Model Curriculum

Qualification Name: Fabrication and Service Technician

Version: 1.0

NSQF Level: 4

Model Curriculum Version: 1.0

Automotive Skills Development Council | 153, Gr Floor, Okhla Industrial Area, Phase – III, Leela Building, New Delhi – 110020

Table of Contents

Year	Semester	Subject	Subject Type
2	3	Basic Welding	Core Mandatory
	3	Advance Welding	Core Mandatory
	3	Fabrication	Core Mandatory
	3	ICE Servicing	Core Elective-1
	3	EV Servicing	Core Elective-2
	3	Applied Physics	Non-Core
	4	Manufacturing Skills	Core Mandatory
	4	Quality Management	Core Mandatory
	4	Robotics	Core Mandatory
	4	Battery Management System-BMS	Core Elective-1
	4	Electric Motors	Core Elective-2
	4	English Language Skills	Non-Core
	4	Employability Skills (120 Hours)	Non-Core

Training Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Production
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3115.0602
Minimum Educational Qualification and Experience	10th Pass + NSQF - Certificate in Basic Manufacturing Technology, Level-3.5 OR 12th Pass OR 10th+2 Years of ITI
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 years
Last Reviewed On	30-11-2023
Next Review Date	30-11-2026
NSQC Approval Date	30-11-2023
QP Version	1.0
Model Curriculum Creation Date	30-11-2023
Model Curriculum Valid Up to Date	30-11-2026
Model Curriculum Version	1.0
Minimum Duration of the Course	1200 Hours
Maximum Duration of the Course	1200 Hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

A Diploma in Manufacturing Technology is a specialized educational program that focuses on providing students with practical skills and theoretical knowledge related to various aspects of manufacturing processes and technologies.

At the end of the program, the learner should have acquired the listed knowledge and skills.

- **Advanced Manufacturing Processes:**

  Students might learn about more advanced manufacturing methods like CNC machining, additive manufacturing (3D printing), advanced welding techniques, and precision machining.

- **Quality Control and Assurance:**

This could cover topics such as statistical process control, quality inspection methods, root cause analysis, and corrective and preventive actions.

- **Materials Science:**

Deeper understanding of materials used in manufacturing, including their properties, behaviors under stress, and selection criteria for specific applications.

- **Industrial Automation:**

Learn about robotics, and other automation technologies used in modern manufacturing facilities.

- **Production Planning and Control:**

Understanding how to manage production processes efficiently, including scheduling, inventory management, and lean manufacturing principles.

- **Tooling and Fixture Design:**

Designing tools, jigs, and fixtures for various manufacturing processes to ensure accurate and repeatable production.

- **Project Work:**

Collaborating on projects that apply the knowledge gained throughout the program to solve real-world manufacturing challenges.

- **Soft Skills and Communication:**

Developing communication skills, teamwork, and problem-solving abilities that are crucial in an industrial setting.

- **Safety and Environmental Considerations:**

Learning about workplace safety protocols and environmental regulations in manufacturing.

Industry Exposure: Some programs might offer field trips, guest lectures from industry experts, or even internships to provide practical industry exposure.

- **Automation and Technology:**

  Depending on the curriculum, graduates might have knowledge of automation technologies, computerized manufacturing systems, and Industry 4.0 concepts.

- **Environmental and Sustainability Awareness:**

  Some programs may cover environmentally friendly manufacturing practices, emphasizing sustainable processes and waste reduction.

- **Career Opportunities:**

  Graduates should be prepared for entry-level positions in manufacturing industries such as automotive, aerospace, electronics, consumer goods, and more.

- **Continuing Education:**

  A Diploma in Manufacturing Technology can also serve as a steppingstone for further education, such as pursuing a higher-level degree or certifications in specialized areas.

Mandatory & Elective Modules

The table lists the modules and their duration corresponding to the Mandatory & Elective Subjects

Subject Details	NOS Code	Subject Type	Theory Duration	Practical Duration	On-the-Job Training Duration	Total Duration
Basic Welding	ASC/N3126	Core Mandatory	24:00	48:00	48:00	120:00
Advance Welding	ASC/N3127	Core Mandatory	24:00	48:00	48:00	120:00
Fabrication	ASC/N3128	Core Mandatory	24:00	48:00	48:00	120:00
ICE Servicing	ASC/N1479	Core Elective-1	18:00	36:00	36:00	90:00
EV Servicing	ASC/N1480	Core Elective-2	18:00	36:00	36:00	
Applied Physics	ASC/N9837	Non-Core	18:00	36:00	36:00	90:00
Manufacturing Skills	ASC/N6459	Core Mandatory	24:00	48:00	48:00	120:00
Quality Management	ASC/N6315	Core Mandatory	24:00	48:00	48:00	120:00
Robotics	ASC/N8379	Core Mandatory	24:00	48:00	48:00	120:00
Battery Management System- BMS	ASC/N8380	Core Elective-1	18:00	36:00	36:00	90:00
Electric Motors	ASC/N8381	Core Elective-2	18:00	36:00	36:00	
English Language Skills	ASC/N9839	Non-Core	18:00	36:00	36:00	90:00
Employability Skills (120 hours)	DGT/VSQ/0104	Non-Core	48:00	72:00		120:00
Total Duration			**264:00**	**504:00**	**432:00**	**1200:00**

Subject Details

Semester-1

Subject: 1 Basic Welding
Mapped to ASC/N3126 ,V1.0

Terminal Outcomes:

- The terminal outcomes of a basic welding course typically include the fundamental knowledge, skills, and abilities that students are expected to acquire by the end of the course. These outcomes are designed to ensure that students have a solid foundation in welding techniques and safety practices.

- Welding Safety: Understand and apply safety procedures, including proper personal protective equipment (PPE) usage, fire prevention, and hazard recognition.

- Welding Equipment: Identify and correctly use welding tools and equipment, including welding machines, electrodes, gas cylinders, and other related tools.

- Welding Processes: Demonstrate proficiency in basic welding processes, such as shielded metal arc welding (SMAW), gas metal arc welding (GMAW), and gas tungsten arc welding (GTAW).

- Joint Preparation: Prepare different types of joints for welding, including butt joints, lap joints, and fillet joints, ensuring proper fit-up and alignment.

- Welding Techniques: Perform welding techniques like bead placement, weaving, and layering to achieve proper weld penetration, fusion, and aesthetics.

