ATTENDENT OPERATOR (CHEMICAL PLANT)

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – CHEMICAL

सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

Directorate General of Training

Skill India
कौशल भारत-कुशल भारत

ATTENDENT OPERATOR (CHEMICAL PLANT)

(Revised in 2018)

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NSQF LEVEL - 5

Developed By
Ministry of Skill Development and Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
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Kolkata – 700 091

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Attendant Operator (Chemical Plant)

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CONTENTS

1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

Attendant Operator (Chemical Plant) trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

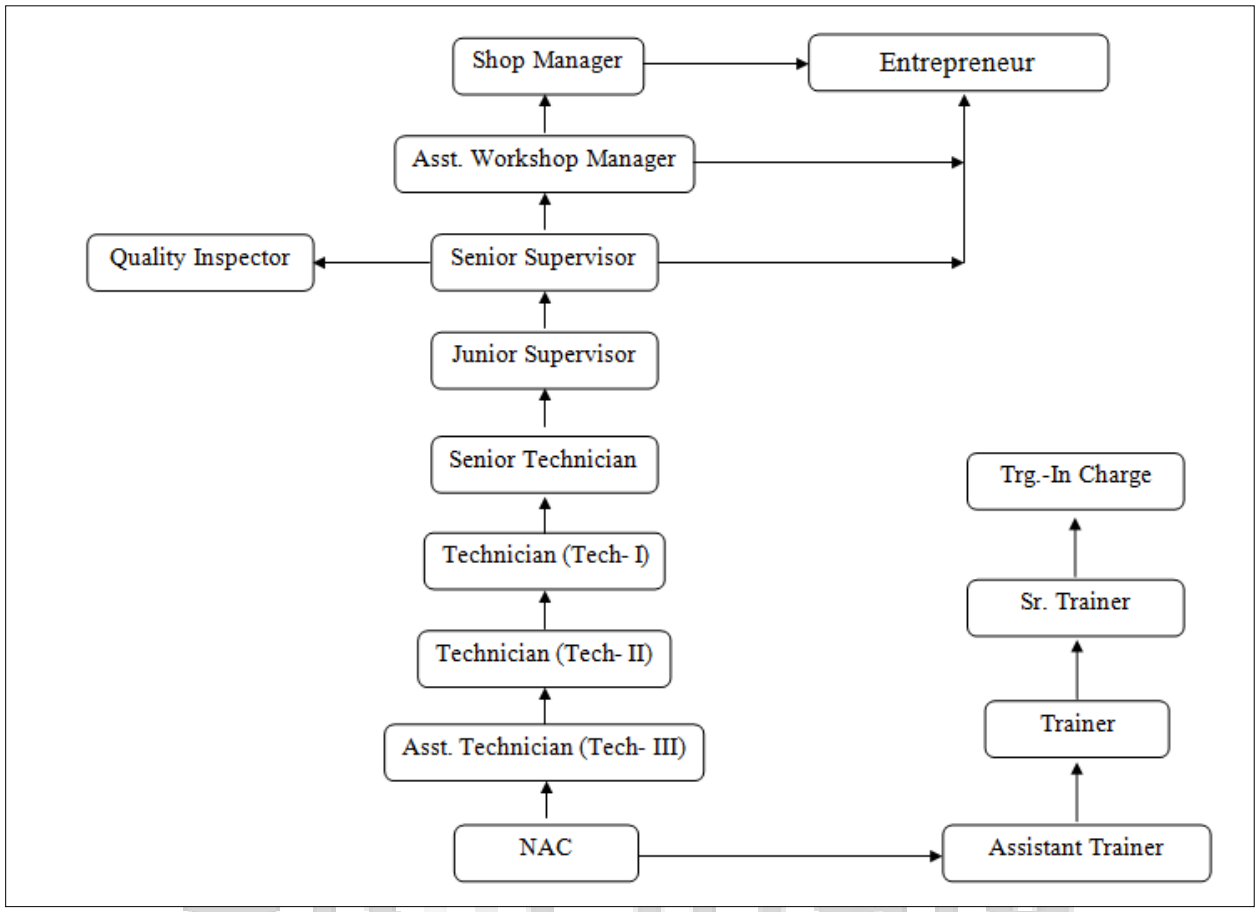
In chemical process Industries required qualified operator who having skill and knowledge of Unit operations and unit process and instrumentation and safely working chemical plant.

After completion of 2 year Apprenticeship Training in AOCP Trade, he/she will gain the skill and knowledge of Unit operations and unit process of chemical process industries.

- Enhancement of training for preparing skilled man power as per need of chemical industries
- To minimize skill gap between trainee and industry
- As per industrial development now a day in India, more skilled man power is required to improve the skill technique.
- Familiarization with industrial exposure.
- Up-gradation of employability ratio.

2.2 CAREER PROGRESSION PATHWAYS:

- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*) : -

Total training duration details: -

Time (in months)	1-3	4-12	13-15	16-24
Basic Training	**Block– I**	**-----**	**Block – II**	**------**
Practical Training (On - job training)	**----**	**Block – I**	**------**	**Block – II**

Attendant Operator (Chemical Plant)

A. Basic Training

For 02 yrs. course (Engg.) : (**Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)

For 01 yr. course (Engg.) : (**Total 03 months:** 03 months in 1st yr.)

Sl. No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	**For 01 Yr. course**
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Course (Engg.) : (**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg.) : (**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. course (Engg.)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course (Engg.)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NAC will be conducted by NCVT on completion of course as per guideline of Govt of India. The pattern and marking structure is being notified by govt of India from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b) Weightage in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Weightage in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief Description of Job roles :

Laboratory Assistant, Physical Laboratory Assistant, Physical assists and carries out routine duties in physical laboratory as directed by physicist in conducting experiments. Sets up required apparatus and instruments in position as directed for conducting experiments. Makes necessary electrical connection to equipment and instruments as required. Records routine and other observations as indicated by instruments and makes necessary calculations as directed. Removes apparatus when not in use, cleans and maintains them in good condition. May do minor repairs to equipment and apparatus. May store and maintain account of instruments, equipment, apparatus etc., if required.

Laboratory Assistant, Chemical Laboratory Assistant, Chemical arranges and sets various chemicals, instruments and apparatus such as salts, acids, balances, heaters as desired by Chemists for conducting experiments in chemical laboratory. Sets up required apparatus and equipment as directed by Chemist. Performs routine tasks, such as preparations of standard solutions and common reagents, weighing and measuring of salts and chemicals, filtration, precipitation etc. and conducts simple tests as directed by Chemist. Cleans and maintains balances. Changes Kipps apparatus and maintains laboratory clean and tidy. Keeps required chemicals readily available and replenishes stock from stores. May clean special apparatus, if required.

Process Man, Chemical Process Man, Chemical process chemical ingredients by mixing in specific proportions, heating, distilling, cooling, filtering, blending, percolating, refining, pulverising, etc. for causing chemical reactions for research or production. Obtains scheme of processing from Chemist; sets apparatus and equipment; collects chemicals in required quantities; regulates feed of gaseous, liquid or solid materials into equipment. Checks progress of process by looking through peep holes, observing temperature readings, pressure gauges and other instruments and making simple chemical tests; regulates material feed, and heating and cooling devices and makes other adjustments necessary to ensure that processes are correctly carried out. Strains, filters and distils chemical substances to obtain required product in purified form. Implements safety measures in regards to operation of plant/machinery and in handling and processing materials such as acids, oils and maintains machinery. May be designated, according to type of material processed or plant in charge of, such as DISTILLING STILL ATTENDANT, FILTER PRESSMAN, etc.

