Preparatory course for Apprenticeship Programme on Boiler Attendant

Course Name	**Preparatory course for Apprenticeship Programme on Boiler Attendant**
Sector	**Capital Goods**
Course Code	**STC-CGM/2025/0709**
Job Description	This is the Preparatory Course for Apprenticeship Programme on Boiler Attendant. This training will help trainees to prepare themselves for the said Apprenticeship Programme. This course must not be treated in any way equivalent to qualification for Boiler Attendant. Trainees must perform all practical under strict supervision of authorized trained person maintaining all safety rules.
Course Duration	**Total Duration 1000Hrs.(T- 280hrs.P- 600hrs. ES-120 hrs.)**
Trainees' Entry Qualification	Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Trainers Qualification	NAC in Boiler Attendant with 3 years' experience in the relevant field OR/ Diploma in Mechanical / Chemical/Power Plant/Electrical/Instrumentation Engineering with2 years' experience in the relevant field and desirable proficiency in Boiler operation\ Boiler operation Engineer {B.O.E } OR/ Degree in Mechanical / Chemical Engineering with 1 year experience in the relevant field and desirable proficiency in Boiler operation\ Boiler operation Engineer {B.O.E }
Any Other Statutory requirement	Minimum age to join for job is 18 years with sound physical fitness.

Structure of Course:

Module No.	Module name	Outcome	Compulsory/ Optional	Theory (Hrs)	Practical (Hrs)	Total (Hrs)
1	**Basic workshop practices**	Perform fitting operations including filing, marking, hacksawing, chipping, drilling, tapping, threading with accuracy using appropriate tools	Compulsory	120	270	390
2	**Basic science and calculations**	Recognize different mathematical calculation & science	Compulsory	20	-	20
3	**Basic engineering drawing**	Practice engineering drawing to apply for different application in the field of work.	Compulsory	10	20	30
4	**Calibration and maintenance of instruments**	Perform installation, operation, maintenance, calibration, dismantling and reassembly of pressure, temperature, level and flow measurement instruments	Compulsory	110	280	390
5	**Introduction of Fluid mechanics and thermodynamics**	Explain basic principles of fluid mechanics and thermodynamics	Compulsory	20		20
6	**Basic Technical drawing**	Draw the sketches of valves, locking devices and process instruments used in boiler operation.	Compulsory		30	30
7	**Employability Skill**	As per guided curriculum	Compulsory	120	--	120
TOTAL				**400**	**600**	**1000**

SYLLABUS:

Module 1:**Basic workshop practices**

Outcome: Perform fitting operations including filing, marking, hacksawing, chipping, drilling, tapping, threading with accuracy using appropriate tools

Theory Content:

- Introduction of Trade and Importance of Safety and General Precautions observed in the workshop. Introduction of Steel Rule, Calipers types and uses
- Introduction of functions and types. Try square and functions & uses of scribing Block / Marking

Block. Introduction of Files, Types of Filing – Details

- Introduction of Hacksaw, types functions and Blade, specifications types & uses etc. types of Files, Special files, functions, uses.
- Introduction of Chisels, types, Chipping & types of Hammers uses & functions. Safety Precautions.
- Introduction of Drill bits in detail and types, functions and Types of Drilling Machines. Introduction of Taps & types and other related details – Tap drill size calculation
- Introduction of precision instruments, vernier caliper, Micrometers, Vernier height gauge & other related instruments.
- Introduction of Dyes, Types & Function, Safety Precautions during Dye operation. Introduction about combination set & its uses.
- Introduction about nomenclature of screw threads – types. Introduction about Nuts & Bolts – types of spanners & studs.
- Introduction about fasteners – keys – keyways – types – functions & other related details.
- Introduction of sheet metal – cutting snips different sheet metal tools – stakes & types – Hand shearing machining & its function – types of sheet metal joints
- Rivets – types & their uses, method of riveting – specification of rivet – safety precaution while riveting.
- Removing of broken tapes by various methods (stud extractors, Tap extractors) Safety precaution during blind hole tapping & drilling.
- Introduction of gauges – types – uses & functions (ring gauges, snap gauges, plug gauge etc.)

