

Syllabus for Junior Sheet Metal Operator

Course Name	Junior Sheet Metal Operator
Sector	Capital Goods
Course Code	CGM/2023/JSMO/249
Level	3
Occupation	Sheet Metal Operator Assistant
Job Description	Able to assist sheet metal operators to perform the work effectively in industries.
Course Duration	Total Duration 360Hrs (T- 60 , P- 180 , OJT-60 and ES-60)
Trainees' Entry Qualification	Grade 10 OR Grade 8 with two year of (NTC/ NAC) after 8 th OR Grade 8 pass and pursuing continuous schooling in regular school with vocational subject OR 8th grade pass with 2 yrs relevant experience OR Previous relevant Qualification of NSQF Level 2 with one yr experience OR Previous relevant Qualification of NSQF Level 2.5 with 6 months experience
Trainers Qualification	ITI, Diploma, B.Tech

Structure of Course:

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
1	Introduction to sheet metal operator, safety and precautions.	Describe the roles & responsibility of sheet metal operator along with the safety practices to prevent hazards & accidents.	9	21	30
2	Importance of material and technical terms related to sheet metal operation.	Explain different types of materials as well as various technical terms used in sheet metal work.	6	24	30
3	Hand tools and equipment used in sheet metal operation.	Demonstrate the use of various tools and equipment for sheet metal operation.	15	45	60
4	Basic sheet metal operations like Measuring, marking, cutting, bending and joining.	Perform different types of sheet metal operations to produce simple objects.	30	90	120
5	OJT	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	--	60	60
6	Employability Skill	As per guided curriculum	60	--	60
TOTAL:			120	240	360

SYLLABUS:**1. Module Name: Introduction to sheet metal operator, safety and precautions. (30 Hrs)**

Outcome: Describe the roles & responsibilities of sheet metal operator along with the safety practices to prevent hazards & accidents.

Theory Content: (9 Hrs)

- 1.1. Key roles and responsibility of a sheet metal operator.
- 1.2. Job opportunity of a sheet metal operator.
- 1.3. Importance of following the instructions of the manufacturer.
- 1.4. Different types of safety.
- 1.5. Method to maintain the safety rules.
- 1.6. Various safety signs.
- 1.7. Safe attitudes.
- 1.8. Importance of first aid box.
- 1.9. Prevention of different types of hazards.
- 1.10. How to avoid an accident.
- 1.11. How to handle the raw material, job and machine.

Practical Content: (21 Hrs)

- 1.1. Demonstration of the roles and responsibilities along with the job opportunities of a sheet metal operator using charts and ppt.
- 1.2. Demonstration of various precautionary practices following the safety rules.
- 1.3. Demonstration of different types of hazards using charts and video clips.
- 1.4. Demonstration of right and wrong safety practices to prevent hazards and accidents using charts.
- 1.5. Interpretation of different charts to understand the signs related to safety practices.
- 1.6. Demonstration of use of first aid box.
- 1.7. Demonstration of handling raw materials, jobs & machines maintaining safety practices.

Tools & Equipment needed: White Boards, Marker, Charts, Projector, First aid box.

2. Module Name: Importance of material and various technical terms related to sheet metal operation. (30 Hrs)

Outcome: Explain different types of materials as well as various technical terms used in sheet metal work.

Theory Content: (6 Hrs)

- 2.1. Introduction to Metals & Non- metals.
- 2.2. Distinguish between Metals and Non-metals.
- 2.3. Ferrous metal and its alloy (Carbon steel & Alloy steel) used in sheet metal work.
- 2.4. Non-Ferrous metals and its alloy (Aluminium, Copper, Zinc, Brass & Bronze) used in sheet metal.
- 2.5. Physical & mechanical properties of metals.
- 2.6. Raw material information of some important materials used in sheet metal industries like MS, GI, Stainless steel and CRCA.