Duration: *<24:00>*	**Duration**: *<48:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Welding Fundamentals: Understand the basic concepts of welding, including heat generation, fusion, and the metallurgical changes that occur during the welding process. • Types of Welding: Differentiate between various welding processes such as shielded metal arc welding (SMAW), gas metal arc welding (GMAW), gas tungsten arc welding (GTAW), and their respective applications. • Welding Equipment: Familiarize yourself with the components of welding equipment, including power sources, electrodes, shielding gases,	Safety Procedures: Demonstrate the ability to set up and adhere to proper safety protocols, including wearing appropriate personal protective equipment (PPE) and following safety guidelines in the welding environment. Welding Equipment Setup: Set up welding equipment correctly, including preparing the welding machine, selecting the appropriate electrode or filler wire, and configuring shielding gas as needed. Electrode Handling and Striking: Handle electrodes (for processes like SMAW) properly, including electrode selection, storage, and proper striking techniques to initiate the arc.

and consumables. • Welding Safety: Grasp safety procedures and guidelines specific to welding, encompassing topics like proper ventilation, fire prevention, electrical safety, and personal protective equipment (PPE) usage. • Metals and Alloys: Understand the properties and characteristics of common metals and alloys used in welding, including carbon steel, stainless steel, and aluminum. • Weld Joint Design: Comprehend different types of weld joints, their purposes, and factors influencing joint design, such as material thickness, joint configuration, and loading conditions.	Arc Control: Develop the skill to maintain a stable and controlled welding arc, which is essential for producing consistent and high-quality welds. Joint Preparation: Prepare different types of joints for welding, ensuring proper fit-up and alignment to facilitate successful welds. Welding Techniques: Demonstrate proficiency in using various welding techniques, such as stringer beads, weave patterns, and multi-pass welding, to achieve proper penetration and aesthetics. Positional Welding: Practice welding in different positions, including flat, horizontal, vertical, and overhead, to build versatility and adaptability in welding skills.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Welding Machine: Depending on the process being used (e.g., SMAW, GMAW, GTAW), you'll need a welding machine that generates the necessary electrical current for welding. Electrodes/Filler Wire: These consumable materials are used to create the welding joint by melting and fusing with the base metal. Shielding Gas (if applicable): For processes like GMAW and GTAW, you may need a shielding gas (argon, CO2, etc.) to protect the welding area from atmospheric contamination. Welding Helmet: A helmet with a darkened visor that protects your eyes and face from the intense light generated during welding. Welding Gloves: Heat-resistant gloves that protect your hands from burns and sparks while welding. Welding Jacket/Clothing: Flame-resistant clothing that provides additional protection for your body while welding. Welding Apron: A heavy-duty apron that safeguards your torso and legs from sparks, spatter, and radiant heat.	

Subject: 2 Advance Welding

Mapped to ASC/N3127 ,V1.0

Terminal Outcomes:

- The terminal outcomes of an advanced welding course encompass the comprehensive knowledge, skills, and expertise gained by students upon completing an in-depth study of welding techniques, processes, and applications. Advanced welding courses build upon the foundations of basic welding and cover more complex methods and materials.
- Advanced Welding Processes: Demonstrate proficiency in advanced welding processes such as flux-cored arc welding (FCAW), submerged arc welding (SAW), and plasma arc welding (PAW).
- Specialized Techniques: Master specialized welding techniques like orbital welding, pulse welding, and multi-pass welding in various positions.
- Exotic Materials: Gain expertise in welding exotic materials such as high-strength alloys, non-ferrous metals, and super alloys used in aerospace, automotive, and other industries.
- Advanced Joint Designs: Apply complex joint design concepts for applications requiring higher structural integrity, including butt welds with backing, corner joints, and T-joints.
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Duration: *<24:00>*	**Duration**: *<48:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Advanced Welding Processes: Understand the principles, advantages, and limitations of advanced welding processes such as pulsed arc welding, laser welding, electron beam welding, friction welding, and more. • Welding Metallurgy: Develop a comprehensive understanding of metallurgical changes during welding, including phase transformations, grain growth, and the effects of heat input on microstructure. • Material Selection: Gain expertise in selecting appropriate materials for specific welding applications based on properties, compatibility, and intended service conditions. • Heat Affected Zone (HAZ): Analyze the effects of welding heat on the HAZ, including microstructural changes, hardness variations, and potential for cracking. • Welding Defects and Prevention: Study advanced defect mechanisms such as hot cracking, liquation cracking, and	• Advanced Welding Processes: Demonstrate proficiency in setting up and performing advanced welding processes, including pulsed arc welding, laser welding, electron beam welding, and friction welding. • Exotic Materials Welding: Develop expertise in welding advanced materials like high-strength alloys, non-ferrous metals, and refractory metals used in specialized industries. • Complex Joint Configurations: Successfully weld complex joint designs, such as double-V, double-bevel, and compound bevel joints, while ensuring proper fit-up and alignment. • Multi-Pass Welding: Master techniques for multi-pass welding, achieving uniform bead placement, adequate fusion, and interpass temperature control. • Welding Automation: Gain hands-on experience with robotic welding systems and automated welding

hydrogen-induced cracking, and learn strategies to prevent them.	processes, ensuring precision and consistency in weld deposition. • Advanced Positional Welding: Apply advanced positional welding techniques, including overhead, vertical-up, and out-of-position welding, while maintaining weld quality.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Advanced Welding Machines: Depending on the processes you'll be using (e.g., laser welding, electron beam welding), you'll need specialized advanced welding machines that cater to these techniques. • Advanced Electrodes/Filler Materials: Specific electrodes or filler materials suited for advanced processes and materials, such as high-strength alloys or refractory metals. • Shielding Gas System (if applicable): For processes like laser welding, gas supply systems for providing proper shielding atmosphere. • Advanced Welding Helmets: Helmets equipped with features to protect against intense light and radiation from advanced welding processes. • Advanced Welding Gloves: Specialized gloves designed to handle higher heat and radiation levels associated with advanced welding methods. • Advanced Welding Apparel: Flame-resistant clothing suited for the specific challenges of advanced welding, such as higher temperatures and exotic materials.	

Subject: 3 Fabrication

Mapped to ASC/N3128 ,V1.0

Terminal Outcomes:

- The terminal outcomes of a fabrication course encompass the knowledge, skills, and abilities that students are expected to have acquired by the end of the course in the field of metal fabrication and assembly. These outcomes prepare students for roles involving the creation of structures, components, and products from raw materials.
- Blueprint Reading and Interpretation: Proficiently read and interpret engineering drawings and blueprints to understand dimensions, tolerances, and assembly instructions.
- Material Selection and Preparation: Select appropriate materials based on project requirements, prepare materials through cutting, grinding, and shaping, and understand material properties.
- Welding Techniques: Demonstrate proficiency in various welding processes, including MIG welding, TIG welding, and arc welding, to join metal components accurately.
- Metal Cutting and Shaping: Master metal cutting techniques such as plasma cutting, oxy-fuel cutting, and abrasive cutting, ensuring precise and accurate cuts.

