

National Vocational Certificate

Level 2 in Mechanical Technology (Machinist)

CBT Curriculum



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Date of approval by NCRC:

8th -9th Jan 2015

Date of Notification:

16th July 2015, vide notification no F.2-1/2013-DD(VT)

This curriculum has been produced by the National Vocational & Technical Training Commission (NAVTTCC) with the technical assistance of TVET Reform Support Programme, which is funded by the European Union, the Embassy of the Kingdom of the Netherland, Federal Republic of Germany and the Royal Norwegian Embassy. The Programme has been commissioned by the German Federal Ministry for Economic Cooperation and Development and is being implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

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1. INTRODUCTION

1.1 Description of the structure of the course

Following is the structure of the course:

| Module # | Title | Theory (hours) | Practical (hours) | Total (hour) |
|----------|--|----------------|-------------------|--------------|
| 1 | Perform Basic Bench work | 20 | 80 | 100 |
| 2 | Drilling Machine Operations | 10 | 30 | 40 |
| 3 | Apply Occupational Health & Safety Procedures at Workplace | 20 | 20 | 40 |
| 4 | Carry Out Maintenance of Tools and Machines | 20 | 20 | 40 |
| 5 | Perform Lathe Machine Operations | 60 | 300 | 360 |
| 6 | Perform Milling Machine Operations | 60 | 300 | 360 |
| 7 | Apply Carry out Basic CNC Machine Operations. | 80 | 280 | 360 |
| 8 | Perform Grinding Machine Operations | 30 | 180 | 210 |
| 9 | perform Shaper Machine operations | 20 | 70 | 90 |
| | Total | 320 | 1280 | 1600 |

1.2 Duration of the course:

The proposed curriculum is composed of 9 modules that will be covered in 1600 hrs. It is proposed that the course may be delivered in a one year period.

The distribution of contact hours is given below:

| | |
|------------------|---------------|
| Total | 1600hrs. |
| Theory | 320 hrs (20%) |
| Practical | 1280hrs (80%) |

1.3 Purpose of the training programme:

The purpose of this training is to develop a range of skills and techniques, personal skills and attributes essential for successful performance in machinist in accordance with industry requirements .It also enables the student to pursue a machinist career path with greater employment and entrepreneurial skills progress to related general and/or vocational qualifications.

1.4 Specific characteristics of this training programme:

- The training programme shall be organized in an institutewhere the Machinist labs are available for trainees.
- The training program shall enable the student to pursue a Machinist career path with greater employment skills
- The training program shall give the opportunity to become entrepreneur in machinist field.
- The training program will be more effective and beneficial who may already have experience or knowledge of basic machine shop.
- The training program will be also be beneficial for them who want to focus on only one area and make their future in the same field
- The training program shall be good guidance on inside tips and tricks on techniques like bench work,drilling, lathe work, milling work, grinding work and CNC milling /lathe work etc.
- The training program shall be more focused that how to finalize the workpiece on lathe or milling machine.
- This training programme will be more creative on how to create special workpiece on CNC milling/lathe.

1.5 Main objectives of the training programme

Following are the main objectives of the training programme:

- To produce a capable &skillful workforce as required by the prevailing market demands
- To produce work safely, effectively and hygienically
- To develop characteristics among the trainees such as self-reliance, reliability, responsibility and ability to lead the program in the field
- To give competency in the field of machinist and its associated elements

- To develop excellent workpiece on milling, lathe, shaper and CNC machines.
- To develop ability among the trainees to work in a team environment
- To develop knowledge of sterilization and sanitation rules and explain their importance
- To define personal and public hygiene & demonstrate good grooming principles

1.6 Skill development by action orientation:

- The student must have the following skills after action orientation:
- Collaborate and lead to a positive community change and improvement in the system
- Consult with Teacher and other trainees to determine their ideas and requirements.
- Give a positive impression of yourself whenever any task given by teacher.
- Develop a sense of duty/patience and a desire to be helpful.
- Ensure personal and machine safety practices at work.
- Ensure personal & occupational health and safety precautions.
- Skill basic bench work operations sawing, filing, threading and reaming.
- Develop a sense of duty/patience and a desire to be helpful
- Define and practice of housekeeping.
- Adopt preventive maintenances of machine and tools.
- Control tools and equipment to minimize the risk of damage.
- Cut thread (internal & external) on lathe machine.
- Mill Gears on milling machine.

1.7 Entry level of trainees

- Metric

Minimum qualification for teachers

- Should have completed intermediate and equivalent qualifications
- Must be a holder of G II Machinist certificate or Three years DAE in Mechanical.
- Must be able to communicate effectively both orally and in written form
- Must have at least two (4) years teaching experience.

1.8 Medium of instruction

Urdu, local language

1.9 Laws and Regulations

- Deal with hazards in accordance with workplace instructions and legal requirements
- Report to the people responsible for health and safety in their workplace those hazards which present the highest risk
- Check which of the potentially harmful working practices and aspects of the workplace present the highest risks to them and others
- Students are led to appreciate the importance of environmental issues as they engage in a range of activities relating to Machinist..
- Impact on the environment of the wrongful disposal of rough material and scrap.
- Health and safety, fire, accident and emergency reporting and procedures, first aid provision, use, storage tools and attachments.
- First aid provision and fire safety, the requirements regarding personal health, safety and hygiene and the broad provisions of the Health and Safety at Work Act 1974

- Workplace Regulations 1992,
- Manual Handling Operations Regulations 1992,
- Personal Protective Equipment at Work Regulations 1992,
- Provision and use of Equipment Regulations 1992,
- Control of Substances Hazardous to Health (COSHH) Regulations 1992, (Students must use, store and dispose of chemicals correctly and have an awareness of the hazards/risks from substances), Electricity at Work Regulations 1989,
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 1985, (Accidents must be reported and the appropriate documentation completed).
- The Management of Health and Safety at Work Regulations 1992 (dermatitis and asthma)
- Hazard Analysis critical control point (HACCP)
- Environment protection agency
- Occupational Health and Safety Act (OHSA) regulations
- Workplace Hazardous Materials Information Systems (WHIMIS) regulations.