Practical Content:

- Apply Personal Protective equipment (PPE)
- First aid method application
- Safe disposal of waste materials like cotton waste, metal chips etc.
- Safety signs for danger, warning, caution personal safety message
- Safe use of tools and equipment used in the trade.
- Filing practice, surface filing, Marking of Straight and Parallel lines with odd leg calipers and Steel Rule, Marking practicewithdividers/oddlegcalipers andSteelRule(Circles,Arcs,Parallel lines)
- Filing Flat, Square and Parallel to an accuracyof0.5mm.Markingaccuracy to simple Blue Print Reading using Scribing Block and Dividers.
- Hacksawing along a straight line, Curved line, on different sections of MetalStraightSawonThicksection, M.S.angleand Pipes.
- ChippingPractice,usingdifferenttypes ofChiselsonkeyways,slotsand practice of Chipping.
- Exercise on Drilling Practice by different diameters of Holes and TappingPractice– ThreadingPractice [External & Internal]
- Exercise on simple fitting involving different operations like filing to dimensions,drillingandtappingby usingverniercalipers&Micrometers.
- MakingexternalthreadusingDyes& its accessories. Checking by Square head
- MakingaNutbyusingTaps–Simple Exercise on Screw threads.
- Makingkeys&keywaysonroundbar or M.S. flat (Key way Practice)
- Making simple joints on sheet metal involvingdifferentsheetmetaljoints.
- Exerciseonrivetingbydifferenttypes of rivets & simple fitting exercise.
- Exerciseonfiling,blindholedrilling, blind hole tapping.
- Makeafittingjob–dovetailfitting with 0.10 tolerances.

Module No 2:Basic science and calculations

Outcome: Recognize different mathematical calculation & science

Content:

Unit:Systemsofunit-CGS,MKS/SIunit, unit of length, Mass and time, Conversion of units

MaterialScience:Properties-Physical & Mechanical, Types –Ferrous & Non- Ferrous, difference between Ferrous and non-Ferrous metals

Fractions:Fractions,Decimalfraction, L.C.M., H.C.F. Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator.

Mass,WeightandDensity:Mass,Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.

Ratio&Proportion:Simplecalculation on related problems.

SpeedandVelocity:Restandmotion, speed, velocity, difference between speed and velocity, acceleration, retardation.

Percentage:Introduction,Simplecalculation. Changing percentage to decimal and fraction and vice-versa

Work,PowerandEnergy:work,unitof work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy,

potentialandkineticenergy,examples ofpotentialenergyandkineticenergy.

Mensuration: Areaandperimeterof square, rectangle, parallelogram, triangle, circle, semi circle,

Volumeofsolids–cube,cuboid, cylinder and Sphere.

Surfaceareaofsolids–cube,cuboid, cylinder and Sphere.

Heat & Temperature: Heat and temperature, their units, difference betweenheatandtemperature,boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer,pyrometer,transmission of heat, conduction, convection,radiation.

Module No 3: Basic engineering drawing

Outcome: Practice engineering drawing to apply for different application in the field of work.

Content:

EngineeringDrawing:Introductionandits importance

DrawingInstruments:theirStandardand uses

- Drawingboard,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,typesandapplicationsin Drawing as per BIS SP:46-2003
- Classification of lines (Hidden, centre, construction,Extension,Dimension,Section)
- Drawinglinesofgivenlength(Straight, curved)
- Drawingofparallellines,perpendicular line

DrawingofGeometricalFigures:Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting.

- Triangle-differenttypes
- Rectangle,Square,Rhombus, Parallelogram, polygons.
- Circleandits elements.

LetteringandNumberingasperBISSP46- 2003:

SingleStroke,DoubleStroke,inclined, Upper case and Lower case

PracticeofLetteringandTitleBlockDimensioning practice:

- Positionofdimensioning(unidirectional, aligned, oblique as per BIS SP:46-2003)
- Symbolsprecedingthevalueofdimension

anddimensionaltolerance.

DrawingofSolidfigures(Cube,Cuboids, Cone,Prism,Pyramid,FrustumofConeand Pyramid.) with dimensions.

Free Hand sketch of hand tools andmeasuringtoolsusedinrespectivetrades.

Free-hand sketches ofHandTools,Screw drivers, Pliers,

Spanner, Tweezer. Free-hand sketches of VernierCaliper,micrometer,DepthGauge, Dial Test Indicator, Bevel protractor

- **ISI symbols**of Generator, Voltmeter, Ammeter, Watt- meter. Resister, inductor, Capacitor,Transformer,AC&DCmotorsetc. Drawing of pressure control process line

Module No 4: Calibration and maintenance of instruments

Outcome: Perform installation, operation, maintenance, calibration, dismantling and reassembly of pressure, temperature, level and flow measurement instruments

Theory Content:

- Safety at work causes and types of fire. fire extinguishers types and uses General Safety precautions in Boiler house, different equipment and Instruments used for boiler.
- Electricity- electric safety Ohm's law, series & parallel connections.
- What is IBR and non IBR Boilers?