Duration: *<24:00>*	**Duration**: *<48:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**

• Blueprint Reading and Interpretation: Develop the ability to read and interpret engineering drawings, symbols, and dimensions accurately. • Materials Science: Understand the properties of common metals and alloys used in fabrication, including their strength, hardness, and corrosion resistance. • Metallurgy Basics: Gain insight into metallurgical concepts such as crystal structures, phase transformations, and heat treatment processes. • Mechanical Principles: Learn basic mechanical principles that affect the behavior of materials under stress, including tension, compression, shear, and bending. • Measurement and Precision: Learn to use measurement tools accurately, including calipers, micrometers, and rulers, to ensure precise fabrication. • Metal Forming Techniques: Understand metal forming processes, including bending, rolling, punching, and deep drawing, and their applications in fabrication. • Sheet Metal Basics: Gain knowledge of sheet metal characteristics, forming techniques, and applications in industries like construction and automotive. • Pipe and Tube Fabrication: Learn about pipe and tube fabrication techniques, including bending, threading, and connecting methods. • Surface Treatment: Understand different methods of finishing and surface treatment, such as grinding, sanding, painting, and coating.	• Blueprint Interpretation: Translate engineering drawings into accurate fabrication plans, ensuring proper dimensions, tolerances, and assembly sequences. • Material Handling and Preparation: Safely handle, measure, and prepare various metals for fabrication, including cutting, grinding, and shaping. • Welding Techniques: Demonstrate proficiency in setting up and performing different welding techniques, producing strong and structurally sound joints. • Metal Cutting and Shaping: Utilize cutting tools and equipment to perform accurate cuts and create desired shapes from raw materials. • Assembly and Joining: Master the art of assembling components through methods like welding, bolting, riveting, and adhesive bonding. • Structural Fabrication: Practice assembling and aligning structural components, ensuring stability and adherence to design specifications. • Sheet Metal Fabrication: Develop skills in bending, forming, and shaping sheet metal to create desired structures and components. • Pipe and Tube Fabrication: Learn to accurately bend, cut, and join pipes and tubes, creating functional assemblies for plumbing and other applications.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Measuring and Marking Tools: Tape measure Steel rule	

Combination square
Calipers
Micrometers
Marking tools (scribe, chalk, marker)

Cutting Tools:

Angle grinder
Plasma cutter
Oxy-fuel cutting torch
Band saw
Circular saw
Shears

Joining Tools:

Bolts, nuts, and washers
Rivet gun and rivets
Adhesives and epoxy
Threaded inserts

Bending and Forming Tools:

Bench vice
Brake press
Pipe bender
Sheet metal roller

Assembly and Fixture Tools:

Clamps (C-clamps, bar clamps, pipe clamps)
Welding tables and fixtures
V-blocks and angle plates
Jigs and templates

Subject: 4 ICE Servicing

Mapped to ASC/N1479 ,V1.0

Core-Elective-1

Terminal Outcomes:

- The terminal outcomes of a course in Internal Combustion Engine (ICE) servicing encompass the knowledge, skills, and competencies that students are expected to have acquired by the end of the course. ICE servicing involves maintenance, repair, and troubleshooting of internal combustion engines commonly found in vehicles, machinery, and other equipment.
- Engine Components and Systems: Understand the various components and systems within an internal combustion engine, including the fuel system, ignition system, lubrication system, cooling system, and exhaust system.

- Engine Types and Configurations: Differentiate between various types of internal combustion engines (gasoline, diesel, rotary) and their configurations (inline, V-type, boxer), and comprehend their operational differences.

- Diagnostic Techniques: Develop skills in diagnosing engine problems using tools such as diagnostic scanners, oscilloscopes, and pressure gauges, and accurately identify issues affecting engine performance.

- Maintenance and Servicing: Demonstrate proficiency in routine engine maintenance tasks such as oil changes, filter replacements, spark plug replacements, and valve adjustments.

Duration: *<18:00>*	**Duration**: *<36:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Engine Fundamentals: Understand the basic principles of internal combustion engines, including the processes of intake, compression, combustion, and exhaust. • Engine Types and Configurations: Differentiate between different types of internal combustion engines, such as gasoline and diesel engines, and understand various engine configurations (e.g., inline, V-type, boxer). • Engine Components: Identify and describe the functions of major engine components, including pistons, cylinders, crankshaft, camshaft, valves, and connecting rods. • Four-Stroke and Two-Stroke Cycles: Explain the differences between four-stroke and two-stroke engine cycles, including their advantages, disadvantages, and operational characteristics. • Engine Lubrication: Understand the importance of engine lubrication, including the roles of engine oil, lubrication system components, and the effects of lubrication on engine longevity. • Engine Cooling: Comprehend engine cooling systems; including radiator operation, thermostat function, cooling fans, and the role of coolant in managing engine temperature. • Fuel Systems: Learn about fuel delivery systems, fuel injection methods, carburetion, and the role of sensors in optimizing fuel-air mixture for combustion.	• Engine Inspection and Diagnosis: Develop skills in visually inspecting engines, identifying signs of wear, leaks, and other issues that may affect performance. • Oil Change and Fluid Replacement: Perform routine oil changes, replace oil filters, and understand the importance of using the correct oil type and viscosity for different engines. • Spark Plug Replacement: Demonstrate proficiency in removing and replacing spark plugs, ensuring proper gap settings and torque values. • Air Filter and Fuel Filter Replacement: Learn to replace air filters and fuel filters to maintain proper air-fuel mixture and prevent contaminants from entering the engine. • Valve Adjustment: Practice adjusting valve clearances to ensure optimal engine performance and reduce valve train noise. • Cooling System Maintenance: Flush and refill the cooling system, replace coolant, and troubleshoot cooling-related issues such as overheating. • Ignition System Servicing: Test and replace ignition components such as spark plugs, ignition coils, and distributor caps to ensure reliable ignition. • Fuel System Cleaning: Perform fuel system cleaning to remove carbon deposits and improve fuel efficiency. •

• Ignition Systems: Explore ignition system components, including spark plugs, ignition coils, distributors, and electronic ignition controls, and understands their roles in combustion.	

Classroom Aids:

Whiteboard, marker pen, projector

Tools, Equipment and Other Requirements

Basic Hand Tools:

- Wrenches (combination, adjustable, socket)
- Screwdrivers (flathead, Phillips, Torx)
- Pliers (needle-nose, slip-joint, locking)
- Hammers (ball-peen, rubber mallet)
- Pry bars and crowbars

Specialized Engine Tools:

- Spark plug socket and gap gauge
- Timing light for ignition timing adjustment
- Feeler gauges for valve clearance adjustment
- Compression tester for cylinder compression testing
- Oil filter wrench or pliers
- Torque wrenches for accurate tightening of fasteners

Diagnostic Tools:

- OBD-II scanner for reading engine codes and sensor data
- Multimeter for electrical testing
- Oscilloscope for analyzing electrical waveforms
- Vacuum gauge for diagnosing engine performance issues

Subject: 5 EV Servicing

Mapped to ASC/N1480 ,V1.0

Core-Elective-2

Terminal Outcomes:

- The terminal outcomes of an Electric Vehicle (EV) servicing course encompass the knowledge, skills, and competencies that students are expected to have acquired by the end of the course. EV servicing involves maintenance, repair, and troubleshooting of electric vehicles, which are powered by batteries and electric drivetrains.
- Electric Vehicle Fundamentals: Understand the basic principles of electric vehicles, including the components of electric drivetrains, battery systems, and regenerative braking.
- Battery Technology: Gain insight into different types of EV batteries (e.g., lithium-ion), their characteristics, charging methods, and safety considerations.
- Electric Motors and Drivetrains: Comprehend electric motor types (AC and DC motors), their operation, power delivery, and drivetrain components (transmissions, differentials).

- Charging Infrastructure: Understand EV charging station types (Level 1, Level 2, DC fast charging), charging protocols (CHAdeMO, CCS, Tesla Supercharger), and safety procedures during charging.