1.10 Suggested distribution of modules

Following is the suggested sequence of modules:

Module-1: Perform Basic Bench work

Module-2: Drilling Machine Operations

Module-3: Apply Occupational Health & Safety Procedures at workplace.

Module-4: Carry Out Maintenance of Tools and Machines

Module-5: Perform Lathe Machine Operations

Module-6: Perform Milling Machine Operations.

Module-7: Apply Carry out Basic CNC Machine Operations.

Module-8: Perform Grinding Machine Operations

Module-9: perform Shaper Machine operations

1.12 Competencies gained after completion of the course

After the completion of the course, the trainees will be able to:

- Explain the bench work relating to safety precautions, hand tools, perception of filing, Polishing, tapping, threading, and reaming.
- Ensure personal and machine safety practices at work.
- Explain and use of Basic Bench work and Machine Operations and using appropriate techniques of Health & Safety Procedures at Workplace.
- Explain Sawing filing threading reaming techniques and methods.
- Explain and demonstrate the use of drill machine operations.
- Explain and demonstrate the use grinding machines for different operations
- Define the use of lathe machine.
- Explain and demonstrate the use of milling machines.
- Explain and demonstrate the use of surface and cylindrical grinding machine
- Explain and demonstrate the setting of CNC lathe and Milling machine
- Explain and demonstrate the use of shaper machines.
- Define and apply the personal tool and Machine safety hazards properly
- Define and practice housekeeping and preventive maintenance of machines and tools

1.13 Worker Traits

- | | | |
|---------------------|-------------|-------------|
| • Personal hygiene | • Honest | • Punctual |
| • Devoted/motivated | • Attentive | • Organized |

- Communication skills
- Knowledge
- Friendly
- Interpersonal skills
- Creative
- Hard worker
- Team work
- Collaborative
- Confident
- Competent
- Innovative

1.14 Opportunities for employment and advancement

- Fertilizer plants.
- Engineering industry
- Chemical plants.
- Pharmaceutical industry.
- Cement plants.
- Oil refineries.
- Automobile industry.
- Sugar plants.
- Power plants.
- Papers and board industry.
- Packaging industry.
- Private & government workshops.
- Own workshop

2. OVERVIEW OF THE CURRICULUM FOR MACHINIST

| Module Title and Aim | Learning Units | Theory ¹ Days/hours | Workplace ² Days/hours | Timeframe of modules |
|--|---|-----------------------------------|--------------------------------------|-------------------------|
| Module 1: Perform Basic Bench Work Aim: Be able to prepare the sawing, filling, threading (internal +external) reaming. | LU-1: Carry out Sawing | 03 hours | 10 hours | 13 hours |
| | LU-2: File the Work Piece to Produce required Smoothness | 10 hours | 40 hours | 50 hours |
| | LU-3: Produce Threads on Work Piece | 04 hours | 20 hours | 24 hours |
| | LU-4: Perform Hand Reaming | 03 hours | 10hours | 13hours |
| Module 2: Perform Drilling Machine Operations Aim: Be able to prepare drilling, Counter Boring, Counter Sinking and machine reaming. | LU-1: Produce Holes using Drilling Machine | 04 hours | 10 hours | 14 hours |
| | LU-2: Perform Counter Boring and Counter Sinking | 02 hours | 10 hours | 12 hours |
| | LU-3: Perform Machine Reaming | 04 hours | 10hours | 14hours |
| Module 3: Apply Occupational Health & Safety Procedures at Workplace Aim: Be able to prepare Occupational Health & Safety Procedures at Workplace | LU-1: Identify hazards in workplace environment | 05 hours | 05 hours | 10 hours |
| | LU-2: Comply with Occupational Health and Safety Precautions | 05 hours | 05 hours | 10 hours |
| | LU-3: Apply Personal Protective and Safety Equipment | 05 hours | 05 hours | 10 hours |
| | LU-4: Practice safe work habits to ensure safety at workplace. | 05 hours | 05 hours | 10 hours |
| Module 4: Carry Out Maintenance of Tools and Machines Aim: Be able to prepare Maintenance of Tools andMachines housekeeping. | LU-1: Perform Preventive Maintenance of Machines and Tools | 10 hours | 10 hours | 20 hours |
| | LU-2: Perform General Housekeeping and Maintenance of Machines and Tools | 10 hours | 10 hours | 20 hours |

¹ Learning hours in training provider premises,

² Training workshop, laboratory and on-the-job workplace

| Module Title and Aim | Learning Units | Theory ¹ Days/hours | Workplace ² Days/hours | Timeframe of modules |
|--|--|-----------------------------------|--------------------------------------|-------------------------|
| Module 5: Perform Lathe Machine Operations Aim: Be able to perform all common +complex .Lathe operation using conventional lathe machine. | LU-1: Perform Facing Operations | 07 hours | 30 hours | 37 hours |
| | LU-2: Perform Turning Operations | 07 hours | 50 hours | 57 hours |
| | LU-3: Perform Drilling / Boring Operations | 08hours | 50hours | 58hours |
| | LU-4: Perform Taper Turning Operations | 10 hours | 50 hours | 60 hours |
| | LU-5: Perform Knurling Operations | 08 hours | 40 hours | 48 hours |
| | LU-6: Perform Threading Operations | 20hours | 80hours | 100hours |
| Module 6: Perform Milling Machine Operations Aim: Be able to perform common milling operation and produce commonly used square, slotting, drilling, boring and gears. | LU-1: Produce a Squared Shape Work Piece | 20 hours | 80 hours | 100 hours |
| | LU-2: Perform Spur Gear Cutting | 20 hours | 100 hours | 120 hours |
| | LU-3: Perform Slotting / Grooving on Work Piece | 10hours | 60hours | 70hours |
| | LU-4: Perform Drilling / Boring using Milling Machine | 10 hours | 60 hours | 70 hours |
| Module 7: Carry Out Computerized Numerical Control (CNC) Machine Operations Aim: Be able to set &perform on computer numerical control (CNC) Lathe (CNC) and milling .Machine | LU-1: Set CNC Machine according to Job Requirements | 30 hours | 100 hours | 130 hours |
| | LU-2: Perform Milling Operations Using CNC Machine | 25 hours | 100 hours | 125 hours |
| | LU-3: Perform Turning Operations Using CNC Machine | 25hours | 80hours | 105hours |
| Module 8: Perform Grinding Machine Operations Aim: Be able to perform on grinding machines (Off-hand, surface, cylindrical and tool & cutter grinding machines). | LU-1: Perform Off-hand Grinding | 06 hours | 40hours | 46 hours |
| | LU-2: Perform Surface Grinding | 06 hours | 40hours | 46 hours |
| | LU-3: Perform Universal Cylindrical Grinding | 08hours | 50hours | 58 hours |
| | LU-4: Perform Tool and Cutter Grinding | 10 hours | 50hours | 60 hours |