Bearing Maintenance Bearing Maintenance, identify the problems in the equipment, rectify the root causes for leakages, replaces the bearings, lubricates the bearings, ensures fitness of all types of bearings in the plant and carry out routine maintenance.

Attendant Operator (Chemical Plant)

Reactor Convertor Operator Reactor Converter Operator (Chemical Process, except Petr oleum) operates or tends number of pieces of equipment, other than those used for treating petroleum, which perform sequence of complex operations in chemical reaction process. Regulates feed of gaseous, liquid or solid material into equipment. Checks progress of process by looking through peep holes, observing temperature readings, pressure gauges and other instruments and making simple chemical tests. Regulates material feed and heating or cooling devices and makes other adjustments as necessary to ensure that processes are correctly carried out.

Pump Man (Petroleum Refining) Pump man (Petroleum Refining) controls pumps and manifold systems to circulate crude semi compressed and finished petroleum products, water and chemical solutions through processing and storage departments of refinery according to schedules or instructions and plans movement of product through lines of processing and storage unit, utilizing knowledge of interconnections and capacities of pipelines, valve manifolds, pumps and tanks. Synchronizes activities with other pump houses to assure continuous flow of products and minimum contamination between products. Starts battery of pumps, observes pressure and flow meter and turns valve to regulate pumping speeds according to schedules. Turns hand wheels to open line valves to direct flow of product. Signals by telephone to operate pumps in designed units to open and closed pipeline and tank valves and to gauge, sample and determine temperature of tank contents. Records operating data, such as products and quantities pumped, stocks used, gauging results and operating time. May blend oil and gasoline. May repair pumps, lines and auxiliary equipment.

Evaporator Operator Evaporator Operator; Pan Operator; Vacuum Pan Operator charges and operates evaporating tank, vacuum-pan or similar device to concentrate solutions by driving off excess water contents. Pumps weak (liquid) solution into evaporator tank or pan; operates vacuum pump to obtain vacuum in pan, if required; regulates flow of steam into heater coils of evaporator; periodically tests concentrations of solution by use of instruments or by making simple chemical tests; makes necessary adjustments to temperature and pressure to obtain required solution; pumps concentrated solution from evaporator for auxiliary heating. Implements safety measures in regard to operation of plant/machinery and in handling and processing materials, oils and maintains machinery. May tend auxiliary equipment such as settling tanks, preheating tanks, condensers and cooling equipment. May treat solutions, such as those of glue, glycerin, glucose and caustic soda and be designated accordingly.

Continuous Still Operator, Petroleum Continuous Still Operator, Petroleum; Still man, Petroleum operates one or more continuous stills for distilling or refining crude oil to obtain fuel gas, gasoline, kerosene, diesel oil, lubricating oil, wax, bitumen, etc. Reads processing schedules, operating logs, test results of oil samples, and laboratory recommendations to determine changes in equipment controls required to produce specified quantity and quality

of product; moves and sets controls, such as knobs, valves, switches, levers, and index arms on control panels to adjust, maintain, and co-ordinate process variables, such as flows, temperatures, pressures, vacuum, time, catalyst, and chemicals, by automatic regulation and remote control of processing units, such as heaters furnaces, compressors, exchangers, recharges, absorbers. Moves controls to regulate valves, pumps, compressors, and auxiliary equipment to direct flow of product, reads temperature and pressure gauges and flow meters, records readings, and compiles operating records; tests products for specific gravity and observes their color to determine whether processing is being carried out properly; makes minor adjustments to equipment; shuts down still for cleaning and opens it up again; supervises workers who assist in operation of still. May fire oil or gas burning furnace through which oil is run to heat it to processing temperature. May specialize in a particular type of still, kind of oil processed, and be designated according to process involved or plant operated as ABSORPTION PLANT OPERATOR; PURIFICATION OPERATOR; STILLMAN; CRACKING UNIT; STILLMAN, POLYMERIZATION, etc.

Crusher Operator, Chemical Crusher Operator, Chemical operates power driven crushing machine to break solid lumps of chemicals or other materials into smaller size for further processing. Collects material to be crushed; fills hopper of machine by hand or by operating mechanical feed; fixes screen to machine to retain pieces which are too large. Operates controls to start, stop and regulate speed of machine; breaks oversize or jammed lumps with a hammer; discharges crushed material into outlet container-cleans crusher and work area. May weigh the material before and after crushing to know loss in crushing. May be designated according to type of process adopted/industry attached to.

Autoclave Operator Autoclave Operator; Sterilization Attendant charges, operates and unloads an autoclave (high-pressure vessel) for processing chemicals, oils, or sterilizing bottles, ampoules, etc. Charges or loads vessel with predetermined quantities of chemicals or objects; checks valves for operation; raises temperature of autoclave by increasing steam pressure. Observes pressure and temperature gauges, thermometers, timings and other instruments and makes necessary adjustments to ensure that process or sterilization is carried out correctly. Unloads product on completion of process and prepares vessel for next batch. Implements safety measures in regard to operation of plant/machinery and in handling and processing materials, and maintains machinery. May keep records. May be designated according to product processed or sterilized.

Batch Still Operator, Chemical Batch-Still Operator, Chemical operates one or more stills in which batches of liquid chemicals, other than petroleum, are treated to separate them into their chemical constituent such as alcohol beverages, perfume or drugs or to refine those constituents. Manipulates feed valves to fill tank with liquid to desired levels; adjusts valves to control pressure in tank and rate of heating; regulates valves to control amount of condensed

vapors returned to tank to enrich vapors driven from it; draws, from containers receiving condensed vapors, product samples for testing either on their own or in laboratory; determines by purity of samples, container to which product should be routed. Maintains record of raw materials drawn, quantity consumed to indicate production capacity of plant; enters in log book condition of plant and abnormalities noticed in distillation during shift for report to Chemist. May make adjustments to still auxiliaries such as condensers and pumps. May operate ordinary type of wood-fire distillation plant. May be designated according to type of chemicals used and industry attached to e.g. AMMONIA STILL OPERATOR; ALCOHOL STILL OPERATOR; BENZENE STILL OPERATOR.

Continuous Still Operator, Chemical Continuous Still Operator, Chemical; Distillation Operator tends one or more stills in which continuous feed of liquid chemical, other than petroleum is heated to separate into chemical constituents by regulating temperature, pressure, cooling valves etc. Adjusts feed valves to allow liquid to enter still at prescribed rate; adjusts controls to maintain temperature at various levels of still and to maintain prescribed pressure in still; regulates valves to control amount of condensed vapor returned to still to enrich vapors driven from it; draws, from containers receiving condensed vapors, product samples for testing either themselves or in the laboratory; determines by purity of samples to which container product should be routed; returns impure samples to main stock; maintains record of temperature, pressure and feed indicator readings. May make adjustments to still auxiliaries such as heat exchangers, absorbers, strippers, boilers and compressors. May specialize in type of chemical treated and be designated accordingly.