Duration: *<18:00>*	**Duration**: *<36:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Electric Vehicle Basics: Understand the fundamental concepts of electric vehicles, including their components, differences from internal combustion engine vehicles, and benefits. • Electric Motor Types: Differentiate between types of electric motors used in EVs, such as AC induction motors and permanent magnet motors, and understand their characteristics. • Battery Technology: Gain insight into various battery chemistries used in EVs (e.g., lithium-ion, solid-state), their energy density, charging characteristics, and degradation patterns. • Electric Vehicle Charging: Comprehend the different levels of EV charging (Level 1, Level 2, DC fast charging), charging connectors, and charging station infrastructure. • Battery Management Systems (BMS): Learn about BMS functions, including cell balancing, state of charge (SoC) estimation, temperature monitoring, and fault detection. • Power Electronics: Understand the role of power electronics components like inverters, converters, and DC-DC converters in controlling power flow between the battery and motor. • Electric Vehicle Drivetrains: Comprehend how electric drivetrains work, including the transmission or single-speed gearbox, differentials, and their contribution to efficiency.	• Battery Inspection and Maintenance: Develop skills in visually inspecting the EV battery system, identifying signs of wear, damage, or deterioration, and performing routine maintenance tasks. • Charging System Operation: Gain hands-on experience in using different types of charging stations, connecting and disconnecting charging cables, and monitoring the charging process. • Battery Management System (BMS): Learn to interact with BMS software interfaces to monitor battery health, balance cells, and diagnose battery-related issues. • Electric Motor Inspection and Testing: Practice inspecting and testing electric motors for proper operation, including checking motor mounts and electrical connections. • High-Voltage Safety Procedures: Learn safety protocols for working with high-voltage components, including de-energizing systems and using personal protective equipment (PPE).
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Safety Equipment: • High-voltage gloves and PPE	

- Voltage testers and detectors
- Insulated tools for working with high-voltage components
- **Safety barriers or signage for isolating work areas**

Diagnostic Tools:

- EV-specific diagnostic scanner or software
- Multimeter with high-voltage capability
- Insulation resistance tester (megohmmeter)

Battery Service Tools:

- Battery cell voltage checker or monitor
- Battery terminal cleaner
- Battery capacity tester

Battery Management System (BMS) Tools:

- BMS diagnostic software and interface
- Cell balancing tools and equipment

Charging Equipment:

- Charging cables and connectors for different charging standards
- Charging station simulator for testing charging protocols

Electric Motor Tools:

- Motor alignment tools
- Motor testing equipment

Subject: 6 Applied Physics

Mapped to ASC/N9837 ,V1.0

Terminal Outcomes:

- The terminal outcomes of a course in Applied Physics encompass the knowledge, skills, and competencies that students are expected to have acquired by the end of the course. Applied Physics focuses on the practical application of physical principles to solve real-world problems and develop technologies.
- Foundational Knowledge: Demonstrate a strong understanding of fundamental physics concepts, including mechanics, electromagnetism, thermodynamics, and waves.
- Mathematical Proficiency: Apply advanced mathematical techniques to solve complex physics problems and equations.
- Critical Thinking and Problem Solving: Analyze and solve complex scientific problems using logical reasoning, critical thinking, and quantitative analysis.
- Experimental Techniques: Understand and apply experimental methods, including data collection, analysis, and interpretation, to validate physical theories.
- Technological Application: Apply physics principles to design, develop, and optimize technologies and systems, such as electronics, optics, and materials.

Duration: *<18:00>*	**Duration**: *<36:00>*

Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Mechanics: Understand the principles of motion, forces, and energy conservation. Learn to analyze motion, equilibrium, and dynamics of particles and rigid bodies. • Electricity and Magnetism: Grasp the fundamentals of electric and magnetic fields, Gauss's law, Ampère's law, and Faraday's law. Learn about capacitance, inductance, and electric circuits. • Thermodynamics: Understand the laws of thermodynamics, heat transfer, and thermal processes. Learn about energy conservation, heat engines, and refrigeration. • Waves and Oscillations: Comprehend wave properties, wave equations, and wave behavior. Study simple harmonic motion, resonance, and the behavior of mechanical and electromagnetic waves. • Optics: Gain knowledge of ray optics and wave optics. Learn about reflection, refraction, diffraction, polarization, and applications in optical systems. • Quantum Mechanics: Introduction to the principles of quantum physics, including wave-particle duality, quantization, and the behavior of particles at the atomic and subatomic levels. • Materials Science: Understand the properties and behavior of materials, including conductors, semiconductors, insulators, and their applications in electronics.	• Experimental Techniques: Develop proficiency in setting up and conducting experiments using scientific equipment, sensors, and data collection tools. • Measurement and Data Analysis: Learn how to make accurate measurements, record data, and analyze experimental results using statistical methods and data analysis software. • Error Analysis: Understand sources of measurement error, uncertainty calculations, and techniques for minimizing experimental uncertainties. • Laboratory Safety: Demonstrate proper laboratory safety practices, including handling chemicals, wearing appropriate personal protective equipment (PPE), and following protocols. • Instrumentation Usage: Gain hands-on experience with laboratory instruments, such as oscilloscopes, spectrometers, microscopes, and electronic measurement tools. • Mechanics Experiments: Conduct experiments related to mechanics, including motion analysis, forces, friction, and conservation of energy.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Measurement and Observation Tools: • Rulers, calipers, and micrometers for length measurements • Vernier calipers and micrometers for precise measurements • Protractors and goniometers for angle measurements • Stopwatch or timer for time measurements • Thermometers for temperature measurements **Optical Equipment:** • Light sources (lamps or lasers)	

• Optical benches and supports • Mirrors, lenses, and prisms for optical experiments • Polarizers and diffraction gratings **Electrical Measurement Tools:** • Multimeters for voltage, current, and resistance measurements • Oscilloscopes for visualizing electrical signals • Function generators for producing varying electrical signals • Breadboards and electronic components for circuit experiments **Mechanical Equipment:** • Pulleys, springs, masses, and pendulums for mechanics experiments • Inclined planes and friction surfaces for studying forces • Balances for mass measurements • Force sensors or load cells for force measurements •

Semester-2

Subject: 1 Manufacturing Skills
Mapped to ASC/N6459 ,V1.0

Terminal Outcomes:

- Manufacturing skills encompass a wide range of abilities and competencies related to the production of goods. These skills are essential for individuals working in various roles within the manufacturing industry. The terminal outcomes of manufacturing skills can vary depending on the specific area of manufacturing and the level of expertise achieved.
- Quality Production: Individuals with manufacturing skills should be able to consistently produce high-quality goods that meet or exceed industry standards and customer expectations.
- Efficiency: Manufacturing skills often focus on optimizing production processes to minimize waste, reduce downtime, and increase overall efficiency.
- Safety: Safety is a critical aspect of manufacturing. Individuals with manufacturing skills are expected to be knowledgeable about safety protocols, regulations, and best practices to ensure a safe working environment for themselves and their colleagues.

