1	Name of Course	**C.C. in Attendant Operator (307105)**
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. Awareness of Instrumentation. Awareness of Fundamental of General Chemistry, physics & Operation Process.. Awareness as Attendant Operator
10	Employment Opportunity	The trainee will either to be able to take up jobs with agencies which Develop, maintain, Work as Attendant Operator or with working experience will be in a position to start his own independent Business.
11	Teacher's Qualification	Diploma in Chemical Engineering.
12	Training System	Training System Per Week **Theory**: 12 Hours; **Practical**: 30 Hours; **Total**: 42 Hours
13	Exam. System	

Sr. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks
1	**30710511**	Attendant Operator	TH-I	3 hrs	100	35
2	**30710521**	Fundamental of General Chemistry, physics & Operation Process.	PR-I	3 hrs	100	50
3	**30710522**	Attendant Operator	PR-II	6 hrs	200	100
		TOTAL			**400**	**185**

SYLLABUS

Attendant Operator

Practical- II	Theory - I
To determine Reynolds No. at different velocities Determine frictional losses in a straight pipe, pipe fitting, valvs Study of head vs capacity curve for pumps	Mechanism of Fluid Flow, nature of fluid, Reynolds number, Bernoulli's Theorem, losses due to friction, contraction, enlargement and fitting, various meters for fluid flow, control of flow and its use. Transportation of fluids. Classification, Principle and function of pumps, blower fan compressors and conveyor elevators, pneumatic transportation - Pressure and vacuum, Different types of valves and pipe fittings
Calculate overall heat transfer coe. For a shell & tube heat exchanger.	Mechanism of Heat Transfer in solid, liquid and gases and their application in industries Different types of transfer equipment-Heat exchangers, coolers, condenser and chillers Different types of boiler, steam traps, Reboilers, heaters, vaporizers, Funnels Kilns Fouling of heat transfer surfaces-maintenance of heat exchange equipment,
To To find rate of evaporation for vertical tube evaporator.	Capacity, steam economy of evaporators Surface and contact condensers, barometric condensers, Vacuum Producing devices-Steam jet ejectors, Vacuum pumps, Multi effect evaporation and methods of feeding Vapor recompression
Sepaasepration of liquid mixture by distillation using packed tower	INTRODUCTION, VAPOR-LIQUID EQUILIBRIUM. BOILING POINT DIAGRAM, RAOULT'S LAW, HENRY'S LAW, RELATIVE VOLATILITY, CONSTANT BOILING MIXTURE, EQUILIBRIUM DIAGRAM, DISTILLATION METHODS, FLASH DIFFERENTIAL, RECTIFICATION, AZEOTROPIC, EXTRACTIVE, VACUUM. STEAM DISTILLATION BINARY AND MULTI COMPOUND DISTILLATION (BATCH & CONTINUOUS). DETERMINATION OF NUMBER OF PLATES BY MACEBEARER, PONCHAN-SAVARIT METHOD, MINIMUM TOTAL - OPTIMUM REFLUX RATIO. LOCATION OF FED PLACE,Q-LINE, TYPES OF DISTILLATION COLUMN, PLATE EFFICIENCY-OVERALL MURPHREE. POINT /LOCAL. FACTOR AFFECTING EFFICIENCY

