

Syllabus For Laboratory Assistant for Steel Products Testing

| | |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course Name | Laboratory Assistant for Steel Products Testing |
| Sector | IRON & STEEL |
| Course Code | CHE/2024/LAST/337 |
| Level | 3 |
| Occupation | Production quality control Assistant / Lab Assistant for Steel Lab |
| Job Description | Laboratory Assistant for Steel Products Testing performs different types of tests related to Iron & Steel manufacturing process. The job involves preparation of test samples and conduct tests on the prepared samples according to the relevant standards, Test results capturing by digital or manual methods and carryout the calibration of the equipment in the physical laboratory. |
| Course Duration | 450 Hrs (Theory- 90 Hrs + Practical- 240 Hrs, OJT: 60 Hrs Employability Skill – 60 Hrs) |
| Trainees' Entry Qualification | Grade 10 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 year experience OR Previous relevant Qualification of NSQF Level 2.5 with 6 months experience |
| Trainers Qualification | BE/B. Tech in Mechanical Engineering / Chemical Engineering with 1Yr experience in the relevant field OR Diploma in Mechanical Engineering with 2 Yrs experience in the relevant field. |

Structure of Course:

| Module No. | Module name | Outcome | Theory (Hrs) | Practical (Hrs) | Total (Hrs) |
|-------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------|------------------------|--------------------|
| 1 | Products and Safety Protocols in Iron & Steel industries | Explain general safety issues maintained in various processes in Iron & Steel Industries. | 10 | 20 | 30 |
| 2 | Preparation of Test Samples | Assist to cut and prepare test samples using proper type of tools. | 30 | 30 | 60 |
| 3 | Steel Testing & Documentation Procedures | Assist to Perform physical tests of steel products with documentation of test results. | 40 | 170 | 210 |
| 4 | Equipment Calibration | Clean and calibrate Equipment at scheduled frequency. | 10 | 20 | 30 |
| 5 | | Work in real job situation with | -- | 60 | 60 |

| Module No. | Module name | Outcome | Theory (Hrs) | Practical (Hrs) | Total (Hrs) |
|---------------|----------------------|--------------------------------------------------------------------|--------------|-----------------|-------------|
| | OJT | special emphasis on basic safety and hazards in this domain (OJT). | | | |
| 6 | Employability Skills | As per guided curriculum. | 60 | -- | 60 |
| TOTAL: | | | 150 | 300 | 450 |

SYLLABUS

Module No. 1: Products and Safety Protocols in Iron & Steel industries:

Outcome:

Explain general safety issues maintained in various processes in Iron & Steel Industries.

Theory Content:

- 1.1. Introduction:** Types of Iron & Steel Industries and list of products from Iron & Steel Industries and their production processes.
- 1.2 Hazards, Health & Safety issues at workplace:** Types of hazards & safety issues at workplace, common hazard signs, safely use of hazardous material.
- 1.3 PPE & Fire Extinguisher:** Use of PPE, types of Fire Extinguisher and their uses.
- 1.4. Do's & Do not's:** List of Do's & Do not's at workplace.
- 1.5 Housekeeping:** Methods of housekeeping both pre-work & post- work and implementation of 5S
- 1.6 Emergency Procedures:** Protocols for handling emergencies in the workplace, including evacuation and first aid measures.

Practical Content:

- 1.Site visit & production observation:** Observing different production processes, Identifying various products in a variety of Iron & Steel Industries.
- 2. Perform health & safety procedures:** safely use of steps and ladders in general use, Lift heavy objects safely using correct procedures, Mock drill on use of various types of fire extinguishers.
- 3. Application of First Aid:** Usage of first aid to victims as required in case of bleeding, burns, choking, electric shock, poisoning etc.

Module No. 2: Preparation of Test Samples:

Outcome:

Assist to Cut and prepare test samples using proper type of tools.

Theory Content:

- 2.1 Basic Engg. Drawing:** various geometric shapes used in metal sample.
- 2.2 Testing Processes:** Destructive and Non-Destructive Testing processes, physical properties of iron and steel, types of physical testing processes.
- 2.3 Tools:** Types of tools needed for preparation of samples of steel including cutting tools, grinding equipment, polishing machines, and other relevant instruments.

Practical Content:

Sample cutting: Cutting of the sample to the required profile using the right tools e.g. Knives, metalworking and multipurpose drill bits, broaches, countersinks, cutting burrs, cutting tool holders, debarring cutters, hole saws, Industrial drill bits etc.

Module No. 3: **Steel Testing & Documentation Procedures:**

Outcome:

Assist to Perform physical tests of steel products with documentation of test results.

Theory Content:

3.1 Machinery & Instruments: Types of Machinery & Instruments and its working principle required for physical testing of steels.

3.2 Mounting of samples: Method of mounting of sample on each type of instruments.

3.3 Analyze and documentation of the results: Methods of documentation of the test results.

Practical Content:

1. **Operation of the Instruments:** Operation of the relevant equipment - Universal Testing Machine, Microscopes, Impact tester, V-notch testing machine, Ultra-sound testing equipment, Hardness testing machine, Bend-testing machine, Electric oven Grinder, Hand Shear, Milling machine, Profile cutter. and conduct the test

2. **Testing Parameters:** Conduct tests to determine Hardness, Property tests (YS, UTS, El%, r-bar etc.), Bend test, Roughness of surface, Coating thickness measurement, Draw ability test, Cupping test, Micro-structure, Inclusion rating.