PRESSURE:

- Definition of pressure. Types of pressure & their units.
- Types of pressure sensing elements- bourdon tube, diaphragms, capsules, and bellows.
- Pressure switches types and applications. Types of manometers. Dead weight tester and comparators and applications.
- Importance of ID fan & FD fan in Boiler

Temperature measurement:

- Definition, Units of Temperature, modes of heat transfer, Temperature gauges – bimetallic, liquid filled system thermometer working and application.Temperature sensors, RTD, Thermocouple, Optical and radiation pyrometer workingand application.
- Basic properties of fluids, fluids in motion, getting fluids to flow, units of flow rate and quantity flow, factors affecting flow rate. Relation between flow rate and pressure, area, quantity. Head type flow meter types.Working and application of venturi and orifice flow meter. Rota meter working, application
- Gases - CO, CO2, O2., Cooling tower. Working, Application of I to P, and valve positioner, ON-OFF controller, P, PI, PD,PID control limitations and application.Blower construction and operation,
- Steam: Its heating and power properties: Principles of steam and application in Modern Boilers. Steam preventing, escape of heat, lagging, steam distribution, charging of steam and water line, steam quality, condensate handling, traps etc.Wet steam saturated steam, super heated steam and their properties. Boiling point, temperature and pressure relations, sensible heat, latest heat super heat, reheat and total heat. Use of steam table and entropy chart. boiling andcondensation
- Construction, working and uses of varioustypes of valves.Construction, working and uses of various types of Pumps, Introduction /overview of thermodynamics. Construction, working and uses of various types of heat exchangers, condenser & cooler

Water treatment:

- Object of feed water treatment
- water analysis water of high Pressure boilers. Impurities in water and their harmful effects.
- Effects of other suspended matter such as Oil, alkalinity, hardness, etc. in feed water
- Total dissolved solids
- Methods of purification.
- Use of Deaerators –Priming and foaming
- scale formation and corrosion. Chemical cleaning of boiler, softening and de- mineralized Water Plant.

- **Types of boilers**-fire tube and water tube boilers Forced circulation boilers. Pre- heater, Economizer, waste heat boiler.
- Boiler drum. Boiler mounting and fittings. Boiler accessories. IBR and non IBR Boiler, Knowledge of Indian Boilers Acts and Rules.

Practical Content:

- Verification of ohm's law
- Specific resistance of wire by Wheatstone bridge
- Electrical safety and safety at boiler and boiler house
- Study different types pressure sensing elements.
- Dismantling and Assembling of bourdon tubePressure gauge.
- Measurement of pressure using manometers.
- Draft gauge and its calibration.
- Calibration of pressure gauge usingdead weight tester and comparator.
- Temperature measurement using – Filled system thermometers, bimetallic thermometers, Thermocouple & RTD. Calibration of Thermocouple and RTD temperature Transmitter, Measurement of temperature using Optical & Radiation pyrometer
- Dismantling, assembling of sight glass gauge.
- Level measurement using by sight glass and float type gauge.
- Installation and testing of hydrostatic level gauge. Installation and testing of venturi and orifice flow meter. Rota meter and testing
- CO, CO2 and O2 Analyzer, pH measurement
- Study the working PID process loop.
- ID Fan and FD Fan, Blowers
- Dismantling, overhauling and assembling of safety valve.

- Dismantling, overhauling and assembling of pressure switch.
- Dismantle, clean & Reassemble ofdifferent types of valves
- Dismantle, clean & Reassemble of different types of Pumps.
- Dismantle, clean & Reassemble of shell & tube Heat exchanger
- Use and maintenance of lagging materials such as glass wool, asbestos and thermocol.
- Gasket cutting as per size of given flange diameter.
- Hydraulic test of non-IBR boiler. Operation of non- IBR boiler and observation of all Parameters while operating boiler and testing of Boiler mounting and fittings, Boileraccessories and shut down of boiler.
- Maintain electrical safety while using temperature sensors like RTDs and thermocouples
- Ensure proper eye protection and avoid exposure to intense heat sources
- Installation safety of flange fitting and sealing to avoid leaks during meter installation

Module No 5: Introduction of Fluid mechanics and thermodynamics

Outcome: Explain basic principles of fluid mechanics and thermodynamics

Content:

- Archimedes' principle, principle offloatation hydrometers. Centre of gravity and Equilibrium condition.
- Definition - viscosity, flash point, fire point, flash points of standard lubricating oils, octane number.
- Pressure, temperature, Boyle's law, Charles's law, Equation of perfect gas calculations.