Study To of spray extraction column	Introduction definition terms feed solvent extract solute raffinate selection of solvent to its properties application of extractions equipment used for extractions classification of equipment-single stage extraction -Agnited mixer, flow mixer settler multistage extraction Multistage mixer settler equipment spray towers packed towers perforated plate towers leaching introduction, field of application , leaching equipment , percolation tanks, counter current multiple contact , shanks system agitated vessels, turbine type agitator , Dorr agitator , oil extraction from oil seeds. Leaching- leaching equipment, percolation tanks. Counter current multiple contact, shanks system agitated vessels, turbine type agitator. Dorr agitator, oil extraction seeds.
Calculation of flooding velocity by using packed tower	Equipments used for absorption -columns, tower packing, flooding velocity, and method of stripping
Study of super saturation	Introduction method of super saturation and different types of crystallizes and their specific applications in industries.
Finding rate of drying by using tray dryer.	Theory, equilibrium moisture content, factors controlling constant drying rate , constant rate period falling rate period factor affecting rate of drying , types of dryers and their uses.
Operation of plate & frame filter press Operation of mixer settler	Introduction, classification of mixing equipments and it's applications, mixers for mixing Solid- solid, solid-liquid, solid-gas
Size education duction using ball mill, hammer mill. To carry out sieve analysis with sieve shaker.	Size reduction and screening, separation, Classification of crushing and grinding machineries, sedimentation - gravity session, cyclone separators Types, use of size reduction equipment i.e black jaw crusher ,hammer mill, ball mill.
Study of Conveyor, elevators	Conveyor, elevators Pneumatic transportation - pressure and vacuum
Determination of wet bulb & dry bulb temperature.	Theory of Humidification and different terms related to Humidification .Theory and different types of cooling towers
Study of refrigeration units	Vapor absorption and vapor recompression system, different types of refrigents and their properties and specific use in industries

To determine the purity of given H2SO4 acid sample	Manufacturing of sulphur by oxidation & reduction of hydrogen sulphide Manufacturing of sulphuric acid by contact process Manufacturing of producer gas Manufacturing of water gas
To determine the purity of given HNO3 acid sample Study expt. Study expt.	Nitrogen industries Manufacturing of Ammonia by synthesis gas Manufacturing of Nitric acid by ammonia oxidation process
To prepare soap from oil by laboratory method	Vegetable oil extraction method, sulfated fatty alcohol Paint & varnish Manufacturing of sugar from sugar cane Manufacturing of ethyl alcohol by fermentation method Manufacturing of pulp by sulfate process Manufacturing of paper from pulp Manufacturing of petroleum by refining process
To prepare bakelite from phenol & formal dehyde by lab. Method	Manufacturing of polyvinyl chloride, bakelite
1. Determine the COD of given water sample	1) Sources of water and water quality Water pollutants-Organic inorganic, Sediments, thermal, Radioactive, biological 2) Sources of water pollution 3) Treatment of water - purification, Sedimentation, Coagulation, Filtration, Sterilization (Physical and Chemical methods of Sterilization 4) Water Softening (Removal of hardness) - Boiling, Distillation, Clark's Method, Caustic soda process, Ion exchange
Determine the BOD of given water sample	5) Effluent, types & source of effluent 6) Effluent analysis (PH, COD, BOD, TSS, Clarity 7) Treatment of effluent 8) Types of equipments use for treatment
Determine the TDS of given water sample	9) Permissible standards 10) Air pollution 11) Types of pollutants 12) Sources of pollutants
Determine the TSS of given water sample	13) Effect of air pollution 14) Analysis of air pollutant 15) Equipment use for measurement and control of air pollution 16) Permissible standards

Cutting and threading of pipes. Bending and fitting of pipe as per drawing. Fitting of different types of pipe joints use of quick released coupling.	Pipe and pipe joints. Pipe bending fixture. Standard pipe threads. Tap and dies Standard pipefitting
Maintenance of globe valve, Gate valve, Stop cock, Non return valve, ball valve , needle valve, Plunger valve, Piston valve, Pneumatic valve, Electrical glass line button valve, butterfly valve Testing and fitting of different type of valves on pipe line .	truction and future of different types of valves. Metallurgy - Corrosion along with respect to corrosion. Selection of metal for chemical application. Lining material. Metal testing method destructive and non destructive.
Maintenance compressor, blowers, crushers, mixers and pulverizes	Construction use of compressor ,blower ,crusher, mixer, and pulverizes
Maintenance and assembly of different type of pump such as centrifugal pump, gear pump, plunger pump , vacuum pump , hydraulic pump, screw pump, and multistage pump Application of voice, RPM,	Type of pumps their construction details
Fitting of bearing such as ball bearing, roller bearing, bush bearing etc. Their care. Lubrication and maintenance . Removing bearing with bearing puller.	bearing their type material and use information about bearing removing and fitting kit. Lubricant and lubrication type of lubricant and method of lubrication . Properties of lubricant
On line training at relevant industries	VALVS- Pneumatically operated valve, electrically operated valve, rotary air lock valve , piston valve , solenoid valve ,plunger valve . PUMPS - Vacuum pump with mechanical seal,vaccum pump with normal gland packing, metering pump ,screw pump for viscous flow
On line training at relevant industries	HEAT EXCHANGERS - Multipass heat exchanger, Plate heat exchanger, spiral heat exchanger. Cooling tower. BOILER - Oil fire boiler, rice hark boiler, gas fire boiler. EXPLOSIVE METER FOR SAFETY - Gas detector ,smoke detector, fire alarm system, sprinklers system for safety