2.7. Definition of Technical terms used in sheet metal work.

Practical Content: (24 Hrs)

- 2.1. Demonstration of various ferrous metals (Carbon steel & Alloy steel) along with their applications related to sheet metal operation using charts and ppts.
- 2.2. Demonstration of various Non-Ferrous metals (Aluminium, Copper, Zinc, Brass & Bronze) along with their applications related to sheet metal operation using charts and ppts.
- 2.3. Demonstration of Physical & mechanical properties of metals required for sheet metal work using charts.
- 2.4. Demonstration of raw material information, properties and application of some important materials like GI, Stainless steel and CRCA in modern sheet metal industries.
- 2.5. Identification of common metals used in sheet metal operation like Mild steel, Stainless steel, Aluminium, Copper, Brass & Bronze using small specimen of materials.
- 2.6. Demonstration of various Technical terms used for getting familiar with sheet metal work like Job holding, measuring, marking, Cutting, Striking, Bending, Punching, Blanking, shearing, Piercing, Forming, Grinding, Wiring, Flanging, Joining, Riveting, Soldering & welding using charts, ppts & Audio-visual clips.

Tools & Equipment needed: White Board, Marker, Charts, Projector, Specimen of materials (Mild steel, Stainless steel, Aluminium, Copper, Brass & Bronze).

3. Module Name: Hand tools and equipment used in sheet metal operation. (60 Hrs)

Outcome: Demonstrate the use of various tools and equipment for sheet metal operation.

Theory Content: (15 Hrs)

- 3.1. Job holding tools and their uses (Bench vice, machine vice, hand vice, leg vice & C-clamp).
- 3.2. Measuring tools and their uses (Steel rule, standard wire gauge, compass, caliper, trammel bar, micro meter & Vernier caliper).
- 3.3. Marking tools and their uses (Straight edge, Try Square, Scriber, Scratch AWL, Center punch, Dot punch & Prick punch).
- 3.4. Cutting Tools and their uses (Snips, Shears, File, Chisel, Hack saw & Portable hand drill).
- 3.5. Striking Tools and their uses (Wooden Mallet, Hammer & Sheet metal Hammer).
- 3.6. Supporting Tools and their uses (Hatchet Stake, Funnel Stake, Half Moon Stake, Round Bottom Stake, Beak Iron stake & Anvil).
- 3.7. Hand operated shearing machine and its uses.
- 3.8. Bar folder machine and its uses.
- 3.9. Pedestal grinding machine and its uses.

Practical Content: (45 Hrs)

- 3.1. Demonstration of how to operate Job holding devices (Bench vice, hand vice & C-clamp) in sheet metal work.
- 3.2. Demonstration of how to use measuring tools (Steel rule, compass, caliper, trammel bar, Outside micrometer & Vernier caliper).
- 3.3. Demonstration of marking operation in sheet metal work using Straight edge, Try Square, Scriber, Center punch & Dot punch.
- 3.4. Demonstration of cutting operation in sheet metal work using tools like Snips, Hand shears, File, Chisel, Hack saw & Portable hand drill.

- 3.5. Demonstration of the working of striking tools using Wooden Mallet, Hammer & Sheet metal Hammer.
- 3.6. Demonstration of the use of supporting tools in sheet metal work using Hatchet Stake, Funnel Stake, Half Moon Stake & Anvil.
- 3.7. Demonstration of how to operate Hand operated shearing machine, Bar folder Machine & Pedestal grinding machines.

Tools & Equipment needed: White Board, Marker, Charts, Projector, Job holding tools (Bench vice, hand vice & C-clamp), measuring tools (Steel rule, compass, caliper, trammel bar, Outside micrometer & Vernier caliper), Marking tools (Straight edge, Try Square, Scriber, Center punch & Dot punch), Cutting Tools (Snips, Hand shears, File, Chisel, Hack saw & Portable hand drill), Striking Tools (Wooden Mallet, Hammer & Sheet metal Hammer), Supporting Tools (Hatchet Stake, Funnel Stake, Half Moon Stake & Anvil), Hand operated shearing machine, Bar folder Machine & Pedestal grinding machines.

4. Module Name: Basic sheet metal operations like Measuring, marking, cutting, bending and joining. (120 Hrs)

Outcome: Perform different types of sheet metal operations to produce simple objects.

Theory Content: (30 Hrs)

- 4.1. Application of Job holding, measuring, marking, Cutting, Striking, Bending, Punching, Blanking, shearing, Piercing, Grinding, Flanging operation related to sheet metal work.
- 4.2. Basic drawing symbols used in sheet metal operation
- 4.3. Basic Geometrical constructions like squares, rectangles, triangles, trapezium, Circles, Arc & Sector of a circle.
- 4.4. Basic Geometrical constructions like cylinder, cone, frustum of a cone, pyramids, frustum of pyramids & spheres.
- 4.5. Introduction to surface development method.
- 4.6. Introduction to Grooved joint, Lock Grooved seam, panned down seam and double hemming operation.
- 4.7. Application of joining operation like Riveting, Soldering & welding to form basic patterns.