Duration: *<24:00>*	**Duration**: *<48:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Manufacturing Processes: Learning about various manufacturing processes such as casting, machining, forming, welding, additive manufacturing (3D printing), and more. This involves understanding the underlying principles, advantages, limitations, and applications of each process.	• Machine Operation: Developing the ability to operate a variety of manufacturing machinery and equipment, such as lathes, milling machines, CNC machines, presses, and welding equipment. • Tool Usage and Maintenance: Learning to select, use, and maintain various

• Metrology and Measurement: Gaining knowledge of measurement techniques and instruments used in manufacturing, including precision measurement, dimensional accuracy, tolerances, and statistical process control (SPC) for quality assurance. • Mechanics and Dynamics: Understanding mechanical principles such as force, stress, strain, motion, and friction, which are crucial for designing and analyzing mechanical components and systems. • Electronics and Automation: Gaining insights into electronic components, sensors, actuators, and control systems used in modern manufacturing automation. This includes learning about programmable logic controllers (PLCs) and computer numerical control (CNC) systems. • Lean Manufacturing and Continuous Improvement: Exploring the principles of lean manufacturing, which focuses on eliminating waste, optimizing processes, and improving efficiency. Learning about methodologies like Six Sigma and Kaizen for continuous improvement.	tools, cutting instruments, and accessories required for different manufacturing processes. • Manufacturing Process Execution: Applying the knowledge of different manufacturing processes to perform tasks like machining, forming, casting, welding, and assembling components. • Quality Inspection: Acquiring skills in inspecting manufactured parts using measurement tools, gauges, and inspection techniques to ensure they meet quality standards and specifications. • Blueprint Reading: Developing the ability to read and interpret technical drawings, blueprints, and schematics that provide instructions for manufacturing and assembly. • Material Handling and Preparation: Learning how to handle, prepare, and position raw materials, workpieces, and tooling to facilitate smooth manufacturing operations. • Assembly and Disassembly: Gaining proficiency in assembling and disassembling mechanical components, structures, and systems accurately and efficiently.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Basic Hand Tools: Screwdrivers Pliers (needle-nose, slip-joint, etc.) Wrenches (adjustable, combination, socket, etc.) Hammers (ball-peen, claw, rubber mallet, etc.) Measuring tape Utility knife **Precision Measurement Tools:** Vernier calipers Micrometers Dial indicators Height gauges **Cutting Tools:** Lathe cutting tools	

Milling cutters
Saw blades (circular saw, band saw, etc.)
Cutting inserts for CNC machines

Machining Equipment:
Lathe
Milling machine
CNC machine (milling, turning, etc.)
Drill press

Welding and Joining Equipment:

Welding machines (arc, MIG, TIG, etc.)
Welding helmets and protective gear
Oxy-acetylene torches
Soldering and brazing equipment

Forming and Fabrication Tools:
Presses (hydraulic, mechanical, pneumatic)
Sheet metal bending tools
Shears and nibblers

Additive Manufacturing Equipment:
3D printers (FDM, SLA, SLS, etc.)
3D printing materials (filaments, resins, powders)

Subject: 2 Quality Management

Mapped to ASC/N6315 ,V1.0

Terminal Outcomes:

- Quality management is a systematic approach to ensuring that products, services, and processes consistently meet or exceed customer expectations and organizational standards. The terminal outcomes of quality management reflect the goals and objectives of implementing effective quality control and assurance practices within an organization.
- Consistent Product Quality: Achieving a high level of consistency in product quality, where products meet defined specifications and standards in every production run.
- Customer Satisfaction: Ensuring that customers are consistently satisfied with the quality of products and services, leading to positive feedback, repeat business, and brand loyalty.

- Defect Reduction: Minimizing defects and non-conformities in products and processes through continuous improvement efforts, leading to improved efficiency and reduced waste.
- Process Improvement: Implementing processes for identifying inefficiencies, bottlenecks, and waste, and systematically improving these processes to enhance overall productivity and quality.

Duration: *<24:00>*	**Duration**: *<48:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
Quality Concepts and Definitions: • Understanding the fundamental concepts of quality, including customer satisfaction, fitness for use, and meeting or exceeding expectations. Quality Standards and Frameworks: • Familiarity with internationally recognized quality standards such as ISO 9001 and industry-specific quality frameworks. Quality Philosophy and Culture: • Appreciating the importance of a quality-oriented organizational culture that emphasizes continuous improvement and customer focus. Total Quality Management (TQM): • Understanding the principles of TQM, which include customer focus, process improvement, employee involvement, and data-driven decision-making. Quality Management Principles: • Learning the core principles of quality management, including leadership commitment, customer focus, process approach, and continual improvement.	• Quality Inspection and Testing: • Developing the ability to conduct quality inspections and tests using appropriate tools and techniques to ensure products meet specifications. • Process Monitoring and Control: • Learning to monitor and control manufacturing processes using statistical process control (SPC) methods to maintain consistent quality. • Data Collection and Analysis: • Gathering relevant data from processes, analyzing trends, identifying patterns, and making informed decisions based on data insights. • Root Cause Analysis Techniques: • Applying techniques such as the 5 Whys, Fishbone Diagrams, and Failure Mode and Effects Analysis (FMEA) to identify root causes of quality issues. • Continuous Improvement Projects: • Participating in or leading improvement projects using methodologies like Lean, Six Sigma, or Kaizen to eliminate defects and optimize processes.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Measuring and Inspection Tools: • Calipers: Used for precise measurements of dimensions. • Micrometers: Instruments for accurate measurements of small distances. • Gauges: Tools for measuring tolerances, thread sizes, and more. • Dial indicators: Used for measuring linear displacement. • Height gauges: Instruments for measuring vertical distances and heights. • Vernier scales: Tools for measuring length with high accuracy. Testing Equipment: • Hardness testers: Devices to measure material hardness. • Tensile testing machines: Used to test the strength and mechanical properties of materials.	

• Impact testers: Instruments to assess the impact resistance of materials. • Coordinate measuring machines (CMM): Used for dimensional measurements of complex components. Statistical Process Control (SPC) Tools: • Control charts: Graphical tools to monitor process stability and variability. • Pareto charts: Used to identify and prioritize the most significant issues. • Histograms: Visual representations of data distribution. Root Cause Analysis Tools: • Fishbone Diagrams (Ishikawa diagrams): Tools to identify potential causes of a problem. • 5 Whys: A technique to iteratively ask "why" to uncover the root cause of an issue.

Subject: 3 Robotics

Mapped to ASC/N8379 ,V1.0

Terminal Outcomes:

- Terminal outcomes of robotics refer to the ultimate goals and achievements that individuals or organizations aim to attain through their involvement in the field of robotics. These outcomes are often related to the successful application, development, and utilization of robotic systems.
- Automation and Efficiency: Achieving the automation of repetitive tasks through robotics, leading to increased operational efficiency, reduced human intervention, and improved productivity.
- Precision and Accuracy: Using robotics to perform tasks with high precision and accuracy, leading to consistent and reliable results in manufacturing, healthcare, and other industries.
- Safety Enhancement: Developing robotic systems that can handle dangerous or hazardous tasks, thereby minimizing the risks to human workers and enhancing overall workplace safety.
- Labour Savings: Utilizing robotics to perform tasks that would otherwise require significant manual labour, resulting in reduced labour costs and optimized resource allocation.