| Module Title and Aim | Learning Units | Theory ¹ Days/hours | Workplace ² Days/hours | Timeframe of modules |
|--|---|-----------------------------------|--------------------------------------|-------------------------|
| Module 9: Perform Shaper Machine operation | LU-1: Perform Squared Shape Work Piece | 10 hours | 30 hours | 40 hours |
| Aim: Be able to perform on shaper machine (Square & V shaping). | LU-2: Perform V shape work piece | 10 hours | 40 hours | 50 hours |

3. TEACHING AND LEARNING GUIDE FOR MACHINIST

3.1 MODULE-1: BASIC BENCH WORK

Duration: 100 hours

Theory: 20 hours

Practice: 80 hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|--|---|--|---|
| LU-1: Carry out Sawing | Trainee should be able to: <ul style="list-style-type: none"> • Selection of blade according to material of workpiece. • Ensure the blade is set in the frame of hacksaw as per procedure. • Perform marking as per drawing. • Perform sawing according to marked line ensure accuracy. • Perform measuring • Observe personal and workplace safety at all times. | <ul style="list-style-type: none"> • Explain properties of workpiece metals. • Describe types of Hacksaw blades. • Describe the importance of safety precaution. • Demonstrate procedure of setting blade in hacksaw. • Explain interpretation of drawings. • Show and explain use of measuring and marking tools. • Explain the importance of clamping of work piece. • Demonstrate marking as per given drawing. • Demonstrate procedure of sawing with hand hacksaw. | Total: 13hrs. Theory: 03hrs. Practical: 10 hrs. | Work bench Bench vice Tri square Scriber Hand hack saw with blade Steel Rule Personal Protective Equipment | Theory: Class room Practical: Lab/workshop |
| LU-2: File the Work Piece to Produce required | Trainee must be able to: <ul style="list-style-type: none"> • Identified the bench workshop tools. | <ul style="list-style-type: none"> • Understand The Bench work shop tools and their application | Total: 50hrs. Theory: | Work bench with vice Files | Theory: Class room |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|--|--|--|---|
| Smoothness | <ul style="list-style-type: none"> Identified the kind of file and their uses. Identified the clamping workpiece properly. Perform and select files according to dimension and finishing. Perform measuring Observe personal and tool safety. | <ul style="list-style-type: none"> Knowledge of different files and their uses. Perform different filling operation, parallel filling, curved edge, even surface and square filling. Profile filling with key file needle file set Perform clamping of workpiece as required. Understand and use of measuring tools Emphasise the importance of safety precaution. | 10 hrs. Practical: 40 hrs. | Scriber Steel rule Try square Personal Protective Equipment | Practical: Lab/workshop |
| LU-3: Produce Threads on Work Piece | Trainee should be able to: <ul style="list-style-type: none"> Identify different kind of taps & die according to requirement Identify the workpiece clamping method. Apply tap and die alignment. Apply lubricants while threading. Avoid unwanted engraving and slips. Identify proper threading | <ul style="list-style-type: none"> Knowledge of different kind of taps & die according to requirement Knowledge of calculation for drill size for internal threading. Perform clamping of workpiece as required. Perform threading by hand. Perform threading by die and taps. Ensure tap and die alignment. | Total: 24 hrs. Theory: 04hrs. Practical: 20 hrs. | Bench and bench vice Tap set Tap handle Lubricant Tri square | Theory: Class room Practical: Lab/workshop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|-----------------------------------|---|--|---|---|--|
| | <p>procedure.</p> <ul style="list-style-type: none"> Observe personal and workplace safety at all times. | <ul style="list-style-type: none"> Ensure use of lubricants during threading. Knowledge of threading procedure for accurate and dimensionally correct. Adopt safety during threading. | | | |
| LU-4: Perform Hand Reaming | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> Identify different kind of reamer standard according to requirement Identify the workpiece clamping method. Apply reamer alignment. Apply lubricants while reaming. Avoid unwanted engraving and slips. Identify proper reaming procedure. Observe personal and workplace safety at all times. | <ul style="list-style-type: none"> Knowledge of different kind of reamer standard according to requirement Knowledge of calculation for reamer drill size Perform clamping of workpiece as required. Perform reaming by hand. Perform reaming by hand reamer. Ensure reamer alignment. Ensure use of lubricants during reaming. Knowledge of reaming procedure for accurate and dimensionally correct. Adopt personal and tool safety during reaming. | <p>Total: 13 hrs.</p> <p>Theory: 03 hrs.</p> <p>Practical: 10 hrs.</p> | <p>Bench vice Hand reamer Handle of reamer Lubricant Try square</p> | <p>Theory: Class room</p> <p>Practical: Lab/workshop</p> |

3.2 MODULE-2: PERFORM DRILLING MACHINE OPERATIONS

Objective of the Module: Be able to prepare drilling, Counter Boring and Counter Sinking on machine reaming.