Practical Content: (90 Hrs)

- 4.1. Demonstration of Job holding, measuring & marking practice, Cutting, striking & Bending practice, Punching practice and Joining practice related to sheet metal work using charts and Audio-visual clips.
- 4.2. Demonstration of basic drawing symbols used in sheet metal operation using charts.
- 4.3. Demonstration of preparing cylinder, cone and pyramids by means of sheet metal operations using Audio-visual clips.
- 4.4. Practice of job holding using Bench vice.
- 4.5. Practice of Length Measurement of sheet metal using steel rule.
- 4.6. Practice of Straight line marking on sheet metal using straight edge and scriber.
- 4.7. Practice of straight line cutting and drilling of sheet metal using Snips, Hand shear and Portable hand drill.
- 4.8. Practice of joining operation of sheet metals using riveting and soldering operation and spot welding machines.
- 4.9. Preparation of a dust pan using measuring & marking tools like steel rule and scriber, cutting tools like Snips and Hand shear, Striking tools like sheet metal hammer and wooden mallets, Joining operation like riveting, soldering and spot welding machines.
- 4.10. Preparation of a square tray using measuring & marking tools like steel rule and scriber, cutting tools like Snips and Hand shear, Striking tools like sheet metal hammer and wooden mallets, Joining operation like riveting, soldering and spot welding machines.

Tools & Equipment needed: White Board, Marker, Charts, Projector, Job holding tools (Bench vice), measuring tools (Steel rule), Marking tools (Straight edge & Scriber), Cutting Tools (Snips & Hand Shears), Striking Tools (Wooden Mallet & Sheet metal Hammer), Hand operated shearing machine, Pedestal grinding machines.

5. Module Name: OJT. (60 Hrs)

Outcome: Work in real job situation with special emphasis on basic safety and hazards in this domain.

Practical Content:

Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for **60 Hours**.)

6. Module Name: Employability Skills (60 Hrs)

Key Learning Outcomes

Introduction to Employability Skills

Duration: 1.5 Hours

After completing this programme, participants will be able to:

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship

Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century

Duration: 2.5 Hours

5. Discuss importance of relevant 21st century skills.
6. Exhibit 21st century skills like Self-Awareness, Behavior Skills, 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.
7. Describe the benefits of continuous learning.

Basic English Skills

Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting

Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills

Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion

Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy

Duration: 5 Hours

17. Outline the importance of selecting the right financial institution, product, and service
18. Demonstrate how to carry out offline and online financial transactions, safely and securely
19. List the common components of salary and compute income, expenditure, taxes, investments etc.
20. Discuss the legal rights, laws, and aids

Essential Digital Skills

Duration: 10 Hours

21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship

Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises
27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service

Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

Getting Ready for apprenticeship & Jobs

Duration: 8 Hours

33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Learning Outcome – Assessment Criteria:

Module No.	Outcome	Assessment Criteria
1.	Describe the roles & responsibility of sheet metal operator along with the safety practices to prevent hazards & accidents.	<p>After completion of this module students will be able to:</p> <p>1.1 Explain the role, responsibility and opportunity of a sheet metal operator.</p> <p>1.2 Explain how to follow the instruction of manufacturer and different types of safety rules.</p> <p>1.3 Interpret different safety signs.</p> <p>1.4 Describe how to prevent hazards and accidents.</p> <p>1.5 Explain how to handle raw materials, jobs & machines maintaining safety practices.</p>
2.	Explain different types of materials as well as various technical terms used in sheet metal work.	<p>After completion of this module students will be able to:</p> <p>2.1 Distinguish between metals & Non-metals</p> <p>2.2 Explain ferrous material and its alloys used in sheet metal operation.</p> <p>2.3 Explain Non-ferrous material and its alloys used in sheet metal operation.</p> <p>2.3 Define various physical and mechanical properties related to sheet metal work.</p> <p>2.4. Identify the materials used in modern sheet metal industries like MS, GI, Stainless steel, CRCA, HRCA.</p> <p>2.5 Interpret various technical terms related to sheet metal operation.</p>
3	Demonstrate the use of various tools and equipment for sheet metal operation.	<p>After completion of this module students will be able to:</p> <p>3.1 Demonstrate the use of different hand tools for job holding, measuring, marking, cutting, striking and supporting the sheet metals.</p> <p>3.2 Demonstrate the use of different hand operated and pedestal machines for working on sheet metals.</p>
4	Perform different types of sheet metal operations to produce simple objects.	<p>After completion of this module students will be able to:</p> <p>4.1 Apply Job holding, measuring, marking, Cutting, Striking, Bending, Punching, Blanking, shearing, Piercing, Grinding, Flanging and Joining operation related to sheet metal work.</p> <p>4.2 Introduce development of surface method for sheet metal work.</p> <p>4.3 Explain simple geometrical constructions to get the idea of shape of the sheet metal.</p> <p>4.4 Explain simple geometrical constructions to get the shape of patterns formed by sheet metal joining operation.</p> <p>4.5 Interpretation of various drawing symbols used in sheet metal operation.</p> <p>4.6 Perform various sheet metal operations to produce simple objects like dust pan and square tray.</p>