Duration: *<24:00>*	**Duration**: *<48:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
Robotics Fundamentals: • Understanding the definition of robotics, its historical development, and its role in various industries and applications. Robot Anatomy and Components: • Learning about the basic components of a robot, including sensors, actuators, controllers, effectors, and end-effectors (tools or grippers).	Robot Assembly and Disassembly: • Gaining proficiency in assembling and disassembling robotic systems, including connecting sensors, actuators, and controllers. Robot Programming and Control: • Developing the ability to program robots using various languages and

Kinematics and Dynamics: • Understanding the motion of robotic systems, including forward and inverse kinematics, as well as dynamics involved in robot movement. Sensors and Perception: • Familiarity with different types of sensors (e.g., cameras, proximity sensors, Lidar) and their applications in providing information about the robot's environment. Actuators and Effectors: • Learning about various types of actuators (e.g., motors, servos, pneumatic actuators) and effectors used to interact with the environment. Robot Programming: • Understanding programming languages and methodologies used for controlling robots, including motion planning, behavior programming, and path optimization. Robot Control Systems: • Learning about open-loop and closed-loop control systems, feedback mechanisms, and control algorithms used to regulate robot behavior. • Path Planning and Trajectory Generation:	platforms to control their movement, actions, and interactions. Sensor Integration and Calibration: • Learning how to integrate and calibrate sensors to provide accurate data for robot perception and decision-making. Robot Simulation and Visualization: • Using simulation software to model and visualize robot behavior and interactions in virtual environments. Robot Path Planning and Navigation: • Implementing algorithms for path planning and navigation, enabling robots to move autonomously while avoiding obstacles. Robot Manipulation and Grasping: • Acquiring skills in designing robotic grippers and end-effectors for manipulating objects and performing tasks.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Basic Hand Tools: • Screwdrivers (various types and sizes) • Pliers (needle-nose, diagonal, etc.) • Wrenches (adjustable, socket, hex key) • Allen wrenches (for assembling components) • Wire strippers and crimping tools Electronics Tools: • Soldering iron and soldering equipment • Multimeter (for measuring voltage, current, resistance) • Breadboard and jumper wires for prototyping Robot Components and Hardware: • Industrial Robot with Teach Pendant Actuators and Effectors: • Grippers and end-effectors (for manipulating objects) • Pneumatic actuators (for soft robotics or gripping) • Linear actuators (for precise linear motion)	

Subject: 4 Battery Management System-BMS

Mapped to ASC/N8380 ,V1.0

Core-Elective-1

Terminal Outcomes:

- Terminal outcomes of a Battery Management System (BMS) refer to the ultimate objectives and achievements that result from the proper implementation and utilization of a BMS. A BMS is a critical component in managing rechargeable batteries, ensuring their safety, performance, and longevity.
- Optimized Battery Performance: Achieving optimal battery performance by actively monitoring and managing various parameters such as voltage, current, temperature, and state of charge to ensure efficient and reliable operation.
- Extended Battery Lifespan: Increasing the longevity of batteries by preventing overcharging, over-discharging, and other detrimental conditions that can lead to premature battery degradation.
- Enhanced Battery Safety: Ensuring the safety of battery systems by detecting and mitigating potential issues such as overvoltage, undervoltage, overcurrent, and overheating, which can lead to battery failure or even hazards like fires and explosions.
- Efficient Energy Utilization: Maximizing the energy utilization of battery systems by maintaining a balanced charge across individual cells or modules, which prevents capacity imbalances and optimizes the overall energy storage capacity.

Duration: *<18:00>*	**Duration**: *<36:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
Battery Fundamentals: • Understanding the basic principles of battery chemistry, types (e.g., lithium-ion, lead-acid), and their characteristics in terms of voltage, capacity, energy density, and discharge profiles. Importance of Battery Management: • Recognizing the critical role of BMS in ensuring battery safety, performance, longevity, and efficient energy utilization. BMS Components and Architecture: • Familiarity with the components of a BMS, including cell voltage sensors, current sensors, temperature sensors, control circuitry, communication interfaces, and protection circuits. Voltage and Current Sensing: • Learning how BMS measures individual cell voltages and currents to monitor the state of charge, state of health, and cell imbalances.	BMS Hardware Implementation: • Assembling and integrating BMS components such as voltage sensors, current sensors, temperature sensors, protection circuits, and control circuitry onto a battery system. • Cell Voltage Measurement and Calibration: • Calibrating and configuring cell voltage sensors to ensure accurate voltage measurements and to provide insights into cell balancing requirements. Current Sensing and Measurement: • Implementing current sensing mechanisms to measure charge and discharge currents accurately and monitoring the health of the battery system. Temperature Monitoring and Control: • Setting up temperature sensors, understanding thermal management strategies, and implementing

State of Charge (SoC) and State of Health (SoH): • Understanding how BMS estimates the battery's state of charge and health based on voltage, current, and temperature measurements. Cell Balancing and Equalization: • Learning about cell balancing techniques that ensure individual cells within a battery pack are equally charged or discharged, preventing capacity imbalances. Overvoltage and Under voltage Protection: • Understanding how BMS prevents overvoltage and under voltage conditions that can damage batteries or lead to unsafe operation.	temperature control mechanisms to prevent overheating. State of Charge (SoC) Estimation: • Developing algorithms to estimate SoC based on voltage, current, and temperature measurements, taking into account battery characteristics and aging. Cell Balancing Strategies: • Designing and implementing cell balancing algorithms to equalize charge levels among individual cells within a battery pack. Overvoltage and Undervoltage Protection: • Configuring protection circuits and response mechanisms to prevent overvoltage and undervoltage conditions that could damage the battery or connected systems.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Development Boards and Microcontrollers: Arduino boards or other microcontrollers for prototyping and testing BMS functions. Voltage Sensors: Voltage measurement circuits or modules to monitor individual cell voltages. Current Sensors: Current sensing modules or shunt resistors for measuring charge and discharge currents. Temperature Sensors: Temperature sensors (thermistors, ICs) for monitoring battery and ambient temperatures. Cell Balancing Circuits: Balancing circuits or modules to equalize cell voltages in a battery pack. Protection Circuits: Overvoltage protection (OVP) and undervoltage protection (UVP) circuits to prevent battery damage. Communication Interfaces: Communication modules or ICs (CAN, UART, SMBus) for data exchange between the BMS and external systems.	

Subject: 5 Electric Motors

Mapped to ASC/N8381 ,V1.0

Core-Elective-2

Terminal Outcomes:

- Terminal outcomes of electric motors refer to the ultimate goals and achievements resulting from the effective implementation, utilization, and advancements in electric motor technology. Electric motors are crucial components in various industries and applications, from transportation and manufacturing to renewable energy generation.
- Efficient Energy Conversion: Achieving high efficiency in converting electrical energy into mechanical energy, resulting in reduced energy consumption and operational costs.
- Environmental Sustainability: Contributing to a cleaner environment by using electric motors in place of internal combustion engines, thereby reducing greenhouse gas emissions and dependence on fossil fuels.
- Enhanced Performance: Developing electric motors with improved power output, torque characteristics, and speed ranges to meet the demands of various applications.
- Reduced Maintenance: Implementing electric motors with fewer moving parts, leading to reduced wear and tear and lower maintenance requirements compared to traditional combustion engines.
- Quiet Operation: Utilizing electric motors for quieter operation, making them suitable for applications in noise-sensitive environments and urban areas.