- Newton's laws of motion, unit of force,find out resultant force parallelogram law of forces, Centre of Gravity, (C.G. Of square, rectangle, triangle, circle, semicircle, cone) & its calculations.

- Condition of equilibrium, kind ofequilibrium, some examples of equilibrium in daily life

- Be cautious when dealing with suspended loads

Flow of fluids

- Equation of continuity, Bernoulli'stheorem.
- Advantages & Disadvantages of friction, Limiting friction, Laws of limiting friction, Coefficient of friction,angle of friction, Inclined plane, Force of friction
- Flow measurement by orifice meter, venturi meter, Rota meter, U-tube manometer.
- Latent heat, sensible heat, saturated steam, wet steam, superheated steam. Reynolds's number, at differentvelocities.
- Use safety gloves and goggles when handling chemicals
- Maintain safe distance from steam outlets and release valves.

Module No 6: Basic Technical drawing

Outcome: Draw the sketches of valves, locking devices and process instruments used in boiler operation.

Content:

- 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.
- 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.
- Drawing of pressure, Level , flow and temperature control system.
- Free hand sketches of crushers, ball mill, hammer mill and centrifuges
- 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.
- Flow sheet / Block diagram of
  1.Sulphuric acid
  2.Nitric acid
  3.Ammonia
  4. Urea
  5. Ethanol

Module No 7 :Employability Skills(120 Hrs.)

DGT/VSQ/N0104

KeyLearningOutcomes

IntroductiontoEmployabilitySkills Duration:3Hours

After completing this programme, participants will be able to:

1. OutlinetheimportanceofEmployabilitySkillsforthecurrentjobmarketandfutureofwork
2. ListdifferentlearningandemployabilityrelatedGOIandprivateportalsandtheirusage
3. Researchandprepareanoteondifferentindustries,trends,requiredskills andtheavailable opportunities

Constitutionalvalues-Citizenship Duration:3Hours

4. Explaintheconstitutionalvalues,includingcivicrightsandduties,citizenship,responsibili tytowards society etc. that are required to be followed to become a responsible citizen
5. Discusstheroleofpersonalvaluesandethics

suchashonesty,integrity,caringandrespectingothers, etc. in personal and social development

6. Identifyandpracticedifferentenvironmentallysustainablepractices

BecomingaProfessionalinthe21stCentury Duration:5Hours

7. Discussrelevant21stcenturyskillsrequiredforemployment
8. Highlighttheimportanceofpracticing21stcenturyskillslike Self-Awareness,BehaviorSkills,time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life
9. Createapathwayforadoptingacontinuouslearningmindsetforpersonalandprofessionaldevelopment

BasicEnglishSkills Duration:20Hours

10. Useappropriategrammarandsentenceswhileinteractingwithothers
11. ReadEnglishtextwithappropriatearticulation
12. Roleplayasituationonhowtotalkappropriatelytoacustomerin English,overthephoneorinperson
13. Writeabriefnote/paragraph/letter/e-mailusingcorrectEnglish

CareerDevelopment&GoalSetting Duration:5Hours

14. Createacareerdevelopment plan
15. Identifywell-definedshort-andlong-termgoals

CommunicationSkills Duration:10Hours

16. Demonstratehowtocommunicateeffectivelyusingverbalandnonverbalcommunicationetiquette
17. Writeabriefnote/paragraphonafamiliartopic
18. Explaintheimportanceofcommunication etiquetteincludingactivelisteningforeffective communication
19. Roleplayasituationonhowtoworkcollaborativelywithothersinateam

DiversityandInclusion Duration:5Hours

20. Exhibithowtobehave,communicate,andconductoneselfappropriatelywithallgendersandPwD
21. DiscussthePOSHActandits significance

FinancialandLegalLiteracy Duration:10Hours

22. Discussvariousfinancialinstitutions,products,andservices
23. Demonstratehowtoconductofflineandonlinefinancialtransactions,safelyandsecurely andcheck passbook/statement
24. Explainthecommoncomponentsofsalarysuchas Basic,PF,Allowances(HRA,TA,DA, etc.),tax deductions
25. Calculateincomeandexpenditureforbudgeting
26. Discussthelegalrights,laws,andaids