Duration: 40 hours

Theory: 10 hours

Practice: 30 hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|--|--|---|---|---|
| LU-1: Produce Holes using Drilling Machine | Trainee should be able to: <ul style="list-style-type: none"> Perform basic mathematical calculation for drilling operations. Identify machine controls. Perform proper clamping the workpiece. Identify the produce to required quality and within the specified dimensional accuracy. Perform marking as per drawing. Perform drilling on drilling machine Perform measuring | <ul style="list-style-type: none"> Understand of construction of different type of drills machine. Knowledge of different type of drills machine and their functions. Calculate cutting speed, feed and RPM on drilling machine Identify the marking as per drawing. Perform drilling on marked point. Understand the use of coolant. Apply safety on drill machine Understand and use of measuring tools Adopt machine tool & personal safety. | Total: 14hrs. Theory: 04hrs. Practical: 10hrs | Drilling Machines Drill chuck with Key Machine Vice Marking Tools Measuring Tools Drill Sleeve and Socket Personal Protective Equipment | Theory: Class room/ Salon Practical: Lab/ work shop |
| LU-2: Perform Counter Boring and Counter Sinking | Trainee should be able to: <ul style="list-style-type: none"> Perform basic mathematical calculation for Counter Boring | <ul style="list-style-type: none"> Calculate cutting speed, feed and R.P.M for Counter Boring and Counter Sinking on drilling machine. | Total: 12 hrs. Theory: 02hrs. | Counter Sink Counter drill Cutting oil | Theory: Class room Practical: |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|--|---|--|---|
| | <p>and Counter Sinking operations.</p> <ul style="list-style-type: none"> • Knowledge of calculation for feed & R.P.M for Counter Boring and Counter Sinking drilling. • Perform proper clamping the workpiece. • Identify the produce to required quality and within the specified dimensional accuracy. • Perform marking as per drawing. • Perform Counter Boring and Counter Sinking on drilling machine. • Perform measuring | <ul style="list-style-type: none"> • Identify the marking as per drawing. • Perform Counter Boring and Counter Sinking on marked point. • Understand the use of coolant. • Apply safety on drill machine • Understand and use of measuring tools • Adopt machine tool & personal safety. | <p>Practical: 10hrs</p> | <p>Tri square Vernier caliper</p> | <p>Lab/worksh op</p> |
| <p>LU-3: Perform Machine Reaming</p> | <p>Trainee should be able to:.</p> <ul style="list-style-type: none"> • Identify machine controls. • Perform proper clamping the workpiece. • Identify the produce to required quality and within the specified dimensional accuracy. • Perform marking as per drawing. • Perform reaming on drilling | <ul style="list-style-type: none"> • Calculate cutting speed, feed and RPM on drilling machine for reaming. • Calculate drill size for reamer size. • Identify the marking as per drawing. • Perform reaming on marked point. • Understand the type and use of coolant. • Apply safety on drill machine • Understand and use of measuring tools | <p>Total: 14hrs. Theory: 04hrs. Practical: 10hrs</p> | <p>Drilling Machines Drill chuck with Key Machine Vice Measuring Tools Personal Protective Equipment</p> | <p>Theory: Class room Practical: Lab/worksh op</p> |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---------------|---|--|----------|-----------------------|----------------|
| | machine <ul style="list-style-type: none"> • Perform measuring | (gauges to check reamed hole). <ul style="list-style-type: none"> • Adopt machine tool & personal safety. | | Reamers Plug gauge | |

3.3 MODULE-3: APPLY OCCUPATIONAL HEALTH & SAFETY PROCEDURES AT WORKPLACE

Objective of the Module: Be able to prepare Occupational Health & Safety Procedures at Workplace

Duration: 20 hours

Theory: 20 hours

Practice: 40 hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---------------------------|---|
| LU-1: Identify hazards in workplace environment | Trainee should be able to: <ul style="list-style-type: none"> Identify drawing and interpret work processes and procedures correctly. Identify risk of hazards at workplace. Recognize engineering processes, tools, equipment and consumable materials that have the potential to cause harm. Identify any potential hazards and take appropriate action to minimize the risk. Health and safety precautions of the company. Techniques and methods to identify the risks of hazards at workplace. Dealing with hazards to avoid any | <ul style="list-style-type: none"> Understand drawing and engineering processes and procedures correctly Knowledge of techniques and methods to identify the risks of hazards at workplace. Knowledge of any potential hazards and takes appropriate action to minimize the risk. <ul style="list-style-type: none"> ✓ Adopt health and safety precautions of work shop.(Worksite Hazardous Materials Information Systems (WHMIS), ✓ fire regulations, Knowledge and understanding of hazards to avoid any accident or injury on workplace. Prepare check list for safety hazardous. Knowledge of reporting procedures and documentation. | Total: 10hrs Theory: 05hrs Practical: 05hrs | Health and safety manual. | Theory: Class room Practical: Lab/workshop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|---|--|---|---|---|
| | accident or injury. <ul style="list-style-type: none"> Safety reporting procedures and documentation. | | | | |
| LU-2: Comply with Occupational Health and Safety Precautions | Trainee should be able to: <ul style="list-style-type: none"> Create safe environment Apply Occupational Health and Safety Act, Regulation and Code. Safe own self and other. Aware worksite hazard accident and emergency Situations Identify chemical e.g. skin, use, storage, disposal, procedures, consequences of not following manufacturers' instructions Use Electrical equipment their storage, maintenance and repair Identify workshop regulations, and hygiene practices Select, use and maintain appropriate Personal protective equipment(PPE) for workshop applications | <ul style="list-style-type: none"> Explain the role of the employer and employee in regard to Occupational Health and Safety (OH&S) regulations Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Explain industry practices for hazard assessment and control procedures. Describe the responsibilities of workers and employers to apply emergency procedures. Describe positive tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures. Describe the health and safety risks that can arise as a result of accidents. Describe the roles and responsibilities of employers and employees with respect to the selection and use of personal protective | Total: 10hrs Theory: 05hrs Practical: 05hrs | Overall combination Safety shoes Safety gloves Safety goggles Safety helmet Ear plugs Fire extinguisher Smoke alarm First aid box | Theory: Class room Practical: Lab/workshop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|---|---|---|---|
| | | equipment (PPE). <ul style="list-style-type: none"> Describe fire hazards, classes, procedures and equipment related to fire protection | | | |
| LU-3: Apply Personal Protective and Safety Equipment | Trainee should be able to: <ul style="list-style-type: none"> Select personal protective equipment in terms of type and quantity according to work orders. Understand wear, adjust, and maintain personal protective equipment to ensure correct fit and optimum protection in compliance with company procedures. Ensure personal protective equipment is cleaned and stored in proper place. Explain the use Personal Protective Equipment. Identify the types of PPE. Protective clothing and equipment (PPE) to be worn and where it can be obtained. Safely maintaining the PPEs. | <ul style="list-style-type: none"> Knowledge of personal protective equipment. Ensure the use wear, adjust, and maintain personal protective equipment correct fit and optimum protection in compliance with company Store the PPEs at neat and clean place and clean after each use. Knowledge of personal protective equipment Type and size (fit size for person). Ensure the wear (PPE)clothing and equipment. | Total: 10hrs Theory: 05hrs Practical: 05hrs | Overall combination Safety shoes Safety gloves Safety goggles Safety helmet Ear plugs First aid box | Theory: Class room Practical: Lab/workshop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|---|---|---|--|
| <p>LU-4: Practice safe work habits to ensure safety at workplace.</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Knowledge of wear required clothing (not loose or torn), confine long hair, and remove watch or ring in accordance with company procedures. • Apply work procedures and approaches that ensure personal safety as well as others safety. • Demonstrate good housekeeping in the workplace by cleaning up spills or leaks. • Keep work area clean and clear from oil and chips, and storing tools or equipment, so that the potential for accident or injury is prevented. • Ensure tools or equipment are in place and available in proper place. • Importance of safety at work and its implications. • Work safety procedures and guidelines. | <ul style="list-style-type: none"> • Knowledge of Importance of safety at work and its implications. • Ensure wear clothing recommended by (PPEs) confine long hair, and remove watch or ring. • Ensure personal safety as well as tools and work safety. • Demonstrate good housekeeping in the workplace. • Demonstrate work area clean and clear from oil and chips, and storing tools or equipment, so that the potential for accident or injury is prevented. | <p>Total: 10hrs</p> <p>Theory: 05hrs</p> <p>Practical: 05hrs</p> | <p>Earth wire</p> <p>Fire extinguisher</p> <p>Tool box/bins</p> <p>Safety covers</p> <p>First aid box</p> <p>Safety equipment</p> | <p>Theory: Class room</p> <p>Practical: Lab/workshop</p> |