5	OJT.	Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for 60 Hours.)
6	Employability Skill.	As per NCVET guided curriculum

List of Tools, Equipment & materials needed for 30 Trainees (Practical):

Sl. No	Items Name	Specification	Qty
1	Bench Vice	Jaw width: 75 mm, Jaw opening: 100 mm, weight: 5 kg.	30
2	Hand Vice	Jaw width: 75 mm, Jaw opening: 100 mm	30
3	C-clamp	Sizes & clamp capacity	30
4	Steel Rule	Length:300mm	30
5	Compass	Sizes: 6 to 8 inches.	30
6	Trammel Bar	Adjustable Length:	30
7	Surface Plate	Sizes: 18"×24", flatness specification:	30
8	Outside Micrometer	Range: 0-50 mm & least count: 0.01 mm	30
9	Vernier Caliper	Range: 0-100 mm & Least count: 0.02 mm	30
10	Straight edge	Length:	30
11	Try Square	Blade length: 100 mm, Blade thickness: 1.7 mm	30
12	Scriber	3 mm to 5 mm diameter, 10° to 20° point angle	30
13	Center Punch	Point Diameter: 6.5 mm, 4.8 mm, 4.0 mm, 3.2 mm	30
14	Dot punch	Length: 5 inch, Point Diameter: 2 mm	30
15	Snips	Cutting capacity:	30
16	Hand Shears	Cutting capacity:	30
17	File (Flat file, Round file, Triangular file, Crochet file)	Length: 350 mm	30
18	Chisel cold flat	25mm x 250mm	30
19	Hacksaw	Blade length: 250 mm to 300 mm	30
20	Wooden Mallet	Sizes: 50 mm 75 mm 100 mm	30
21	Hammer (Straight peen , Ball peen, cross peen)	Weight : 250 grams	30
22	Sheet metal Hammer (Setting hammer , Riveting hammer, Creasing hammer, Stretching hammer, Hollowing hammer, Bullet hammer, Planishing hammer , Peening hammer)	Weight: 250 grams	30
23	Hatchet Stake	Various Shapes & sizes:	30
24	Funnel stake	Various Shapes & sizes:	30
25	Half Moon stake	Various Shapes & sizes:	30
26	Electric Soldering Iron (hatchet type)	Various Shapes & sizes:	6

Sl. No	Items Name	Specification	Qty
27	Anvil	Various Shapes & sizes:	30
28	Electric Hand Drill (light)	13 mm size drill	1
29	Spot welding machine		1
30	Hand operated shearing machine	Cutting capacity: Blade length:	1
31	Bar folder machine	Capacity: sizes & thickness:	1
32	Pedestal Grinding Machine	Grinding wheel diameter:	1
33	Copper Sheet	3"×3"	1
34	Aluminium Sheet	3"×3"	1
36	Mild steel (MS) sheet	3"×3"	1
37	Projector		1

Marks Distribution

Outcome	Outcome Code	Total Th. Marks	Total Pr. Marks
Describe the roles & responsibility of sheet metal operator along with the safety practices to prevent hazards & accidents.	CGM/0704/OC1	20	120
Explain different types of materials as well as various technical terms used in sheet metal work.	CGM/0704/OC2	20	130
Demonstrate the use of various tools and equipment for sheet metal operation.	CGM/0704/OC3	40	180
Perform different types of sheet metal operations to produce simple objects.	CGM/0704/OC4	70	220
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	CGM/0704/OC5	0	150
Employability Skills – 60 Hrs	DGT/VSQ/N0102	50	0