3. **Documentation of the result:** Analyze the results, report and document as per SOP.

Module No. 4: **Equipment Calibration:**

Outcome:

Clean and calibrate Equipment at scheduled frequency.

Theory Content:

4.1 SOP: SOP for Preservation/Disposing-off the test samples.

4.2 Calibration of the equipment: Principles and frequency of calibration of each type of equipments.

Practical Content:

1. **Cleaning of the equipment:** Dismounting the samples from equipments after testing and cleaning of the equipment.

2. **Calibration of the Equipments:** Perform manual/auto calibration of each type of equipments as per scheduled frequency.

Module No. 5: **OJT**

Outcome:

Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).

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.)

Module No. 6: **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 | Explain general safety issues maintained in various processes in Iron & Steel Industries. | <p>After completion of this module students will be able to:</p> <ol style="list-style-type: none"> 1.1 Identify different types of products manufactured by Iron & Steel Industries. 1.2 Perform Occupational health & Safety practices at workplace. 1.3 Evaluate safely use of steps and ladders, 1.4 Follow correct procedures for lifting heavy objects 1.5 Demonstrate proficiency in using various types of fire extinguishers during mock drills. 1.6 Identify various housekeeping methods, both pre-work and post-work. |
| 2 | Assist to cut and prepare test samples using proper type of tools. | <p>After completion of this module students will be able to:</p> <ol style="list-style-type: none"> 2.1 Identify and select various geometric shapes used in metal sample. 2.2 Identify and select the specific types of tools required for the preparation of steel samples. 2.3 Prepare test samples for physical testing. 2.4 Demonstrate the concepts of destructive and non-destructive testing |

| Module No. | Outcome | Assessment Criteria |
|------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | processes 2.5 Execute precise sample cutting procedures using appropriate tools. |
| 3 | Assist to perform physical tests of steel products with documentation of test results. | After completion of this module students will be able to: 3.1 Demonstrate the types of machinery and instruments required for physical testing of steels, including their working principles and specific applications in the testing process. 3.2 Operate machinery & instruments required for physical testing of steels. 3.3 Conduct physical testing of steels on different parameters. 3.4 Analyze, report and documentation of the test results as per SOP. |
| 4 | Clean and calibrate Equipment at scheduled frequency. | After completion of this module students will be able to: 4.1 Preserve/dispose-off the test samples after physical testing as per SOP. 4.2 Demonstrate effective equipment cleaning after sample dismounting. 4.3 Perform calibration of each type of equipments as per scheduled frequency. |
| 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 Skills | As per guided curriculum |

List of Tools, Equipments & Machinery needed for 30 Trainees:

| Sl No | Items with description | Qty |
|-------|---------------------------------------------------------------|-------------|
| 1 | Universal Testing machine | 1 no |
| 2 | Metallurgical Microscope | 1 no |
| 3 | Impact tester machine | 1 no |
| 4 | V-notch testing machine | 1 no |
| 5 | Ultra-sound testing equipment | 1 no |
| 6 | Hardness testing machine | 1 no |
| 7 | Bend-testing machine | 1 no |
| 8 | Electric oven | 1 no |
| 9 | Hand Grinder | 1 no |
| 10 | Hand Shear | 1 no |
| 11 | Milling machine | 1 no |
| 12 | Profile cutter | 1 no |
| 13 | Slotting machine | 1 no |
| 14 | Drilling machine | 1 no |
| 15 | Steel rule 300 mm, Graduated both in Metric and English Unit | 10 nos |
| 16 | Outside Micrometer (Digital) 0 to 100 mm, Least Count 0.01 mm | 3 nos |
| 17 | Outside Vernier Caliper 200 mm, Least Count 0.02 mm | 3 nos |
| 18 | Hexa- blades, knives, drill bits, tool holders | 10 nos each |
| 19 | Personal protective equipments (PPE) | 10 nos each |
| 20 | Firest Aid box | 3 nos |
| 21 | Fire extinguisher (different types) | 1 each |

Marks Distribution

| Outcome | Outcome Code | Total Th marks | Total Pr Marks | Total OJT marks |
|----------------------------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|------------------------|
| Explain general safety issues maintained in various processes in Iron & Steel Industries. | I&S/2001/OC1 | 20 | 110 | 0 |
| Assist to cut and prepare test samples using proper type of tools. | I&S/2001/OC2 | 50 | 140 | 0 |
| Assist to Perform physical tests of steel products with documentation of test results. | I&S/2001/OC3 | 60 | 290 | 0 |
| Clean and calibrate Equipment at scheduled frequency. | I&S/2001/OC4 | 20 | 110 | 0 |
| Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT). | I&S/2001/OC5 | 0 | 0 | 150 |
| Employability Skills – 60 Hrs | DGT/VSQ/N0102 | 50 | 0 | 0 |