Ammonia Operator/Ammonia Plant Operator Ammonia Operator controls converter and auxiliary equipment that combine hydrogen and nitrogen to produce anhydrous ammonia: Lights burner and starts pumps, compressors, scrubbers, and absorption units. Moves controls on panel board to regulate temperatures of solutions and opens valves to admit heated and purified air and hydrogen into combustion chamber of burner, where nitrogen driven from air combines with hydrogen to form ammonia. Reads instruments, such as thermometers, pressure gauges, and potentiometers. Makes control adjustments according to operating instructions and charts. Pumps fresh solutions into scrubbing and absorption towers when readings indicate excessive alkalinity. Records operational data in logbook. May compute percentage of hydrogen and ammonia in burner gases, using standard test procedure.

Acid Plant Operator Acid Plant Operator maintains and operates acid plant for manufacturing sulphuric, hydrochloric, nitric or other acids by treating raw materials (Sulphur, salts, etc.) with acid or steam. Collects required amount of raw materials for preparation of desired acid. Sets up and checks equipment, valves, gauges and other instruments; charges vessel with predetermined amount of chemicals, or regulates feed of materials into equipment; controls temperature in vessel by adjusting steam pressure; checks progress of process by looking

through peep holes, observing temperature readings, pressure gauges and other instruments and making simple chemical tests; regulates material feed and heating or cooling devices, as necessary; removes acid when process is completed. May keep records. May be designated according to product or process, e.g. SULPHURIC ACID PLANT OPERATOR; HYDROCHLORIC ACID PLANT OPERATOR; FERTILISER MAKER; PHOSPHORUS MAKER.

Digester Operator, Paper Pulp Digester Operator, Paper Pulp; Rag Boiler Operator, Paper Pulp operates boiler (cooker) to convert raw materials into paper pulp. Supervises charging of cooker with ingredients such as wood chips, rags, straw and waste paper shreds. Directs adding of chemicals and admission of steam to raise temperature and pressure. Observes gauges and makes adjustments to maintain desired operating conditions. Tests samples by titration or color tests to determine stage of cooking. When the process completes, drains liquid from digester and instructs others in removal of cooked pulp. May be designated according to materials processed or chemicals used.

Mixing Machine Man Attendant (Chemical) Mixing Machine Attendant, (Chemical) feeds and tends machine to mix and blend different solid or liquid ingredients in required proportions. Weighs ingredients according to formulae or specifications and feeds prescribed quantities of ingredients into machine container by hand or by operating valves, pumps or mechanical loaders; starts machine agitators to mix materials thoroughly; adds further ingredients, if required; runs machine until mixing process is completed; removes mixture from machine container; cleans machine and work area and prepares machine for fresh run. Observes and reports abnormalities in blending and mixing.

Filter Press Operator Filter Press Operator operates filter press machine to filter impurities or other insoluble materials from slurries, chemical solutions or mother liquids. Opens filter press and covers filter plates with canvas, paper or other filtering media; closes press and ensures that its joints make a liquid tight seal; adds diatomaceous earth, saw dust, other settling compound to solution to precipitate impurities; pumps when specified pressure is reached. Removes filtered impurities from screen with compressed air, water or steam, and dislodges solid materials caught between frames. Occasionally replaces damaged filter media and adjusts and makes minor repairs to equipment.

Hydro Extractor Operator Hydro Extractor Operator, Centrifuge Operator operates centrifuge machine that separates solids from liquids, or liquids of different specific gravity. Fills drum of machine with liquid material. Starts machine and adjusts drum speed to obtain efficient separation of substances; empties containers when separation is completed. May fix and clean filtering media in machine, operate heating attachment on machine and test samples for moisture content. May be designated according to type of materials separated.

Attendant Operator (Chemical Plant)

Drying Chamber Attendant (Drugs)/Chamber Operators Drying Chamber Attendant, Drug dries tables and powder in drying chamber. Spreads out powder and tables evenly in trays and loads trays on racks and shelves in drying chamber. Closes chamber and applies heat for fixed period of time; checks at frequent intervals to ensure that products are properly dried. Keeps drying chamber clean.

Extraction Attendant, Chemical Extraction Attendant; Chemical, Extraction Operator; Extractor Battery Attendant; Kettle Operator; Percolation Attendant; Acidification Operator boils necessary ingredients in kettles, vats, pans, and regulates temperature, pressure etc. as directed by Process man, Chemical, to effect desired chemical reaction. Collects different ingredients in required proportions and feeds them into pan separately or together, according to specification, adding required amount of fluids and other liquids, mixing them by stirrer. Switches on plant, injecting steam to boil and mix ingredients; observes temperature, pressure gauges, timings and other instruments, making adjustments, where necessary, to ensure process is complete. Collects samples for observation and test; drains stuff for storage; cleans pan and work place. Implements safety measures in regard to operation of plant/machinery and in handling and processing materials, oils and maintains machinery. May tend open or wood fire pan. May be designated according to type of pan or industry associated with.

May be designated, according to type of material processed or plant in charge of, type of chemicals used and industry attached to, process involved or plant operated as such as DISTILLING STILL ATTENDANT, FILTER PRESSMAN, AMMONIA STILL OPERATOR; ALCOHOL STILL OPERATOR, BENZENE STILL OPERATOR. May specialize in a particular type of still, kind of oil processed, and be designated according to ABSORPTION PLANT OPERATOR; PURIFICATION OPERATOR; STILLMAN; CRACKING UNIT; STILLMAN etc.

Reference NCO-2015:

(i) 3111.0100 – Laboratory Assistant, Physical
(ii) 3111.0300 – Laboratory Assistant, Chemical
(iii) 3133.0100 – Process Man, Chemical
(iv) 7233.0301 – Bearing Maintenance
(v) 8131.3700 – Reactor Convertor Operator
(vi) 3134.0300 – Pump Man (Petroleum Refining)
(vii) 8131.3600 – Evaporator Operator Evaporator
(viii) 3134.0100 – Continuous Still Operator, Petroleum
(ix) 8131.0100 – Crusher Operator, Chemical
(x) 8131.3501 – Autoclave Operator
(xi) 3133.0400 – Batch Still Operator, Chemical
(xii) 3133.0500 – Continuous Still Operator, Chemical

Attendant Operator (Chemical Plant)

(xiii) 8131.2100 – Ammonia Operator/Ammonia Plant Operator
(xiv) 8131.7700 – Acid Plant Operator
(xv) 3139.0100 – Digester Operator, Paper Pulp
(xvi) 8131.0400 – Mixing Machine Man Attendant (Chemical)
(xvii) 8131.2300 – Filter Press Operator
(xviii) 8131.2700 – Hydro Extractor Operator
(xix) 8131.1400 – Drying Chamber Attendant (Drugs)/Chamber Operators
(xx) 8131.8500 – Extraction Attendant, Chemical

4. NSQF LEVEL COMPLIANCE

NSQF level for "Attendant Operator (Chemical Plant)" trade under ATS: **Level 5**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. Professional knowledge,
c. Professional skill,
d. Core skill and
e. Responsibility.

The Broad Learning outcome of Attendant Operator (Chemical Plant) trade under ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context.	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	ATTENDENT OPERATOR (CHEMICAL PLANT)
NCO - 2015	3111.0100, 3111.0300, 3133.0100, 7233.0301, 8131.3700, 3134.0300, 8131.3600, 3134.0100, 8131.0100, 8131.3501, 3133.0400, 3133.0500, 8131.2100, 8131.7700, 3139.0100, 8131.0400, 8131.2300, 8131.2700, 8131.1400, 8131.8500
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block–I : 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic training	As per the related trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees / Bsc. (PCM)	01 year
CTS trades eligible for Attendant Operator (Chemical Plant) Apprenticeship	Attendant Operator (Chemical Plant)

Note:

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the Attendant Operator (Chemical Plant) course of 02 years duration under ATS.