EssentialDigitalSkills Duration:20Hours

27. Describetheroleofdigitaltechnologyin day-to-daylifeandtheworkplace
28. Demonstratehowtooperate digitaldevicesandusetheassociatedapplications andfeatures,safelyand securely
29. Demonstratehowtoconnectdevicessecurelytointernetusingdifferentmeans
30. Followthedosanddon'tsofcybersecuritytoprotectagainstcybercrimes
31. Discussthesignificanceofdisplayingresponsibleonlinebehavior whileusingvarioussocialmedia platforms
32. Createane-mailidandfollowe-mailetiquettetoexchangee-mails
33. Showhowtocreatedocuments,spreadsheetsandpresentations usingappropriateapplications
34. utilizevirtualcollaborationtoolstowork effectively

Entrepreneurship Duration:14Hours

35. Describethetypesofentrepreneurshipandenterprises
36. Discusstheprocessofidentifyingopportunitiesforpotentialbusinessandrelevantregulatoryand statutory requirements
37. Describethe4PsofMarketing-Product,Price,PlaceandPromotionandapplythemasperrequirement
38. Createasamplebusinessplan,fortheselectedbusinessopportunity
39. Discussvarioussourcesoffundingandidentifyassociatedfinancialandlegalriskswithitsmitigationplan

CustomerService Duration:5Hours

40. Describedifferenttypesofcustomers

41. Roleplayasituationonhowtoidentifycustomerneedsandrespondtotheminaprofessionalmanner
42. Explainvarioustoolsusedtocollectcustomerfeedback
43. Discussthesignificanceofmaintaininghygieneanddressingappropriately

Gettingreadyforapprenticeship&Jobs Duration:20Hours

44. DraftaprofessionalCurriculumVitae(CV)
45. Usevariousofflineandonlinejob searchsourcessuchasemploymentexchanges,recruitmentagencies, and job portals respectively
46. Demonstratehowtoapplytoidentifiedjobopeningsusingoffline/onlinemethodsasperrequirement
47. Discusshowtoprepareforaninterview
48. Roleplayamockinterview
49. Listthestepsforsearchingandregisteringforapprenticeshipopportunities

LearningOutcome–AssessmentCriteria

Module No.	Outcome	AssessmentCriteria
1	Perform fitting operations including filing, marking, hacksawing, chipping, drilling, tapping, threading with accuracy using appropriate tools	(1.1) Follow workshop safety rules and precautions. (1.2) Measure accurately using steel rule and callipers. (1.3) Identify files, chisels and hacksaws correctly. (1.4) Perform filing within 0.5 mm accuracy. (1.5) Cut metal using a hacksaw along straight and curved lines. (1.6) Drill and tap holes with correct dimensions. (1.7) Assemble sheet metal joints and riveting. (1.8) Make external and internal threads using taps and dies. (1.9) Fit a dovetail joint within 0.10 mm tolerance. (1.10) Check accuracy using vernier callipers and micrometres.
2	Recognize different mathematical calculation & science	(2.1) Identify CGS, MKS, and SI units of length, mass, and time. (2.2) Convert units between different measurement systems. (2.3) Differentiate between ferrous and non-ferrous metals. (2.4) Solve fraction and decimal problems using a scientific calculator. (2.5) Compare mass, weight, and density with correct units. (2.6) Calculate ratio and proportion in simple problems. (2.7) Distinguish speed, velocity, acceleration, and retardation.
3	Practice engineering drawing to apply for different application in the field of work.	(3.1) Identify different drawing instruments and their uses. (3.2) Classify types of lines as per BIS SP:46-2003. (3.3) Draw straight, curved, parallel, and

Module No.	Outcome	AssessmentCriteria
		perpendicular lines accurately. (3.4) Construct geometrical figures with proper nomenclature. (3.5) Bisect angles using standard methods. (3.6) Write lettering and numbering in single and double strokes. (3.7) Dimension drawings using unidirectional, aligned, and oblique methods. (3.8) Sketch solid figures with correct proportions and dimensions. (3.9) Create free-hand sketches of hand tools and measuring instruments. (3.10) Apply dimensioning symbols and tolerances correctly.
4	Perform installation, operation, maintenance, calibration, dismantling, and reassembly of pressure, temperature, level and flow measurement instruments	(4.1) Identify causes and types of fireand select appropriate fire extinguishers. (4.2) Demonstrate electrical safety procedures and verify Ohm's law. (4.3) Classify IBR and non-IBR boilers and explain their applications. (4.4) Measure pressure using bourdon tubes, diaphragms and manometers. (4.5) Calibrate a pressure gauge using a dead weight tester. (4.6) Install and test a hydrostatic level gauge. (4.7) Measure temperature using thermocouples, RTDs and optical pyrometers. (4.8) Dismantle, clean and reassemble different types of valves and pumps. (4.9) Analyze gases (CO, CO_2, O_2) and measure pH levels.
5	Explain basic principles of fluid mechanics and thermodynamics	(5.1) Explain Archimedes' principle and principle of floatation. (5.2) Demonstrate the use of hydrometers to measure fluid density. (5.3) Determine the center of gravity for different shapes. (5.4) Define viscosity, flash point and fire point of lubricating oils. (5.5) Calculate pressure and temperature using Boyle's and Charles's laws. (5.6) Apply Newton's laws of motion to practical scenarios. (5.7) Find the resultant force using the parallelogram law of forces. (5.8) Explain equilibrium conditions and provide real-life examples. (5.9) Derive and apply Bernoulli's theorem in fluid flow. (5.10) Measure flow using orifice meters, venturi