Practical: - FUNDAMENTALS OF GENERAL CHEMISTRY AND PHYSICS

Practical-1
To study triangular and parallelogram of force with the help of mechanical board. Determination of coefficient of static friction using inclined plane.
Determination of mechanical advantage velocity ratio and % efficiency of simple machine. Determination of acceleration due to gravity by simple pendulum.
Determination of Young's modulus by Searle's apparatus. Determination of coefficient of expansion of solid and liquid. Determination of coefficient of thermal conductivity of metal rod. Determination of specific rotation of optically active substance by a polarimeter.
To study Ohm's law and Kirchoff's law about current and voltage. To study electric cell using series and parallel connections. Determination of specific resistance using wheat stone's bridge. Verification of Faraday's First Law of electrolysis. Determination of mechanical equivalent of heat using electrical method
Volumetric analysis -> Acidimetric titration ->Alkalimetric titration ->Redox titration -> Precipitation titration. Iodometric titration Complexo metric titration
[A] Preparation of Chemicals -> To study the allotropic forms of sulphur. -> To study the properties of mixture (Fe+ S) and Compound (FeS) -> Preparation of aniline -> Preparation of copper sulphate -> To study Action of pure and salt water on metals and alloys -> To study action of acids and base on metals alloys

List of tools & Equipments

Sr. No.	Description	Qty.
01	Reynolds's Experiment equipment	01 Set
02	Shell and tube heat exchanger glass type	01 No.
03	Boiler (Electrically Heated)	01 No.
04	Vertical Tube Evaporator	01 No.
05	Packed tower of glass for flooding velocity experiment	01 No.
06	Top driven centrifuge	01 No.
07	Rotary vacuum filter	01 No.
08	Tray drier	01 No.
09	Hammer mill	01 No.
11	Ball mill	01 No.
12	Blake jaw crusher	01 No.

13	Mixer settler type extractor	01 No.
14	Spray extraction tower	01 No.
15	Multistage compressor fitted with inter cooler	01 No.
16	Sieve shaker and sieves	01 No.
17	Annular (for flow of fluids)	01 No
18	Vacuum pump with mechanical Seals	01 No
19	Vacuum pump with normal gland packing	1
20	Pneumatically operated valve	1
21	Electrically operated valve	1
22	Multipass heat exchanger	
23	Thermal mass flow meter	11
24	Magnetic flow (Rota meter)	1
25	Screw pumps for viscous flow	
26	Metering pump	1
27	Rotary air lock valve	1
28	Plate heat exchanger	1
29	Spiral heat exchanger	1
30	Glass Tube heat exchanger	1
31	Oil fire boilers	1
32	Rice hurk fire boiler	1
33	Gas fired boiler	1
34	Rising film and fallowing film Evaporators	1
35	Bruck field viscometer	1
36	Crystallizers - Flickers	
37	Absorption- striping	1
38	dryer , Pedal dryer ,	1
39	Droplet formation, Uses of nozzle, and water Distribution concept in cooling towers	1
40	Filtration - Lift filter, Sparker filter, Star filter, Notch filter, filtration media, Micron size	1
41	Explosive meters for safety	
	i) Gas detector	1
	ii) Smoke detector	1
	iii) Fire alarm system	1
	iv) Sprinklers system for safety	1
42	Humidification /Dehumidification and air handling unit	1
43	Piston valve	2
44	Solenoid valve	2
45	Plunger valve	2
46	Pneumatic control valve	2
47	Safety valve	2
48	Rotary air lock valve	2
49	Cooling tower (common for instrumentation lab)	2
50	Pressure vessel with all accessories (training type)	2