Block I & II:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Understand and explain different mathematical calculation & science in the field of study including basic electrical. *[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, speed and velocity Pressure, flow of fluids, viscosity, Reynolds number,]*
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, freehand sketches of valves , free hand flow sheets of manufacturing of Sulphuric acid, nitric acid, urea, Ammonia, ethanol, free hand sketches of distillation column, size reduction equipments, pressure, level, flow ,temperature control system.]*
4. Acid & Base titration, Boiling point ,melting point, P^H measureurment ,static friction, pipe fittings and gasket cutting ,Operation & overhauling of pumps and valves.
5. Select and ascertain measuring instrument and measure dimension of components and record data.
6. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
7. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
8. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
9. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Role & duties of Attendant Operator (Chemical Plant) in chemical process Industry.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Familiarization of different section of chemical plant, raw materials used ,Product capacity of production ,flow sheet ,writing report ,etc.
4. Familiarization of safety, health & environment (SHE) in chemical Plant, PPEs ,fire extinguishers, good housekeeping ,Fire hazards & Toxic hazards on site & offsite emergencies.
5. Familiarization of plant utilities, pipe colour coding, standard operation procedure (SOP) of flow meters, pumps, fans ,blowers, compressors, Heat transfer equipments, mass transfer equipments , agitation and mixing equipments.
6. SOP of Effluent Treatment Plant and Water treatment plant.
7. SOP of Storage and handling, vessels ,Chemical Reactors
8. SOP of APCM (Air pollution control Measures) ESP /cyclone separator/ Venturi scrubber, Bag filter etc.

Block – II

9. Familiarization with sample quality control tests (Quality control).
10. Routine Chemical plant jobs such as start up and shut down of plants, taking readings in log sheet , replacement of gland seal /mechanical seals/gasket/coupling ,chains, keys. Cleaning of tubes of heat exchangers, etc.
11. Mitigation of emergencies in the plant i.e. leakage / fix / process chemicals –Toxic Hazards.
12. Reading, maintenance and controlling of various parameters such as flow, level, temperature, concentration, P^H , sampling in chemical process industries.
13. Standard operation procedure (SOP) of mass transfer equipments such as Absorption columns, adsorption columns. , dryers crystallizers, etc.
14. Standard operation procedure (SOP) of filtration equipments, size reduction equipments, material handling equipments such conveyers, elevators, etc.
    (The practical for this component may demonstrated by video)

Note: *Learning outcomes are reflection of total competencies of a trainee and assessment will be carried out as per assessment criteria.*

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1. 1. Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1. 2. Recognize and report all unsafe situations according to site policy.
	1. 3. Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1. 4. Identify, handle and store / dispose off dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1. 5. Identify and observe site policies and procedures in regard to illness or accident.
	1. 6. Identify safety alarms accurately.
	1. 7. Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1. 8. Identify and observe site evacuation procedures according to site policy.
	1. 9. Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1. 10. Identify basic first aid and use them under different circumstances.
	1. 11. Identify different fire extinguisher and use the same as per requirement.
	1. 12. Identify environmental pollution & contribute to avoidance of same.
	1. 13. Take opportunities to use energy and materials in an environmentally friendly manner
	1. 14. Avoid waste and dispose waste as per procedure
	1. 15. Recognize different components of 5S and apply the same in the working environment.
2. Understand, explain	2.1 Explain concept of basic science related to the field

different mathematical calculation & science in the field of study including basic electrical and apply in day to day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, flow of fluid , Pressure, Viscosity ,Reynolds's number]*	such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.
	2.2 Measure dimensions as per drawing
	2.3 Use scale/ tapes to measure for fitting to specification.
	2.4 Comply given tolerance.
	2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
	2.7 Explain basic electricity, insulation & earthling.
	2.8 Different types of flow, viscosity, Reynolds's number
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views,]*	3. 1. Read & interpret the information on drawings and apply in executing practical work.
	3. 2. Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters.
	3. 3. Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
	3.4 Symbolic representation of valves, free hand sketches of size reduction equipments, distillation column ,flow sheets of Sulphuric acid, Nitric acid, .Ammonia, Urea, Ethanol, etc.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as micrometers, vernier callipers, dial gauge, bevel protector and height gauge (as per tool list).
	4.2 Ascertain the functionality & correctness of the instrument.
	4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement.
5. Chemical sample analysis	5.1 Acid-base titration, distillation, BP, MP,P^H measurement. Sample analysis

6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, and pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7. 1. Explain personnel finance and entrepreneurship.
	7. 2. Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
	7. 3. Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8. 1. Use documents, drawings and recognize hazards in the work site.
	8. 2. Plan workplace/ assembly location with due consideration to operational stipulation
	8. 3. Communicate effectively with others and plan project tasks
	8. 4. Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.
SPECIFIC OUTCOME	
Block-I & II (Section:10 in the competency based curriculum)	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II**(section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*	

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	• Introduction of glass wares used in chemical Laboratory • Acid Base Titration First Aid Method and basic training	Introduction of Chemistry, branches of chemistry, importance of chemistry, Safety precautions to be taken in Chemistry Laboratory, different equipment and apparatus used in Laboratory **Importance of housekeeping & good shop floor practices.** Introduction to 5S concept & its application. **Occupational Safety & Health**: Health, Safety and Environment guidelines, legislations & regulations as applicable.
2	• Acid Base Titration • Preparation of soap	Atom, molecule, Element, compound, mixture, Physical change, chemical change, Acids, bases, salts &their properties. Molecular weight, equivalent weight, atomic weight, Normality, molarity.
3	• Simple Distillation • Fractional Distillation	Sources of water, hard and soft water, causes and removal of hardness.
4	• Boiling Point • Melting Point • P^H Measurement	Purification processes, organic reactions, Boiling point, Melting point, Distillation
5	• Law of parallelogram of forces • Coefficient Of Static Friction	Introduction to Physics, Scalar and Vector quantities, their representation, resultant. Triangle and parallelogram laws of forces.
6	• M.A,V.R,& Efficiency by inclined plane • ‘ g’ by simple pendulum	Simple machine Inclined plane, Lever, Screw jack, pulley Motion –uniform ,circular & rotational motion
7	• Coefficient Of cubical expansion • Coefficient Of linear expansion • Thermal conductivity of metal	Modes of heat transfer, determination of thermal conductivity. Temperature & its measurement, expansion of solid, liquid and gases

8	• Verification of ohm's law • Specific resistance of wire by Wheatstone bridge	Electricity- Ohm's law, series & parallel connections, specific resistance
9.	• ECE of Copper J by electrical method	Electrolysis Faraday's First & Second law of electrolysis Calorimetry, mechanical equivalent of heat, 'J' by electrical method
10	• Pipe Fitting • Gasket cutting	Different types of pipe joints, Gasket materials for particular applications-cork sheet, oil-proof paper etc
11	• Dismantle, clean & Reassemble of different types of valve.	Construction, working and uses of various types of valves.
12	• Dismantle, clean & Reassemble of different types of Pump. • Operation of Centrifugal pump, Reciprocating pump and Gear Pump.	Construction, working and uses of various types of Pumps
13	**Revision**	
	Assessment/Examination 03days	