3.4 MODULE-4: CARRY OUT MAINTENANCE OF TOOLS AND MACHINES

Objective of the Module: Be able to prepare Maintenance of Tools and Machines housekeeping.

Duration: 40 hours

Theory: 20 hours

Practice: 20 hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|---|---|---|---|---|
| LU1: Perform Preventive Maintenance of Machines and Tools | Trainee should be able to: <ul style="list-style-type: none"> • Prepare oiling and greasing chart (daily, weekly as machine requirement). • Prepare machine history record date of installation condition, oiling and maintenance has to done. • Inspect and assess the general condition of an assigned machine on regular basis. • Observe problems and carry out routine maintenance as per given instructions and schedules. • Report to authority that problems which are beyond the scope him. • Read maintenance schedule • Identify faulty/damaged/ worn out parts • Troubleshooting of minor faults | <ul style="list-style-type: none"> • Understand machine operations • Understand oiling greasing rotation machine • Identify faulty/damaged/ worn out parts and can remove small fault. • Maintain history record of assign machine. • Observe routine maintenanceproblems and can solve them. • Demonstrate daily check of assigned machine on regular basis. • Write report to authority those problems which are beyond the scope him. | Total: 20hrs Theory: 10hrs Practical: 10hrs | Wrench set L-Key set Spanner set Hammer Chisel Bearing puller Safety equipment Machinist toolkit | Theory: Class room Practical: Lab/worksh op |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|--|--|--|---|
| LU-2: Perform General Housekeeping and Maintenance of Machines and Tools. | Trainee should be able to: <ul style="list-style-type: none"> • Clean and maintain all bench-work tools and machines as per housekeeping checklists or instructions given. • Prepare check list for daily cleanliness of the workplace. • Respond appropriately to safety hazards on all bench-work tools and machines. • Identify all the tools and material in proper place to ensure safe work. • Knowledge of methods and techniques for cleanliness and maintenance of machines and tools. • Prepare Specific guidelines and checklists to conduct maintenance and housekeeping of machines and tools. | <ul style="list-style-type: none"> • Knowledge of material, tools and equipments for Straightening the hair • Knowledge of guidelines and checklists to conduct maintenance and housekeeping of machines and tools • Adopt habit daily cleanliness of the machine and workplace. • Adopt habit daily and as per given check list of oiling and lubrication. • Knowledge of storing all tools and material in specify place. | Total: 20hrs Theory: 10hrs Practical: 1 0hrs | Tool racks Grease gun Oil gun Cotton rags Tool grinders Machinist toolkit | Theory: Class room Practical: Lab/workshop |

3.5 MODULE-5: PERFORM LATHE MACHINE OPERATIONS

Objective of the Module: Be able to perform all common +complex .Lathe operationsby using conventional lathe machine.