Duration: *<18:00>*	**Duration**: *<36:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
Electric Motor Principles: • Understanding the basic principles of electromagnetic induction and how they relate to the operation of electric motors. Motor Types and Classification: • Familiarity with different types of electric motors, including DC motors, AC induction motors, synchronous motors, and their variations. Motor Components and Structure: • Learning about the key components of an electric motor, such as the stator, rotor, windings, commutator (in DC motors), and other structural elements. Magnetic Fields and Flux: • Understanding the concepts of magnetic fields, magnetic flux, and how they interact with the motor's components. Electromagnetic Forces and Torque: • Exploring how electromagnetic forces generated by the interaction of currents and magnetic fields result in rotational torque, driving the motor's motion. Motor Operation and Working Principles: • Understanding the basic operation of	Motor Installation and Mounting: • Gaining proficiency in installing and mounting electric motors in different applications, considering factors such as alignment, vibration, and structural support. Wiring and Connection: • Learning how to correctly wire and connect electric motors to power sources, control devices, and protective circuits. Motor Testing and Measurement: • Developing skills in measuring key motor parameters, such as voltage, current, speed, and torque, using appropriate instruments. Motor Control Setup: • Setting up motor control systems, including switches, relays, contactors, variable frequency drives (VFDs), and motor starters. Starting and Stopping Procedures: • Practicing safe starting and stopping procedures for different motor types, including direct-on-line starting, soft starting, and dynamic braking. Troubleshooting and Diagnostics: • Acquiring skills to diagnose common

electric motors, including the role of the stator and rotor, the generation of torque, and the relationship between speed and voltage/frequency. Motor Efficiency and Power Factors: • Learning about motor efficiency, power factor, and the factors that influence motor efficiency, such as winding resistance and core losses. Motor Control Methods: • Exploring various methods for controlling electric motor speed and torque, including voltage control, frequency control, and pulse-width modulation (PWM).	motor issues, such as overheating, abnormal noises, and mechanical faults, using methods like visual inspection and vibration analysis.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Basic Hand Tools: Screwdrivers (flathead, Phillips) of various sizes Pliers (needle-nose, lineman, slip-joint) Adjustable wrenches Allen wrenches (hex keys) Combination wrenches Electrical Testing Tools: Digital multimeter for measuring voltage, current, resistance, and continuity Clamp meter for measuring current without breaking the circuit Insulation resistance tester (megohmmeter) for testing motor winding insulation Motor Alignment Tools: Laser alignment tools for aligning motor shafts and driven equipment Dial indicators for precise alignment measurements Motor Analyzer or Tester: Motor testing equipment for measuring motor parameters such as current, voltage, speed, and efficiency Motor Control Equipment: Variable frequency drives (VFDs) for motor speed control Motor starters and contactors for controlling motor operation	

Subject: 6 English Language Skills

Mapped to ASC/N9839 ,V1.0

Terminal Outcomes:

- Terminal outcomes of English language skills refer to the ultimate goals and achievements that individuals aim to attain through the development and mastery of their English language abilities. Proficiency in English is essential for effective communication, academic success, professional growth, and cultural engagement.
- Effective Communication: Achieving the ability to communicate fluently, accurately, and confidently in both spoken and written English across various contexts and audiences.

- Comprehensive Reading: Being able to comprehend and analyze a wide range of texts, including literature, articles, reports, and academic materials.
- Expressive Writing: Demonstrating the capacity to write coherent, organized, and persuasive pieces in English, ranging from essays and reports to creative works.
- Listening Comprehension: Developing the skill to understand spoken English in various accents, speeds, and contexts, including conversations, lectures, podcasts, and media.
- Cultural Awareness: Gaining an understanding of English-speaking cultures, their values, customs, and norms, and showing sensitivity to cultural differences.

Duration: *<18:00>*	**Duration**: *<36:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
Language Structure and Grammar: • Understanding the basic components of English grammar, including parts of speech, sentence structure, verb tenses, and subject-verb agreement. Vocabulary and Word Usage: • Building a robust vocabulary and learning to use words effectively in context, including synonyms, antonyms, idiomatic expressions, and collocations. Phonetics and Pronunciation: • Familiarity with phonetic symbols, sound patterns, stress, intonation, and pronunciation rules to enhance spoken communication. Reading Comprehension Strategies: • Learning techniques to comprehend written texts effectively, such as skimming, scanning, inference, summarization, and critical analysis. Listening and Speaking Skills: • Developing active listening skills, note-taking strategies, and effective speaking techniques for clear and coherent verbal communication. Writing Process and Organization: • Understanding the stages of the writing process, from prewriting and drafting to revising, editing, and proofreading, to produce well-structured written pieces. Paragraph and Essay Structure: • Mastering the organization and development of paragraphs and essays, including introduction, body, conclusion, topic sentences, and supporting details.	• Effective Spoken Communication: • Engaging in conversations, discussions, and presentations with clarity, appropriate tone, and effective use of verbal communication strategies. • Listening and Note-Taking: • Actively listening to spoken English, extracting key information, and taking meaningful notes during lectures, meetings, or presentations. • Interactive Language Use: • Applying appropriate language register and communication techniques for various social settings, such as formal meetings, casual conversations, and interviews. • Language Adaptation: • Adapting language use to different audiences, contexts, and levels of formality, ensuring effective communication across diverse situations. • Reading Comprehension and Analysis: • Reading and comprehending a variety of texts, including articles, reports, academic papers, and literature, and critically analyzing their content. • Effective Writing Skills: • Producing well-structured and organized written pieces, such as essays, reports, emails, and business correspondence, with clear expression and coherence. • Creative Writing and Expression: • Engaging in creative writing, such as short stories, poems, and narratives, to express ideas and emotions through literary forms.

Effective Communication Strategies: • Learning strategies for maintaining effective communication in various situations, such as using appropriate tone, clarity, and nonverbal cues.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Books and Reading Materials: • A variety of books, novels, magazines, newspapers, and online articles in English to improve reading comprehension, vocabulary, and exposure to different writing styles. Online Language Learning Platforms: • Websites and apps like Duolingo, Babbel, Rosetta Stone, and Memrise offer interactive lessons, quizzes, and exercises to practice reading, writing, listening, and speaking skills. English Language Learning Apps: • Mobile apps like Anki, Quizlet, and FluentU provide vocabulary flashcards, interactive exercises, and video content to enhance language skills. English Language Dictionaries: • Online dictionaries like Merriam-Webster, Oxford English Dictionary, and Cambridge Dictionary for instant definitions, pronunciation, and usage examples. Language Exchange Platforms: • Online platforms like Tandem, HelloTalk, and Speaky connect learners with native speakers for language exchange and real-time practice.	