NOTE: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	• Occupational Safety & Health. Importance of housekeeping & good shop floor practices. • Introduction to safety equipment and their uses in chemical plant. • Personal protective Equipments (PPE). • Use of Fire extinguishers • Study of chart of MSDS Of chemicals which is mostly used in chemical industry.	Role of Attendant Operator (Chemical Plant) in chemical plant. Introduction about chemical industrial work Introduction to Unit Operations and Unit processes, their meanings. Features of unit Operations. Soft Skills: its importance and Job area after completion of training Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure. **MSDS of Chemicals**:- Material safety data sheet of Acid, Base , Hydrocarbon & Solvents
2 - 3	• To determine viscosity of liquid by Brooks field viscometer. • To determine Reynolds's number and hence the type of flow either laminar or turbulent. • Flow measurement & Calibration of flow meters.	**Flow of Fluid:** Definition of fluid, compressible fluid, incompressible fluid. Properties of fluid-viscosity, Manometer, Reynolds's number, Flow measuring devices.
4.	• To operate Shell and Tube heat exchanger and calculate rate of heat transfer.	**Heat Transfer:** Mechanism of Heat Transfer in solid, liquid and gases and their application in industries, thermal conductivity. Heat transfer equipment.
5	• To operate vertical tube evaporator.	**Evaporation:** Definition, classification of evaporators, Capacity, steam economy of evaporators.
6	• Separation of binary liquid mixture by distillation.	**Distillation:** Concept of distillation, Flash differential, rectification and azeotropic, extractive, vacuum, steam distillation. Reflux ratio: minimum, total, optimum, importance of reflux

		ratio. Types of distillation column.
7 - 8	• Operation of mixer settler. • Study of spray extraction column.	**Manufacturing Process of Sulphuric Acid and Nitric Acid: Raw** materials, chemical reactions, process description, flow sheet, uses. **Solvent Extraction:** Introduction, definition, choice of solvent,. Equipments used for extraction **Leaching:** Application and different types of equipment uses for leaching
9	• Flooding velocity experiment using a packed glass column.	**Absorption:** Introduction, equipment's used for absorption –columns, factors affecting rate of absorption, types of packing, flooding and flooding velocity.
10	• Operation of Plate and frame filter press. • Operation of Rotary Vacuum Filter. • Operation of Top/ Bottom driven centrifuge.	**Manufacturing process of Ammonia, urea and Ethyl alcohol:** Raw materials, chemical reactions, process description, flow sheet, uses **Filtration:** Principles of filtration, types of filtrations & its applications. Rate of filtration Classification, construction & working of different types of filters used in industries.
11	• Finding rate of drying by using tray dryer.	**Drying:** Theory, types of dryers and their uses.
12	• Operation of Blake jaw crusher. • Operation of Ball mill.	**Size Reduction:** Introduction to crushing & grinding, construction, working and applications of size reduction equipment
13	• To carry out sieve analysis with a sieve shaker.	**Screening:** Mesh number, Classification of Screening equipment's.
	Assessment/Examination 03days	

NOTE: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units **Material Science** : Properties - Physical & Mechanical, Types – Ferrous & Non-Ferrous, difference between Ferrous and non-Ferrous metals	**Engineering Drawing: Introduction and its importance** - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips. **Lines :** - Definition, types and applications in Drawing as per BIS SP:46-2003 -Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines.
2.	**Fractions**: Fractions, Decimal fraction, Addition, Subtraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Calculator. **Mass, Weight and Density:** Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.	**Drawing of Geometrical Figures**: Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram, polygons. - Circle and its elements. **Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case .
3.	**Ratio & Proportion:** Simple calculation on related problems. **Speed and Velocity**: Rest and motion,	**Practice of Lettering and Title Block** **Dimensioning practice**: - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003)

	speed, velocity, difference between speed and velocity, acceleration, retardation.	- Symbols preceding the value of dimension and dimensional tolerance.
4.	**Percentage** : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa. **Work, Power and Energy**: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy	**Drawing of Solid figures** (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions. **Free Hand sketch of hand tools and measuring tools used in res**pective trades.
5.	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere **Heat & Temperature**: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	**Free-hand sketches** of Hand Tools, Screw drivers, Pliers, Spanner, Tweezer. Free-hand sketches of Vernier Caliper, micrometer, Depth Gauge, Dial Test Indicator, Bevel protractor **ISI symbols** of Generator, Voltmeter, Ammeter, Watt- meter. Resister, inductor, Capacitor, Transformer, AC & DC motors.etc. - Drawing of pressure control process line

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration : - 30 hrs.)**
1.	**Calculation:** Archimedes's principle, principle of floatation hydrometers. Centre of gravity and Equilibrium condition. **Science:** Definition - viscosity, flash point, fire point, flash points of standard lubricating oils, octane number.	**Drawing sketches of different types of valves**, such as gate valve, globe valve, ball valve, Plug Valve, check valve etc. **Drawing of different types locking devices** such as double nut, castle nut, pin etc.
2.	**Calculation:** Pressure, temperature, Boyle's law, Charles's law, Equation of perfect gas. Calculations. **Science** :Newton's laws of motion unit of force, find out resultant force parallelogram law of forces,	**Symbolic representation of different types of valves**- gate valve, globe valve, butterfly valve, ball valve, diaphragm valve, control valve, non-return valve, and needle valve. **Free hand sketches** of Belt conveyor, Screw conveyer, Bucket elevator
3.	**Calculation**: Centre of Gravity, (C.G. Of square, rectangle, triangle, circle, semicircle, cone) & its calculations **Science:** Condition of equilibrium, kind of equilibrium, some examples of equilibrium in daily life,	**Drawing of pressure, Level , flow and temperature control system.** **Free hand sketches** of crushers, ball mill, hammer mill and centrifuges.
4.	**Flow of fluids:** Equation of continuity, Bernoulli's theorem **Science** : Advantages & Disadvantages of friction, Limiting friction, Laws of limiting friction, Coefficient of friction, angle of friction, Inclined plane, Force of friction	**Free hand sketches** of steam jet ejector, steam trap **Diagram of distillation column** with all accessories Free hand sketches of process instrument- such as temperature indicator, level indicator, LIC, TIC, PI, PIC, FI, FIC **.**
5.	**Flow of fluids:** Flow measurement by orifice meter, venturimeter, Rotameter, U-tube manometer. Reynolds's number, at different velocities. **Science :** Latent heat, sensible heat, saturated steam, wet steam, superheated steam.	Flow sheet / Block diagram of 1.Sulphuric acid 2.Nitric acid 3.Ammonia 4. Urea 5. Ethanol

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
1. English Literacy	Duration : 20 Hrs. Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy	Duration : 20 Hrs. Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking	Basic of computer Networks (using real life examples), Definitions of

and Internet	Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills	Duration : 15 Hrs. Marks : 07
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
Block – II Duration – 55 hrs.	
4. Entrepreneurship Skills	Duration : 15 Hrs. Marks : 06
Concept of	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue

Entrepreneurship	Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity	Duration : 10 Hrs. Marks : 05
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education	Duration : 15 Hrs. Marks : 06
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.

Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation	Duration : 05 Hrs. Marks : 03
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
8. Quality Tools	Duration : 10 Hrs. Marks : 05
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

Block – I

1. **Safety and best practices (5S, KAIZEN etc.)**
2. **Store procedure, Record keeping, inventory management and documentation**
3. **Identification and testing of equipments and machineries of chemical plant.**
4. **Repair & Maintenance work of equipments and machineries of chemical plant**

DURATION : 09 MONTHS (39 WEEKS)	
List of operations in Petro Chemicals, heavy chemicals, fire chemicals, paper and pulp, Cement, pharmaceutical ,Fertilizer and allied chemical industries	
Sl. No	**List of operations / skills to be covered during Industrial Training**
	Introduction in safety precautions as applicable to the trade
	Orientation i) The General Plant Knowledge and its products, raw materials used capacity of production etc. (ii) Different sections of the plant including process, Co ordination of maintenance and their activities. (iii) Study of the process and operations carried out in the establishment with the help of Simple flow sheet under the guidance of plant-in –charge/supervisor/familiarization with the equipments used in the establishment by actually going round the plant. (iv) Writing report (Diary of day-to-day work.)
	Safety i) Cause and prevention of accidents first aid to the injured. (ii) Personal safety and use of personal protective equipment (iii) House keeping (iv) Fire hazards & Toxic hazards on site & offsite emergencies. (v) Isolation of equipment's and ancillaries prior to handing.
	Familiarization with utilities and service lines such as steam, cooling water, chilled water, brine, vacuum, compressed air, refrigeration, air Handling units etc. Familiarization with colour code system of pipe lines used in chemical industries
	Standard operating procedure (SOP), process conditions and the corrective action in case of the following equipment available in the industry. (i) Flow meters, pipe fitting and joints, Pumps, compressors, blowers, fans, steam ejectors etc.. (ii) Heat exchangers, condensers, coolers, chillers, re-boilers, boilers, furnaces, kilns.

	Etc. (iii) Distillation columns etc. (iv) Evaporators and refrigeration units. (v) Solvent (liquid –liquid) Extraction units and leaching (solid –liquid) extraction units (vi) Agitation ,mixing and blending equipments (vii) Effluent Treatment Plant (viii) Water Treatment Plant (ix) Storage and handling, vessels ,Chemical Reactors (x) APCM (Air pollution control Measures) ESP /cyclone separator/ Venturi scrubber, Bag filter

Block – II

1. **Safety and best practices (5S, KAIZEN etc.)**
2. **Store procedure, Record keeping, inventory management and documentation**
3. **Identification and testing of equipments and machineries of chemical plant.**
4. **Repair & Maintenance work of equipments and machineries of chemical plant**

DURATION:	**09 MONTHS (39 WEEKS)**
List of operations in Petro Chemicals, heavy chemicals, fire chemicals, paper and pulp, Cement, pharmaceutical , Fertilizer and allied chemical industries.	
Sl.No	**List of operations/skills to be covered during Industrial Training**
1.	**Quality Control** Familiarization with sample quality control tests.
2.	**Routine Plant Jobs** (i) Aware with Startup & shut down of equipment or opening and closing of pipeline. (ii) Taking Reading of pressure and vacuum gauges, thermometers etc. winding of recorders (iii) Removal of chart and inking of pens of recorders. (iv) Replacement of packing seal/gasket seal in pipe flanges. (v) Changing of belts coupling, Chain etc. (vi) Operating Process of evaporator tubes, heat exchangers etc. (vii) Mitigation of emergencies in the plant i.e. leakage / fix / process chemicals –Toxic Hazards
3.	Reading Maintaining and controlling of process control instruments measuring, flow, temperature, pressure, pH, concentration etc., Their inter locking system, automatic signaling instruments for high or low pressure temperature, flow etc.
4.	Standard operating, procedure(SOP), process conditions and the corrective action in case of the following equipment available in the industry.

	i) Absorption towers. Adsorption equipments ii) Drying Operation. iii) Crystallizing Operation. iv) Filtration equipments v) Sedimentation and coagulation vi) Size separation and grinding equipment. vii) Crushing and grinding equipment. viii) Material handling and conveying equipment

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.

2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

APPRENTICE ATTENDANT OPERATOR – (CHEMICAL PLANT)			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
A. TRAINNES TOOL KIT			
Sl. no.	**Name of the consumable Items**	**Specifications**	**Quantity (Nos.)**
1.	Ear Plug		21
2.	Nose Mask		21
3.	Specific Gravity bottle	25 cc	6
4.	Bunsen Burners		10
5.	Tripods Stand		10
6.	Asbestos wire gauge 8”		21
7.	Burettes 25ml boroflow type borosilicate Glass	MOC: Borosilicate	10
8.	Measuring Pipettes 10ml borosilicate glass	MOC: Borosilicate	05
9.	Clamp holders		21
10.	Stands with clamps for burette		10
11.	Measuring cylinder 500 ml borosilicate glass	MOC: Borosilicate/Plastic	05
12.	Measuring cylinder 100 ml borosilicate glass	MOC: Borosilicate/Plastic	10
13.	Volumetric flask 100 ml borosilicate glass	MOC: Borosilicate	10
14.	Volumetric flask 250 ml borosilicate glass	MOC: Borosilicate	05
15.	Funnels Dia 7.5cms borosilicate glass	MOC: Borosilicate	05

16.	Beaker 100ml corning	MOC: Borosilicate	10
17.	Beaker 250ml corning	MOC: Borosilicate	10
18.	Beaker 500ml corning	MOC: Borosilicate	05
19.	Bottles for solutions 1000 ml borosilicate glass	MOC: Borosilicate	04
20.	Conical flask – 100 ml borosilicate glass	MOC: Borosilicate	10
21.	Conical flask – 250 ml borosilicate glass	MOC: Borosilicate	10
22.	Tong – Flat – 300 mm	300 mm	20
23.	Spatula – 8”	8”	05
24.	Round Bottom Distillation flask with side neck 250ml borosilicate glass	MOC: Borosilicate	05
25.	Round Bottom Distillation flask with side neck 500ml borosilicate glass	MOC: Borosilicate	05
26.	Water Condenser for distillation lebig 30 cm long borosilicate glass	MOC: Borosilicate	05
27.	Rubber cork of (2.5 cm, 3cm) size Various size		10
28.	Wooden cork of (2.5 cm, 3cm) size Various size		10
29.	Rubber Tubing Heavy Duty (ID- 5mm)	8 / 10 ml	10 meter

30.	Rubber Bulbs for pipettes (Teat)		02
31.	Hydrometer 0-1200 with measuring Cylinder 1000 ml		02
B. TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS			
32.	Safety Goggles		21
33.	Safety hand gloves leather (Regular size)		21
34.	Fire Extinguishers (Dry Chemical powder)	Capacity: 4 kgs.	01
35.	Fire Extinguishers (Foam type)	Dry powder – 4 kgs.	01
36.	Fire bucket		05
37.	Pipe wrench 12”	12”	01
38.	Pipe wrench 18”	18”	01
39.	Double Ended Spanner set Metric 6*7 to 30*32	Metric 6*7 to 30*32	01
40.	Combination Plier	6”	05
41.	Screw Driver – 9 X 300 mm	9 X 300 mm	05
42.	Hammer – Ball Pein – 500 grams		05
43.	Chisel – Cold – Flat – 20 mm X 150 mm	20 mm X 150 mm	05
44.	Hollow punch		05
45.	Snip for gasket cutting		02

Attendant Operator (Chemical Plant)