Duration: 360 hours

Theory: 60 hours

Practice: 300 hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|---|---|---|---|
| LU-1: Perform Facing Operations | Trainee should be able to: <ul style="list-style-type: none"> • Explain the construction of lathe machine and their uses. • Understand the attachment/of lathe machine. • Identified the lathe tools and their settings. • Prepare tools for required operation etc. facing. • Mount the clamping device and clamping job property • Clamp the tool and set centre position. • Knowledge of machine calculation. • Knowledge of jobs calculation • Perform facing operation. • Deburr the job. • Check size with Vernier caliper on all steps. | <ul style="list-style-type: none"> • Understand of construction of different type of Lathe machine. • Enlist the main part of lathe machine and their uses. • Deduct the small fault and repair them. • Enlist the main attachment /of lathe machine • Mount and remove the attachment and can use them. • Knowledge of all kind of turning and thread tools angles. • Calculate cutting speed, RPM and feedfor facing. • Enlist the required tools for job and clamping device. • Handle and sharp tools with care. • During use measuring tool store separately. • Tools equipment used cleaned and stored as specified. | Total: 37hrs Theory: 07hrs Practical: 30hrs | Lathe Machine Cutting Tools Venire Caliper Personal Protective Equipment | Theory: Class room Practical: Lab/worksho p |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| | <ul style="list-style-type: none"> Personal safety, Tool and work safety | <ul style="list-style-type: none"> Wear specified cloths for in the work shop handle the heavy part carefully. Keep working space clean from oil and chips. | | | |
| LU-2: Perform Turning Operations | Trainee should be able to: <ul style="list-style-type: none"> Identify the lathe turning tools and their settings. Identified the lathe turning tools and its angles Knowledge of machine calculation. Knowledge of use of measuring tools. Shut down the machine while checking of size. Knowledge of jobs calculation Perform turning operation. Personal safety, Tool and work safety | <ul style="list-style-type: none"> Selection of cutting tool for turning Calculate cutting speed, RPM and feed for turning. Enlist the required tools for job and clamping device. Mount the clamping device and clamping job property Clamp the tool and set centre position. Handle sharp tools with care. During use measuring tools store separately. Tools equipment used cleaned and stored as specified. Wear specified cloths for in the work shop handle the heavy part carefully. Keep working space clean from oil and chips | Total: 57hrs Theory: 07hrs Practical: 50hrs | Lathe Machine Cutting Tools Vernier Caliper Personal Protective Equipment Files | Theory: Class room Practical: Lab/workshop |
| LU-3: Perform Drilling / Boring Operations | Trainee should be able to: <ul style="list-style-type: none"> Identified the drill and boring tools and their settings. Knowledge of drilling and boring | <ul style="list-style-type: none"> Selection of drills as per drawing for drilling. Calculate cutting speed, RPM and feed for drilling. | Total: 58hrs Theory: | Drill Drill chuck | Theory: Class room |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|---|--|---|--|--|
| | <p>purpose.</p> <ul style="list-style-type: none"> • Knowledge of drilling and boring difference. • Knowledge of machine calculation. • Knowledge of use of measuring tools. • Shut down the machine while checking of size. • Knowledge of jobs calculation • Knowledge of procedures of drilling and boring operation. • Personal safety, Tool and work safety | <ul style="list-style-type: none"> • Calculate cutting speed, RPM and feed for boring. • Perform drilling by using proper clamping device. • Mount the clamping device and clamping job property • Clamp the boring tool and set centre position. • Perform boring as per drawing. • Check size of drilled and bored workpiece. • During use measuring tools store separately. • Tools equipment used cleaned and stored as specified. • Wear specified cloths for in the work shop handle the heavy part carefully. • Keep working space clean from oil and chips | <p>08hrs</p> <p>Practical: 50hrs</p> | <p>Boring Tool</p> <p>Vernier caliper</p> <p>Depth gauge</p> <p>Personal Protective Equipment</p> <p>Lathe Machine</p> | <p>Practical: Lab/workshop</p> |
| <p>LU-4: Perform Taper Turning Operations</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Knowledge of the different taper turning method. • Knowledge of internal & external taper turning setting angle. • Knowledge of machine calculation for taper turning. • Knowledge of checking the taper with taper gauge. | <ul style="list-style-type: none"> • Adopted taper turning method as per workpiece required. • Select taper turning tools for internal & external taper turning. • Clamp the tool and set Centre position. Perform internal & external taper turning. • Calculate and set setting angle for taper. • Calculate cutting speed, RPM and feed for | <p>Total: 60hrs</p> <p>Theory: 10hrs</p> <p>Practical: 50hrs</p> | <p>Lathe Machine</p> <p>Cutting Tools</p> <p>Vernier Caliper</p> <p>Personal Protective Equipment</p> | <p>Theory: Class room</p> <p>Practical: Lab/workshop</p> |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|--|--|---|---|
| | <ul style="list-style-type: none"> Shut down the machine while checking of taper. Knowledge of jobs calculation Knowledge of procedures of taper turning operation. Personal safety, Tool and work safety | taper turning. <ul style="list-style-type: none"> Check taper size as per drawing with Vernier caliper. Perform resetting if required. Perform check taper with taper gauge. Tools equipment used cleaned and stored as specified. Wear specified cloths for in the work shop handle the heavy part carefully. Keep working space clean from oil and Chips | | Files Checking gauges | |
| LU-5: Perform Knurling Operations | Trainee should be able to: <ul style="list-style-type: none"> Knowledge of the different Knurling tools. Knowledge of different type of Knurling. Knowledge of knurling purpose. Knowledge of machine calculation for Knurling. Knowledge of checking Knurling Shut down the machine while checking of size. Knowledge of jobs calculation Knowledge of procedures of | <ul style="list-style-type: none"> Select type of knurling tool as per workpiece required. Calculate turn dia for Knurling. Clamp and set Knurling tool straight and Centre position. Calculate cutting speed, RPM and feed for Knurling. Adopted Knurling procedures Perform Knurling. Check impression if ok complete in one cut. Apply coolant during Knurling Check Knurling size as per drawing with | Total: 48hrs Theory: 08hrs Practical: 40 hrs | Lathe Machine Knurling Tools Personal Protective Equipment Files | Theory: Class room Practical: Lab/ workshop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|--|---|--|--|----------------|
| | knurling operation. Personal safety, Tool and work safety. | Vernier caliper. <ul style="list-style-type: none"> Tools equipment used cleaned and stored as specified. Wear specified cloths for in the work shop handle the heavy part carefully. Keep working space clean from oil and Chips | | | |
| LU-6: Perform Threading Operations | Trainee should be able to: <ul style="list-style-type: none"> Knowledge of thread kind as per standard. Knowledge of thread as per shape. Knowledge of thread characteristics.(Shape And standard) Knowledge of thread calculation formulas. Knowledge of thread cutting procedures. Knowledge of threads and cutting tools angle. Knowledge of calculation for bore size for internal thread. Observe personal and workplace safety. | <ul style="list-style-type: none"> Describe the kind of threads as per standard. <ul style="list-style-type: none"> Matric thread (American National Standard Thread) Matric fine thread Unified Thread - UNC Unified Course Thread Series - UNF Unified Fine Thread Series - UNEF extra fine thread series Describe the kind of threads as per shape. <ul style="list-style-type: none"> Vee thread Acme thread. Square thread Buttress thread Identify the Characteristics of threads. Calculate the Characteristics of threads Grind the threading tools Internal/ External | Total: 100hrs Theory: 20hrs Practical: 80hrs | Lathe Machine Threading Tools Personal Protective Equipment Files Thread Pitch Gauge Tool Centre Gauge Vernier Caliper | |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---------------|-------------------|--|----------|--------------------|----------------|
| | | <p>according to thread angle.</p> <ul style="list-style-type: none"> • Describe the kind of thread cutting tools metric, metric fine , pipe, acme, square buttress threads (internal/external • Thread cutting by die and tap on lathe • Calculate and set lead for thread. • Perform mount of workpiece. • Perform grinding of thread tools angles. • Clamp the tool and set Centre position • Perform Procedure for setting up of machine lead (change gears). • Ensure all the required threading cutting Procedure and completed. • Perform checking with thread gauge. • Mind the safety precautions involved in threading operations. | | | |

3.6 MODULE-6: PERFORM MILLING MACHINE OPERATIONS

Objective of the Module: Be able to perform common milling operation and produce commonly used square, slotting, drilling, boring and gears.

