tower made of glass.	Procedure of installing venturimeter orifice and rotameter precautions to be observed
Finding rate of drawing curve by tray drier. Calibration of resistance thermocouple. Experiment on a level measurement	Procedure of installing venturimeter orifice and rotameter precautions to be observed
Operation of : (1) Plate and frame fitter press. (2) Top driven centrifuge (3) Ball mill (4) Blake jaw crusher	Construction, principle, trouble, shooting and precautions to be observed during operation of the equipments. Sketches of the equipment.
(1) To carry out sieve analysis with sieve shaker. (2) Operation of a mixture settler. (3) Operation of a spray extraction tower. Calibration of Bi-metallic	Procedure of conducting experiments calculation and precautions to be observed sketch of the equipment.
Calibration 0f Bourdon tube pressure gauges. (1) Manometers Calibration of mercury in glass thermometer.	Units of pressure, measurements of pressure by different methods.Temperature, its units and different methods of measurements.

Basic Refrigeration & Air Conditioning & Laboratory Technician.

Practical - I
a- Use of refrigeration service tools, their care & safety. b- Cutting, bending And Joining of copper tubing, flaring, swaging,pinching & silver soldering. c- Identification of refrigeration system
a- Dismantling of Commercial type reciprocating compressor, Checking components & parts. b- Cutting gasket of compressor. Testing efficiency of compressor.
a- Study & type of semi rotary, centrifugal & screw type compressor. b- Study, testing & servicing of air cooled condensers, evaporators, expansion valves & pressure switch
a- Handling of gas cylinders, transfer of refrigerant, gas charging, tests leakage in the system. b- Oil charging to compressor, installing compressor, cooling coil & condenser of refrigeration unit.
a- Study types & checking of window, split type air conditioner & their fault finding. b- Study types & checking of water cooler, deep freezer, ice candy plant.
a- Study types & checking of air cooler, room cooler & desert cooler. Study type & servicing of heat exchanger.
a- Study types & checking of cold storage, cooling tower, water softening & iron removing plants. b- Study types & servicing of fans, blowers, dampers, air filters and humidifiers.
Types, application & use of Gas welding, setting up of flames. Lighting & adjustment of oxyacetylene flame & fusion runs with & without filler rod on 2 to 3 mm thick M.S. sheet Lap & T Fillet joints on MS sheet 3 mm is flat position (gas). Brazing on MS & Copper.
A - Safety precaution to be used in laboratory. B - Volumetric analysis- types of titration. Analysis of acids bases & salts.
A - Young's modulus, law of parallelogram, thermal conductivity of metals. B - Faraday's laws of electricity. Study of electric cells-series & parallel connections.
A- Organic preparations- etherification, supranational, nitration, oxidation, reduction, hydrolysis & saponification. B- inorganic preparation- alum, Mohr's salt, copper sulphate, potassium nitrate
A- Oil analysis- acid value, saponification value, estimation of sugar by Lane's method, glucose by iodometry, fat by Soxhlet`s method. B- Analysis of organic compound-elements present, group location.
A- Microbiology-study of staining, size if micro organism, total plate count. B- Types of distillation for liquid. Purification of substances using different techniques, sublimation error
A-Determination of melting, boiling, flash, pour & freezing points of liquids. B-Alloy analysis-bauxite, brass.
A- Gravimetric analysis, inorganic qualitative analysis. B- Raw, DM/ DI, distilled, boiler & cooling water analysis.
Principle, handing & procedure to use following laboratory equipments-balances, viscometer, surface tension apparatus, pH meter, turbidity meter, conductivity meter, microscope, refractrometer, hydrometer, thermometer, alcohol meter, Pykno meter, electrolytic analyzer, polar graph. Orsat apparatus, IR moisture balance, specific job analyzer.

List of Tools & equipments : Attendant Operator (Chemical Plant)

Sr No	Particulars	Quantity
1	**2**	**3**
	For Unit Operation Laboratory	
1	Venturimeter	01
2	Orificemeter	01
3	Rotameter	01
4	Centrifugal pumps - 2 Nos	02
5	Gear pump	01
6	Reynolds experiment equipment	01
7	Shell and tube heat exchanger	01
8	Boiler	01
9	Vertical tube evaporator	01
10	Packed distillation column	01
11	Packed tower of glass for flooding velocity experiment	01
12	Plate and frame filter press	01
13	Top - driven centrifuge	01
14	Rotary vacuum filter	01
15	Tray drier	02
16	Hammer Mill	01
17	Ball Mill	01
18	Black jaw crusher	01
19	Mixer-settler type extractor	01
20	Spray extraction tower	01
21	Viscometer	04
22	Lobe blower for filter press	01
23	Weighing machine	01
24	Multistage compressor fitted with inter-coolers and after coolers	01
25	Sieve shaker and sieves	01 set

	For Physics Laboratory	
26	Physical balance (with weight box)	01 set
27	Chemical balance (with weigh box)	03 sets
28	Viscometer (a) CS Wald Viscometer (b) Redwood viscometer (c) Stop watch(1/10th Second) (d) Thermostatic bath	 3 pieces 3 pieces 6 pieces *2* pieces
29	Stalagnometer	6 pieces
30	Travelling microscope	03
31	Specific gravity bottle	06

32	Pyknometer	06
33	Mechanical board for testing triangle and parallelogram of forces including all accessories	6 sets
34	Spirit level	3 sets
35	Inclined plane with pulley, pan, weights etc	2 sets
36	Simple machines (wheel and axel), Screw jack inclined plane with roller or trolley, pulleys or pulley blocks for first, second and third system of pulleys)	1 set
37	Different types of levers	1 set
38	Instrument for determining 'g' (simple pendulum)	2 sets
39	Barometer	01
40	Altimeter	01
41	Searle's apparatus for young's module	02 sets
42	Nicolson Hydrometer with glass jar	02 sets
43	Wet and dry bulb thermometer	02 sets
44	Apparatus for measurement specific heat of solid and liquid (Regnaults Apparatus)	2 sets
45	Apparatus for measurement of co-efficient of expansion (thermal) of solid and liquid.	2 sets
46	Apparatus for measurement of thermal conductivity of good and bad conductors.	2 sets
47	Salorimeter for determining 'Soules' Mechanic equivalent of heat and specific heat.	4 sets
48	Thermometers : (i) 0 to 11 C (ii) 0 to 36 C (iii) 0 to 250 C	 2 dozen 1 dozen 1 dozen
49	Polarimeter with monochromatic light	2 sets
50	Abbe refractometer	2 sets
51	Fulfrish Refractometer	2 sets
52	Equipment to study Kirchoffs law and electro chemical equivalent	1 set
53	Potentiometer	2 sets
54	Wheatstone's bridge	2 sets
55	Resistances centre zero Galvanometer	4