46.	Instrument for determining 'g' (Simple Pendulum) complete set		02
47.	Mechanical board for testing triangle and parallelogram of forces including all accessories		02
48.	Inclined plane with pulley, pan, weights etc.		02
49.	Calorimeter for determining Joule's mechanical Equivalent of heat by electric method		02
50.	Universal Dial Test Indicator	Plunger Type - Range 0 - 10 mm, Graduation 0.01 mm & 0.001mm Reading 0 - 10 with Revolution Counter complete with Clamping Devices and Magnetic Stand	01
51.	Apparatus for measurement of co-efficient of expansion(thermal) of solid (plunger's apparatus)	It will consist of a half-meter long chromium plated rod, Steam prepared in copper steam boiler of 2-liter capacity, 2 Thermometers, 1 hot plate of 1kw.	02
52.	Apparatus for measurement of thermal conductivity of good and bad conductors complete set	Made with heater assembly of 1000 watt, 300 mm (D) test specimen, 8 J type sensors, Dimmer state, Voltmeter and Amperemeter.	02
53.	Boiling/Melting point apparatus	Microprocessor temp. range: Ambient to 300 ^{o}C, Digital type, Memory: up to 100 samples	01
54.	Fire alarm system with	Consisting of 2' x 2' chamber with suitable size water tank,	01

	sprinkler system	consisting of sprinklers and smoke detection sensors, suitable pump will be connected with the water tank to sprinkle water in the system once smoke is detected in it.	
55.	Gas detector with air tight chamber	Consisting of 2' x 2' chamber with suitable size water tank, consisting of sprinklers and smoke detection sensors, suitable pump will be connected with the water tank to sprinkle water in the system once smoke is detected in it.	01
56.	High Volume Air Sampler	For Suspended Particulate Matter with Filter Holder, Cabinet, Gaseous Sampling arrangement, Gable Roof and microprocessor based Electronic Control with Electronic Timer, Time Totalizer & Digital Display of Flow & Volume of air sampled. Blower, Filter Holder for filter paper, Electronic Control & Electronic Timer, LCD/LED Display.	01
57.	Capacitance Level indicator	Made up of S.S. sump tank, Acrylic measuring tank, S.S. pump, Level transmitter – Range : 0 – 500 mm WC Accuracy: +/- 3 % With HART version 6. Output : 4-20 mA DC Probe: fully insulated rod probe with pre-amplifier with necessary piping arrangement	01
58.	Air purge Level Indicator	Made up of S.S. tank, Casing of Aluminum with Front Transparent Cover, glass tube, S.S. purge pipe.	01

59.	Final control element (control valves) Pneumatically & Electrically	Globe Valve: (Pneumatically Operated) Body Type: 2 way Size: 1” Operating Pressure: 3-15 psi (0.2-1kg/cm2) Diaphragm Control valve: (Pneumatically Operated) Type: Pneumatic Size: 1/2” Input: 3-15 psig, Action: Air to close Ball Type (Electrically Operated) Body Type: 2 Way Size: I"	01
60.	Apparatus for determine Frictional losses in straight pipe, pipe fitting	With S.S. sump tank, S.S. measuring tank, S.S. pump, Manometer & suitable piping & fittings with pressure tappings.	01
61.	Double pipe Heat exchanger	Made up of S.S. 1000 mm (L) 75 mm (D) heat exchanger with S.S. hot water tank with heater, S.S. cold water tank, 2 rotameters, 2 S.S. pumps, Multi zone temperature indicator, PID and suitable piping.	01
62.	Thermometers of different range as per requirement		01
63.	Rheostat 100 ohms		02
64.	Resistance box 0 to 1000 ohms		02
65.	Nicrome Wire Resistance of 50cm long 2 ohm,3 ohm,5 ohm		02 each
66.	Battery eliminator	Input: 240 volts	02

		Output: 4.5 -6 volts	
67.	Copper voltmeter for Electrochemical equivalent		02
68.	Ammeter 0 to 1000 mA. (DC)		02
69.	Voltmeter 0 to 15 volt (DC)		02
70.	pH Meter digital	Microprocessor base, Auto calibration facility with electrode, Auto & Manual temperature compensation.	01
71.	Steam generator (copper) Cap. 1000ml		06
72.	Vernier calliper – 0 – 200 mm with least count 0.02mm	0 - 200 mm with least count 0.02mm	02
73.	Micro meter 0 – 25 mm		02
74.	Water bath 6 places		02
75.	Wheatstone bridge apparatus with 1m long wire	Resistance Bulb Thermometer: Pt – 100 Accuracy: Class A, Insulation: Mineral insulated Terminal Block: 4 wire termination in ceramic terminal, Block provided in cast Aluminium Block, Length: 200 mm, The construction drawing, Temperature Vs Resistance Table & calibration Checking procedure along with portable Wheatstone bridge	02

		(having inbuilt Galvanometer & battery) to measure resistance of Resistance Bulb Thermometer having measurement accuracy + 0.075 %.	
76.	Different types of pipe fittings	Test pipes made up of GI of ½" &3/4" size and 1-meter length, Pressure tapings are provided at 1-meter distance apart on each pipe. The flow through each pipe can be controlled using the valves provided. Sump Tank made up of S.S. 304 with ½" drain valve, Measuring Tank made up of S.S. 304 with self-graduated glass tube level indicator, with 1" drain valve. 0.5 HP Monoblock Pump, Necessary piping and valves will be provided to supply water to test pipes.	01 set
77.	Different types of valves	Like Safety valve, Gate valve, Globe valve, check valve, diaphragm valve, ball valve, needle valve, butterfly valve (Flanged and Thread End) 2"/4" dia.	01 set
78.	Different types of pumps	Centrifugal, Reciprocating, gear	01 set

79.	Stop watch 1/10 sec Racer make		02
80.	Digital balance 0.1 mg to 200 gms	Digital type capacity: 200 gms Accuracy: ± 0.1 mg	01
C. GENERAL MACHINERY INSTALLATIONS: -			
81.	Reynolds's equipment	With S.S. sump tank with bell mouth discharge, Glass tube of 1 meter of 1" diameter with Flow control valve, measuring cylinder, stop watch,	01
82.	Shell and Tube heat exchanger	Made up of S.S. 500 mm (L) 75 mm (D) heat exchanger with S.S. hot water tank with heater, S.S. cold water tank, 2 rotameters, 2 S.S. pumps, Multi zone temperature indicator, PID and suitable piping arrangement.	01
83.	Packed distillation tower.	Made up of S.S. of 1000 mm (H) 75 mm (D) with sight glasses, feed tank, cold water tank, steam generator, 4 rotameters, Multi zone temperature indicator, Shell & Tube type heat exchanger, 2 S.S. pumps, reflux pump, PID, distillate pump, Reflux drum, solenoid valve, product collection tank with essential automation and suitable piping.	01
84.	Mixer-settler type extractor	Made up of S.S. extraction column of 700 mm (H) 100 mm (D), S.S. feed tank, S.S. solvent tank, S.S. pump, 2 rotameters and suitable piping.	01
85.	spray extraction column	Made up of glass. 750 mm (H) 75 mm (D), S.S. feed tank, S.S. solvent tank, 2 S.S. pump, 2 rotameters, 2 sample	01

		collection tanks with suitable piping.	
86.	Cooling Tower	Made up of Acrylic of minimum 1-meter height, S.S. hot water tank with heater, S.S. pump, rotameter, manometer, blower, PID, Multi zone temperature indicator, packings, PID. With necessary piping arrangement.	01
87.	Humidification control equipment with dry and wet bulb Temperature	With heating and cooling arrangement to increase and decrease humidity.	01
88.	Plate and frame filter press and Rotary Vacuum Filter	Made up of Cast iron structure with plate and frame made up of P.P. of 300 mm x 300 mm size, S.S. slurry tank, S.S. pump, S.S. water tank, 2 cake trays, stirrer and suitable piping..	01 each
89.	Top driven centrifuge	Made up of S.S. 304 of 450 mm Dia * 225 mm Ht. size, Filter area of Basket: 0.32 Sq. meter, Basket speed (Max.): 1350 RPM Release valve: 1 No., Basket, Nozzle : At the bottom to collect mother liquor, 5 HP drive motor, with necessary Accessories, painted in synthetic enamel.	01
90.	Tray dryer	Made up of S.S. from inside, with heaters, variable speed DC motor, multi zone temperature indicator, weighing scale, PID.	01
91.	Spray Dryer	**Spray Dryer**: Made up of S.S. with spray nozzles and drying arrangement.	01
92.	Rotary drum drier	Made up of S.S., with heater, variable speed blower, Temperature indicator, PID, collection tray.	01