Duration: 360 hours

Theory: 60 hours

Practice: 300 hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|---|--|---|--|
| LU-1: Produce a Squared Shape Work Piece | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> Select the milling cutters and their settings. Selection clamping device for different milling operations. Mount and dial the machine vice according to job requirement. Mount arbor and cutter for squaring. Mount cutters and work piece in the machine. Perform clamping for squaring as proper procedure. Ensure all the required squaring operations have been completed to the given specification. Perform De-burring. Check size and angle after each step. | <ul style="list-style-type: none"> Explain the construction of milling machine and their uses Enlist the main part of milling machine and their uses Deduct the small fault and repair them. Enlist the main attachment of milling machine. Calculate and set cutting speed, RPM and feed. Interpreting information given in the engineering drawings and job specifications Explain square milling procedure. Perform checking size and right angle with the tri square. Safety guidelines and procedures for Milling machine. Safety checks for operating on milling machine. Handle and sharp cutter with care. | <p>Total: 100 hrs.</p> <p>Theory: 20 hrs.</p> <p>Practical: 80 hrs.</p> | Milling machine Machine Vice Tri square Vernier Caliper Dial indicator with magnet stand Personal Protective Equipment | <p>Theory: Class room</p> <p>Practical: Lab/workshop</p> |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|--|---|--|---|
| | <ul style="list-style-type: none"> Identify safety hazards related with milling operations and take appropriate steps to avoid any injury or accident. | <ul style="list-style-type: none"> Tools equipment used cleaned and stored as specified. Keep working space clean from oil and chips. | | | |
| LU-2: Perform Spur Gear Cutting | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> Calculate the all kind of gears characteristics Set the gear blank on the mandrel according to job requirement. Set the dividing, as per requirements. Hold the mandrel between indexing head and tail stock. Calculate the and set indexing Enlist the required cutterfor job. Mount the cutter on the arbor centre position of workpiece to procedure. Perform the gear cutting according to the given specifications. Perform indexing with care after each tooth. | <ul style="list-style-type: none"> Calculate Pitch dia, outside dia, root dia, Depth. Calculate the indexing as per No. of tooth. Perform clamping of indexing head on milling table and clamp gear blank on mandrel and hold in indexing head. Selection of cutter for required No. of tooth. Calculate and set cutting speed, RPM and feed. Ensure the setting of indexing plate and sector Aram. Clamp the cutter and set Centre position of gear blank. Take the touching point depth of cut. Perform indexing after each tooth with care. Complete gear cutting and check. Handle and sharp tools with care. Handle the heavy part (Indexing head) carefully. | <p>Total: 120 hrs.</p> <p>Theory: 20 hrs.</p> <p>Practical: 100 hrs.</p> | Milling machine Indexing head Vernier Caliper Dial indicator with magnet stand Set of module cutters. Tooth Vernier | <p>Theory: Class room</p> <p>Practical: Lab/works hop</p> |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|---|--|--|--|--|
| | <ul style="list-style-type: none"> • Check depth with tooth Vernier. • Shut down the machine at safe position after finishing the work. • Identify safety hazards related with gear cutting and take appropriate steps to avoid any injury or accident. | <ul style="list-style-type: none"> • Keep working space clean from oil and chips. | | | |
| LU-3: Perform Slotting / Grooving on Work Piece | Trainee should be able to: <ul style="list-style-type: none"> • Identify setting of workpiece for slotting. • Identify setting of machine vice and dial with dial indicator. • Select and mount cutter for grooving or slotting as per drawing. • Adopt produce for slotting or grooving on the work piece to the required quality. • Identify the checking method for slotting or grooving on the work piece. • Check the final size. (Length + depth). • Observe personal and workplace safety at all time. | <ul style="list-style-type: none"> • Knowledge of different between grooving and slotting. • Enlist the kind of Grooving and slotting cutter. • Selection of cutter as per required. • Mount of cutter on milling machine. • Perform clamping of and dial with dial indicator. • Calculate and set cutting speed, RPM and feed. • Clamp the workpiece and set Centre position the cutter workpiece. • Perform touching point and small depth of cut. • Check Centre position of groove. • Complete the depth and check depth and | Total: 70 hrs. Theory: 10hrs. Practical: 60 hrs. | Vernier calliper Depth gauge End mil cutter (two lip) Slotting cutter | Theory: Class room Practical: Lab/works hop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|---|---|---|---|--|
| | | <p>length.</p> <ul style="list-style-type: none"> Adopt personal and tool safety during grooving or slotting | | | |
| LU-4: Perform Drilling / Boring using Milling Machine | Trainee should be able to: <ul style="list-style-type: none"> Select drill according to drawings. Knowledge of mounting of drill method. Identified and set the required work-holding devices. Identified set the required drill holding devices hold the drill as required. Perform marking as per drawing. Knowledge of calculation and set cutting speed, RPM and feed for drilling. Set drill on marked point and drilled. Identified holding devices hold the boring head and boring bit as required. Knowledge of calculation and set cutting speed, RPM and feed for | <ul style="list-style-type: none"> Enable to select and mount drill holding-devices. Set cutting speed, RPM and feed for drilling. Perform marking as per drawing. Perform drilling. Enable to use of boring head. Set cutting speed, RPM and feed for boring. Perform mounting and setting the bore bit in drill bore. Perform boring as per boring procedures. Perform checking with inside micro metre. Enlist and adopted safety precautions and procedures during drilling and boring. | Total: 70 hrs. Theory: 10 hrs. Practical: 60 hrs. | Drills Boring unit Boring tools Depth gauge Milling Machine Internal Micrometre Personal Protective Equipment | Theory: Class room Practical: Lab/works hop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---------------|---|-------------------|----------|--------------------|----------------|
| | boring. <ul style="list-style-type: none"> • Perform boring as Procedure. • Perform check with micrometre. • Observe personal and workplace safety during drilling and boring. | | | | |

3.7 MODULE-7: CARRY OUT COMPUTERIZED NUMERICAL CONTROL (CNC) MACHINE OPERATIONS

Objective of the Module: Be able to set & perform on computer numerical control (CNC) Lathe (CNC) and milling Machine.