Module No.	Outcome	AssessmentCriteria
		meters, and rotameters. (5.11) Explain friction, its types and the laws of limiting friction.
6	Draw the sketches of valves, locking devices and process instruments used in boiler operation.	(6.1) Draw sketches of different types of valves. (6.2) Illustrate different types of locking devices. (6.3) Represent different valve types using symbols. (6.4) Sketch freehand drawings of belt conveyors, screw conveyors and bucket elevators. (6.5) Draw diagrams of pressure, level, flow and temperature control systems. (6.6) Sketch freehand drawings of crushers, ball mills, hammer mills and centrifuges. (6.7) Illustrate steam jet ejectors and steam traps. (6.8) Draw a labeled diagram of a distillation column with all accessories. (6.9) Sketch process instruments such as temperature indicators, level indicators, LIC, TIC, PI, PIC, FI and FIC. (6.10) Develop flow sheets or block diagrams for Sulphuric acid, Nitric acid, Ammonia, Urea and Ethanol production.
7	Employability Skills (60 Hrs.)	As per guided curriculum

Basic Training Programme for Boiler Attendant			
LISTOFTOOLSANDEQUIPMENTforBasicTraining(For30candidates)			
A.TRAINEESTOOLKIT			
Sl. no.	**NameoftheTool &Equipments**	**Specification**	**Quantity**
1	SteelRule	15cmwith metric graduation	30
2	TrySquare10 cm blade	10mm blade	30
3	Caliperoutside15cmspring	150mm	30
4	Caliperinside.	15cmspring	30
5	Caliper	15 cm hermaphrodite	30
6	Divider	15cm spring	30
7	Scriber.	15cm	30
8	Centre Punch	10Cmand	30
9	Screwdriver	15c m	30
10	Chiselcoldflat10cm	15cm	30
11	Hammerballpeen	0.45kg.With handle	30
12	Hammerballpeen	0.22kg.With handle.	30
13	Chisel –Cold –Flat	–20mmX150mm	30
14	Fileflat	25cm.secondcut	30
15	Fileflat	25 cm.smooth	30
16	Filehalfroundsecondcut	15cm.	30
17	Hacksawframe fixed	30cm.	30
18	Safety goggles.		30
19	Dotslot punch	10cm.	30
B:INSTRUMENTS&GENERALSHOP OUTFIT			
1.	SteelRule	30cm	05
2.	SteelRule	60cm	05
3.	Straightedge steel	45cm	02
4.	Surface plate	45 x45 cm CI/Granite.	02
5.	Markingtable	91 x91 x122cm.	01
6.	Universalscribing block	22cm.	02
7.	V-Blockpair	7cmand15 cmwith clamps	02
8.	Angle plate	10 x20cm	02
9.	SpiritLevelmetal	15cm	01
10.	Punch letter	3mmset.	01
11.	Punchnumber	set3mm.	01
12.	Punch hollow	6mmto19setof5	02
13.	Punchround	3mmx4mm setof 2	02