Subject 7: Introduction to Employability Skills (120 Hours)

Mapped to DGT/VSQ/N0104

Terminal Outcomes:

- Discuss about Employability Skills in meeting the job requirements

Duration: *<48:00>*	**Duration**: *<72:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
Problem-Solving and Critical Thinking: • Enhancing the ability to analyze complex situations, identify issues, generate innovative solutions, and make informed decisions. Adaptability and Flexibility: • Learning to embrace change, adjust to new situations, and remain open to learning and growth in dynamic work	Problem-Solving and Decision-Making: • Identifying workplace challenges, analyzing situations, and making informed decisions to resolve issues efficiently. Adapting to Change: • Demonstrating flexibility and resilience by adapting to changes in tasks, procedures, and priorities while

environments. Time Management and Organization: • Developing skills to prioritize tasks, manage time efficiently, set goals, and meet deadlines to ensure optimal productivity. Leadership and Influence: • Understanding leadership qualities, motivating others, taking initiative, and being a positive influence on team dynamics. Conflict Resolution and Negotiation: • Acquiring skills to manage conflicts constructively, communicate differences, and negotiate win-win solutions. Emotional Intelligence: • Developing self-awareness, empathy, and the ability to manage emotions effectively, fostering positive relationships and communication. Interpersonal Skills: • Enhancing social skills, active listening, empathy, and building rapport with colleagues, clients, and stakeholders.	maintaining a positive attitude. Time Management and Productivity: • Effectively managing tasks, setting priorities, and using time management techniques to meet deadlines and achieve goals. Taking Leadership Initiative: • Assuming leadership roles when appropriate, delegating tasks, motivating team members, and driving projects forward. Conflict Resolution in Practice: • Applying conflict resolution techniques to address disagreements or misunderstandings in a constructive and collaborative manner. Emotional Intelligence in Interactions: • Demonstrating self-awareness and empathy in interactions, managing emotions, and fostering positive relationships. Building Professional Relationships: • Actively networking, building connections, and maintaining professional relationships that contributes to career growth. Effective Negotiation Skills: • Applying negotiation strategies to reach mutually beneficial agreements and resolve conflicts while maintaining positive relationships.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Online Courses and Workshops: Platforms like Coursera, Udemy, and LinkedIn Learning offer courses on communication, leadership, time management, conflict resolution, and other soft skills. **Books and EBooks:** Numerous books provide guidance on developing soft skills, such as "Emotional Intelligence" by Daniel Goleman and "Crucial Conversations" by Kerry Patterson. **Podcasts and Audiobooks:** Listen to podcasts like "The Art of Charm," "The Tony Robbins Podcast," and "HBR IdeaCast" that discuss personal development, leadership, and communication. **Webinars and Seminars:** Participate in online or in-person workshops, seminars, and webinars that focus on	

specific soft skills and offer practical insights.

Language Learning Apps:

Apps like Duolingo and Babbel can improve communication skills, language proficiency, and cross-cultural communication.

Online Learning Communities:

Join forums, online groups, and communities focused on professional development and soft skills to connect with others and share experiences.

Networking Events:

Attend networking events, industry conferences, and workshops to practice networking and relationship-building skills.

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E/B.Tech	Mechanical/Automobile/ Electrical/ Electronics	4	Mechanical/ Automobile/ Electronics/ Instrumentation	1	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
B.E/B.Tech	Mechanical/Automobile/ Electrical/ Electronics	5	Mechanical/ Automobile/ Electronics/ Instrumentation	0	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
Diploma	Mechanical/Automobile/ Electrical/ Electronics	3	Mechanical/ Automobile/ Electronics	1	Mechanical/ Automobile/ Electronics	NA
Diploma	Mechanical/Automobile/ Electrical/ Electronics	4	Mechanical/ Automobile/ Electronics	0	Mechanical/ Automobile/ Electronics	NA
M.E/M.Tech	Mechanical/Automobile/ Electrical/ Electronics	2	Mechanical/Automobile/ Electrical/	1	Mechanical/Automobile/ Electrical/ Electronics	NA

			Electronics			
M.E/M.Tech	Mechanical/Automobile/ Electrical/ Electronics	3	Mechanical/Automobile/ Electrical/ Electronics	0	Mechanical/Automobile/ Electrical/ Electronics	NA

Trainer Certification	
Domain Certification	**Platform Certification**
"Fabrication and Service Technician, version 1.0". Minimum accepted score is 80%.	Recommended that the trainer is certified for the job role "Trainer (VET and Skills)", Mapped to Qualification Pack: MEP/Q2601, V2.0" Minimum accepted score is 80%

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E/B.Tech	Mechanical/Automobile/ Electrical/ Electronics	5	Mechanical/ Automobile/ Electronics/ Instrumentation	1	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
B.E/B.Tech	Mechanical/Automobile/ Electrical/ Electronics	6	Mechanical/ Automobile/ Electronics/ Instrumentation	0	Mechanical/ Automobile/ Electronics/ Instrumentation	NA
Diploma	Mechanical/Automobile/ Electrical/ Electronics	4	Mechanical/ Automobile/ Electronics	1	Mechanical/ Automobile/ Electronics	NA
Diploma	Mechanical/Automobile/ Electrical/ Electronics	5	Mechanical/ Automobile/ Electronics	0	Mechanical/ Automobile/ Electronics	NA
M.E/M.Tech	Mechanical/Automobile/ Electrical/ Electronics	3	Mechanical/Automobile/ Electrical/ Electronics	1	Mechanical/Automobile/ Electrical/ Electronics	NA
M.E/M.Tech	Mechanical/Automobile/ Electrical/ Electronics	4	Mechanical/Automobile/ Electrical/ Electronics	0	Mechanical/Automobile/ Electrical/ Electronics	NA

Assessor Certification	
Domain Certification	**Platform Certification**
"Fabrication and Service Technician, version 1.0". Minimum accepted score is 80%.	"Recommended that the Accessor is certified for the job role "Assessor (VET and Skills)", Mapped to Qualification Pack: MEP/Q2701, V2.0" Minimum accepted score is 80%.

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Assessment Strategy

1. Assessment System Overview:
    - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
    - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
    - Assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records

2. Testing Environment:
    - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
    - Check the duration of the training.
    - Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
    - If the batch size is more than 30, then there should be 2 Assessors.
    - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
    - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
    - Confirm the number of TABs on the ground is correct to execute the Assessment smoothly.
    - Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:
    - Question papers created by the Subject Matter Experts (SME)
    - Question papers created by the SME verified by the other subject Matter Experts
    - Questions are mapped with Semester-wise Curriculum.
    - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
    - Assessor must be ToA certified & trainer must be ToT Certified
    - Assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:
    - Time-stamped & geotagged reporting of the assessor from assessment location
    - Centre photographs with signboards and scheme specific branding
    - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
    - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:
    - Surprise visit to the assessment location
    - Random audit of the batch
    - Random audit of any candidate

6. Method for assessment documentation, archiving, and access
    - Hard copies of the documents are stored
    - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage

- Soft copies of the documents & photographs of the assessment are stored in the Hard Drives

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
SOP	Standard Operating Procedure
WI	Work Instructions
PPE	Personal Protective equipment