Attendant Operator (Chemical Plant)

93.	Blake jaw crusher	Made up of having minimum size 4”X6” with electric motor, starter, energy meter capacity: approx. 150 kg/hr.	01
94.	Ball mill	Made up of S.S. of 450 mm (L) 300 mm (D), 50 S.S. balls, Dual starter, energy meter, RPM indicator, proximate sensor, variable speed.	01
95.	Hammer mill	Made up of M.S. diameter 8”, S.S. 6 hammer, electric motor 2 HP, V pulleys & belt system, starter, energy meter, Filter bag, Feed Hooper, suitable size metallic screen. Capacity 15 -20 kg/hr.	01
96.	Elevators Bucket, Screw conveyor and Belt conveyor	**Bucket Elevator:** Made up of S.S. 8 nos. of buckets with Nylon belt, FHP motor coupled with reduction gear box, Feed Hopper, Bins 2 Nos. **Screw Conveyor:** Made up of S.S. with screw type conveying elements, with gear box, feed Hooper, collection tray. **Belt Conveyor:** Made up Nylon/rubber Belt, with roller coupled with gear box and idler supported, Bins.	01
97.	Cyclone Separator and water scrubber	**Cyclone separator:** Made up of S.S. with damper, blower, manometer, orifice plate assembly, starter, energy meter. **Water Scrubber:** Made up of S.S. with S.S. pump, Spray nozzles, rotameter, S.S. sump tank for water, Air blower. With piping arrangement	01
98.	Sieve shaker and sieves	Sieve shaker machine with sieves Made up of Brass with different sieves, with viberator/rotap and timer.	01

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99.	Different types of pipe fittings and joints	Test pipes made up of GI of ½" &3/4" size and 1-meter length, Pressure tapings are provided at 1-meter distance apart on each pipe. The flow through each pipe can be controlled using the valves provided. Sump Tank made up of S.S. 304 with ½" drain valve, Measuring Tank made up of S.S. 304 with self-graduated glass tube level indicator, with 1" drain valve. 0.5 HP Monoblock Pump, Necessary piping and valves will be provided to supply water to test pipes.	2 sets
100.	PLC and DCS Training Kit	**PLC:**With 8 DI/DO, 8 AI/AO with necessary hardware & software to understand PLC functioning. **DCS:** True distributed control system having dedicated redundant function controller, power supply, communication modules, and integrated software modules, algorithms for complex process control. consist of small pilot plant with different control action using basic parameters like level, temperature, flow, pressure, ratio, feed forward, cascade, with 4-20 mA input single pan circular chart recorder.	1 each

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101.	Different types of pumps (Centrifugal pump, Reciprocating and Gear pump test rigs)	**Centrifugal pump** coupled with 1 HP electrical motor. With suitable piping arrangement. **Reciprocating pump** With S.S. sump tank, S.S. measuring tank, Variable speed DC drive, RPM regulator, RPM indicator, Pressure gauge, vacuum gauge, energy meter and suitable piping, mounted on Suitable Frame Structure. **Gear Pump** coupled with 1 HP electric motor. With necessary piping.	1 each
102.	Digital Viscometer	LED display/LCD • Measurement range in mpa.s/cp with 4 spindles, • 6/12/30/60 rotor speed (rpm), • Provided with RS 232 C interface.	01
103.	Flow meter Test rig (Rotameter-Venturimeter- Orifice meter – Pitot Tube-water meter)	Made up of S.S. sump tank, S.S. measuring tank, S.S. pump, venturimeter, orifice meter of 10 mm (D) of orifice with flange, Pitot tube made up ofM.S, compatible to 2" Diameter pipe, rotameter of 3 - 30 LMP, manometer with pressure tappings as required with suitable piping.	01set
104.	Air Compressor Test Rig	Two stage Air compressor Made up of M.S. with Air receiving tank, 5 HP 440 V AC motor, with all Accessories, Orifice meter of 10 mm ID and U-tube manometer, 5 nos. of thermocouples, Digital Temperature, starter, Energy Meter, 2 Nos. of pressure gauge the control panel	01
105.	Vertical Tube Evaporator	S.S. sheet boiler with Electric Immersion type heaters of 4	01

		kW, Pressure Gauge and Safety Relief Valve, Evaporator vessel is made of SS – 304 and it consists of 12 mm diameter and 100 mm long tubes arranges in triangular pitch. The shell diameter is about 150 mm and 500 mm long. Vessels are covered with 25 mm insulation and SS – 304 sheet cladding pressure gauge. The condenser consists of 500 mm long shell with 10 numbers of tubes inside. It is of 1-1 pass type, Digital temperature indicator, MCB for heater, On/Off Switches for Pump Indicator lamp for the heater and feed rotameter. Feed tank is made of S.S.	
106.	Plant for Operator having various operations like heat exchanger, condenser, evaporator, distillation, pumps, valves and instrumentation controls etc.	Made up of S.S. of 1000 mm (H) 75 mm (D) with sight glasses evaporator, feed tank, cold water tank, steam generator, 4 rotameters, Multi zone temperature indicator, Shell & Tube type condenser, 2 S.S. pumps, reflux pump, PID, distillate pump, Reflux drum, solenoid valve, product collection tank with essential instrumentation and automation and suitable piping	01

Note: In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: ATTENDENT OPERATOR (CHEMICAL PLANT)

LIST OF TOOLS& EQUIPMENTS FOR -20 APPRENTICES

1) Space Norms : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		21 set
2.	Set square celluloid 45^o	250 X 1.5 mm	21 set
3.	Set square celluloid 30^o-60^o	250 X 1.5 mm	21 set
4.	Mini drafter		21 set
5.	Drawing board	700mm x500 mm) IS: 1444	21 set
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1	Drawing Board		20
2	Models : Solid & cut section		as required
3	Drawing Table for trainees		as required
4	Stool for trainees		as required
5	Cupboard (big)		01
6	White Board	size: 8ft. x 4ft.	01
7	Trainer's Table		01
8	Trainer's Chair		01

Attendant Operator (Chemical Plant)

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
***Note**: Above Tools & Equipments not required, if Computer LAB is available in the institute.*		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness (15)	Workplace hygiene (5)	Attendance/ Punctuality (10)	Ability to follow Manuals/ Written instructions (5)	Application of Knowledge (10)	Skills to handle tools & equipment (10)	Economical use of materials (5)	Speed in doing work (10)	Quality in workmanship (15)	VIVA (15)	**Total internal assessment Marks**	**Result (Y/N)**
1														
2														