14.	Portablehanddrill (Electric)	0to6mm	02
15.	Drilltwiststraightshank	1.5to 12 mmby0.5 mm	01set
16.	Drilltwiststraightshank	3mmto15mmby ½ mm	01set
17.	TapsanddiescompletesetinboxB.A		01
18.	Tapsanddiescompleteset inbox with-worth.		01
19.	Tapsanddiescompleteset in	box3-18mmset of10	01
20.	Fileknifeedgesmooth	15cm	05
21.	Filewardingsmooth	15cm	05
22.	File cutsawsmooth	15cm	05
23.	Filefeatheredge smooth	15cm	05
24.	Filetriangular smooth	15cm	02
25.	Fileround	20cmsecondcut	10
26.	FileSquare	15cmsecondcut	05
27.	Filesquare	25cmsecondcut	05
28.	Feelergauge	10blades	1set
29.	Filetriangular	20cmsecondcut.	10
30.	Fileflat	30cmsecondcut.	10
31.	Fileflat	20 cm bastard	10
32.	Fileflat	30 cm bastard.	10
33.	File Swisstypeneedle	set of 12.	02
34.	Filehalf round	25cmsecondcut.	10
35.	Filehalf round	25 cm bastard.	10
36.	Fileround	30 cm bastard.	10
37.	Filehand	15cmsecondcut.	10
38.	SolderingIron	350gm.	02
39.	BlowLamp	0.50liters.	02
40.	Spanner D.E.	6-26mmsetof10pcs.	05sets
41.	Interchangeableratchetsocket	set with a12mmdriver, sizeD10-32mmsetof18 socket & attachments.	1set
42.	Box spanner	set6-25mmsetof8with Tommy bar.	1set
43.	Glassmagnifying	7cm	02
44.	Clamp toolmaker	5cmand7.5cmsetof2.	02
45.	Clamp“C”	5cm	02
46.	Clamp“C”	10cm	02
47.	HandReameradjustablecover	max9,12,18mm–setof3	1set
48.	HandReamertaper	4-9mm set of 6OR4-7 mm setof4.	1set
49.	Reamerparallel	12-16mm set of 5.	01
50.	Scraperflat	15cm.	10
51.	Scrapertriangular	15cm	10

52.	Scraperhalfround	15cm	10
53.	Chiselcold diamond.	9 mm crosscut9mm	10
54.	Chiselcold diamond.	9 mm crosscut9mm	10
55.	Chiselcoldroundnoze.	9mm	10
56.	StudExtractorEZY –out		02
57.	Micrometer	0 –25 mm outside.	10
58.	Micrometer	25–50mmoutside.	05
59.	Micrometer	50 –75 mm outside.	2
60.	Micrometerinsidewithextension rods.	25-50mm	01
61.	Verniercaliper	20cm	01
62.	Vernierbevel protractor		01
63.	Vernierheightgauges.	30cm	01
64.	Screwpitchgauge.		01
65.	Drilltwist TaperShank	06mmto25mmx1.5mm	01
66.	Drillchuck	12mm.	01
67.	Pipe wrench	40cm	01
68.	Pipe wrench	40cm	01
69.	Pipevice	100mm	01
70.	AdjustablepipetapsetBSPwithdie set coverpipe	size15,20,25,32,38,50mm.	01
71.	Wheeldresser	(Onefor4units).	01
72.	Machinevice	10cm	01
73.	Sleevedrill Morse	0–1,1–2,2–3.	01set
74.	Vice bench jaw	12 cm	20
75.	Vice leg jaw	10 cm	02
76.	Bench working	240 x 120 x 90 cm.	05
77.	Almirah	180 x 90 x 45 cm.	01
78.	Lockers with 6 drawers (standard size).		03
79.	Metal rack	182 x 182 x 45 cm	01
80.	Fire extinguisher (For 4 Units)		02
81.	Fire buckets.		02
82.	Hand hammer with handle and Mallet	1 kg.	02 each
83.	Resistance coils	(2 Ohms, 5, ohms,10 ohms, 100 ohms)	2 sets
84.	Resistance boxes	(0-100 ohms and 0 to 500 ohms)	2 sets
85.	Ampere meters	DC: 0-1Amp, 0-3 Amp, 0-10Amp, 0-30Amp AC: 0-10Amp, 0-30Amp	2 each
86.	Volt meters	DC : 0- 1V, 0-4 V, 0-10 V, , 0-50V 0-250 V	2 each

		AC : 0-250 V	
87.	Rheostat :	25 Ohms , 100 ohms, 500 ohms	2each
88.	Wheatstone bridge		2 sets
89.	Potentiometer		2 sets
90.	Bourdon Tube Pressure gauges.	(0- 10 Kg/sq. cm)	2 sets
91.	Mercury filled U-tube manometer (100 cms height)		2 nos.
92.	Dead weight tester with accessories and comparator		One set
93.	Pressure switch	(0- 10 Kg/sq. cm)	2 nos
94.	Glass Rod Thermometer (Mercury and alcohol) Range: (various ranges)		2 each
95.	Bi-Metal thermometers, stem & dial (various ranges)		04
96.	RTD Resistance-bulb Wheatstone Bridge Thermometers	(PT – 100, PT-1000)	02
97.	Thermo-couple Pyrometers (with different thermocouple)		10
98.	Thermo-couple with mill-volt-potentiometer pyrometer		02
99.	Optical Pyrometer and radiation pyrometer		Oneeach
100.	Mercury in Steel Thermometers, RemoteIndicating		2nos
101.	ON-OFF Controller P, PI, PD controllersPIDcontroller		Oneeach
102.	Controlvalvewithvalvepositioned andI/P convertor andP/Iconvertor		One set
103.	FlowmeterTest rig (Rotameter-Venturimeter-Orifice meter–PitotTube- water meter)		1set
104.	Differenttypesofvalves(Gate,Globe, Needle, Ball, Plug, Butterfly, Diaphragm, check valves (NRVs), spring loaded safety valves, etc.)		2sets
105.	Different types of pumps (Centrifugal pump, multistage centrifugal pump, ReciprocatingandGearpumptest rigs)		1each
106.	Plungerpumpforhydraulictestof Non-IBRBoiler		1no.
107.	DigitalIP^HMeter		2nos
108.	Gasanalyses		1no.
109.	AirBlowers		1no
C:GENERALMACHINERY INSTALLATIONS			
1.	Anvilon stand	50kg	01

2.	Drillingmachinepillarsensitive0-20mm cap with swivel table motorize with chuck and key.		01
3.	Drilling machine pillar sensitive 0-12mmcapwithswiveltablemotorize with chuck and key.		02
4.	Forgeportablehandblower	30cmto 45 cm	01
5.	GrindingmachineD.E.pedestalwith 17mm diameter wheels rough and smooth with twist drill grinding attachment		01
6.	ShellandtubeHeat Exchanger		01
7.	Non-IBR Boiler with all mounting & fitting, Accessories with feed water tankandcontrolpanelforoperation ofboiler.	(100kgsteamoutput capacity)	01

LISTOFTOOLS&EQUIPMENTSFOR ENGINEERING DRAWING

A:TRAINEESTOOLKIT:-			
Sl. No.	**Nameof theitems**	**Specification**	**Quantity**
1.	Draughtsmandrawinginstrumentbox		30
2.	Setsquarecelluloid45^{o}	(250X1.5mm)	30
3.	Setsquarecelluloidmm)	30^{o}-60^{o}(250X1.5	30
4.	Minidrafter		30
5.	Drawing board	700mmx500mm) IS:1444	30
B:Furniture Required			
Sl. No.	**Nameof theitems**	**Specification**	**Quantity**
1	Drawing Board		asrequired
2	Models:Solid&cutsection		asrequired
3	DrawingTablefor trainees		asrequired
4	Stoolfor trainees		asrequired
5	Cupboard(big)		01
6	WhiteBoard	(size:8ft.x4ft.)	01
7	Trainer'sTable		01
8	Trainer'sChair		01

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl.No.	**Nameof theEquipment**	**Quantity**
1.	Computer(PC)with latest configuration sand Internet connection with standard operating system and standard word processor and worksheet software	15Nos.
2.	UPS-500VA	15Nos.
3.	ScannercumPrinter	1No.
4.	Computer Tables	15Nos.
5.	Computer Chairs	30Nos.
6.	LCDProjector	1No.
7.	WhiteBoard1200mm x900mm	1No.
Note:-AboveTools&Equipmentsnotrequired,ifComputerLABisavailableintheinstitute.		

Marks Distribution

Outcome	Outcome Code	Type	Total Th marks	Total Pr Marks
Perform fitting operations including filing, marking, hack sawing, chipping, drilling, tapping, threading with accuracy using appropriate tools	CGM/0709/OC1	Compulsory	50	320
Recognize different mathematical calculation & science	CGM/0709/OC2	Compulsory	20	0
Practice engineering drawing to apply for different application in the field of work.	CGM/0709/OC3	Compulsory	10	70
Perform installation, operation, maintenance, calibration, dismantling and reassembly of pressure, temperature, level and flow measurement instruments	CGM/0709/OC4	Compulsory	50	320
Explain basic principles of fluid mechanics and thermodynamics	CGM/0709/OC5	Compulsory	20	0
Draw the sketches of valves, locking devices and process instruments used in boiler operation.	CGM/0709/OC6	Compulsory	0	90
Employability Skills – 120 Hrs	DGT/VSQ/N0102	Compulsory	50	0
Total Marks: 1000 **Theory: 200 including ES** **Practical: 800**				