Duration: 360 hours **Theory:** 80 hours **Practice:** 280 hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|--|--|---|--|--|---|
| LU-1: Set CNC Machine according to Job Requirements | Trainee should be able to: <ul style="list-style-type: none"> • Introduction of CNC machines and safety precaution • Advantages and structure of CNC machine • How does CNC work • Introduction of CNC lathe control panel. • How to rotate the turret hand manually. • Report uncertainties and deviations to person concerned for timely action. • Safety on CNC machine | <ul style="list-style-type: none"> • Understanding the construction of CNC Machine • Understanding the main part of CNC machine and their functions. • Enlist the advantages and disadvantages of CNC machine. • Understanding and used of control panel, operating knob and keys, mode system and their function. • Observe the uncertainties and deviations and prepare report to concerned person. • Clamp the job and tool set "0" position • Knowledge of G commands and M commands programming. • Demonstrate the basic computer programming. • Select and set the machine reference point | Total: 130 hrs. Theory: 30 hrs. Practical 100 hrs. | CNC Milling machine CNC Lathe machine CNC Lathe Manual | Theory: Class room Practical: Lab/ workshop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|--|--|---|--|---|
| | | <ul style="list-style-type: none"> • Knowledge of clamping of workpiece and tools on machine, • Knowledge to select and set feed, speed on control panel. • Demonstrate the Checking procedure as drawing requirement. • Knowledge of X, Y, and Z axis. • Observe the uncertainties and deviations and report to concern. • Adopt safety precautions and guidelines required on CNC machine. | | | |
| LU-2: Perform Milling Operations Using CNC Machine | Trainee should be able to: <ul style="list-style-type: none"> • Understand the simulation software. • Execute program on CNC milling to perform milling operations (e.g. surfacing, drilling, slotting, tapping, key ways, step cutting etc.) to achieve work specifications. • Understand the specifications for the component to be produced. • Observe uncertainties and | <ul style="list-style-type: none"> • Understand of CNC milling machines and safety precaution • Advantages and structure of CNC milling machine • Knowledge of the basic computer programming. • Execute program on CNC and check via simulation • Select and set the machine reference point • Knowledge of clamping of workpiece and tools on machine. | Total: 125 hrs. Theory: 25 hrs. Practical: 100 hrs. | CNC milling machine with all accessories Cutting Tools Tool Kit Gauges Measuring Instruments | Theory: Class room Practical: Lab/workshop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---------------|---|---|----------|--------------------|----------------|
| | <p>deviations and report to concerned person.</p> <ul style="list-style-type: none"> • Observe safety and workplace precautions to avoid any injuries. | <ul style="list-style-type: none"> • Knowledge of G commands and M commands programming. <ul style="list-style-type: none"> ○ How does CNC work ○ Coordinate system ○ G commands and m commands ○ Programming with linear interpolation ○ Programming with rotary interpolation ○ Mathematics (trigonometry) ○ Programming with tool path • Perform checking programming and simulation on computer and machine. • Knowledge of and used of operating knob and keys • Knowledge of the mode system and their function • Knowledge of operate and handling of CNC milling machine • Select and set the machine reference point • Knowledge of clamp the material on machine table • Knowledge of select and set feed, speed on control panel • Mill the surface and side of work piece by | | | |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|--|---|---|
| | | <p>hand wheel</p> <ul style="list-style-type: none"> • Mill the surface and side of work piece by machine feed • Knowledge of edge finder and its safety precaution • Select and set work piece reference point x and y with edge / finder • How to set the reference point of z axis with tool. • Knowledge of install the programme in control panel • Programme and mill the exercise, with linear absolute dimension • Knowledge of safety precautions and guidelines for CNC Milling Machine and apply it all time. | | | |
| LU-3: Perform Turning Operations Using CNC Machine | Trainee should be able to: <ul style="list-style-type: none"> • Explain the constructions of CNC lathe. Lathes tools and their settings. • Setting of machine for different operation. • Execute program on CNC Lathe | <ul style="list-style-type: none"> • Knowledge of how does CNC work. coordinate system, use of operating knobs and keys, • Knowledge of select and set feed, speed on control panel • Set reference points (machine, work piece | Total: 105 hrs. Theory: 25 hrs. Practical: 80 hrs. | CNC Lathe machine with all accessories Cutting Tools Tool Kit | Theory: Class room Practical: Lab/workshop |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---------------|--|---|----------|---|----------------|
| | <p>to perform turning operations (e.g. facing, grooving, tapering, taper turning, step turning, form turning, threading, knurling, drilling, boring, reaming etc.) to achieve work specifications.</p> <ul style="list-style-type: none"> • Report uncertainties and deviations to person concerned for timely action. • Observe safety and workplace precautions to avoid any injuries. | <p>and tools)</p> <ul style="list-style-type: none"> • Knowledge of G commands and M commands programming. • Demonstrate the basic computer programming. • Demonstrate to clamp the workpiece on machine, • Select and set tools on turret head • Handle the machine manually on both axes • Knowledge to rotate the turret head manually • Measure and put the value of tools in tool off set geometry • Calculate and put the value of work piece length in work shift. • Programme and turn exercise, with longitudinal turning • Programme and turn exercise, with step turning • Programme and turn exercise, with stock removal command step turning, corner bevelling • Programme and turn exercise, with stock, removal command and finishing command | | <p>Gauges Measuring Instruments</p> | |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---------------|-------------------|---|----------|--------------------|----------------|
| | | <p>(step turning, corner bevelling, radius, under cut)</p> <ul style="list-style-type: none"> • Programme and turn ex with stock, removal command, finishing command and grooving command • Programme and turn exercise, with stock, removal, finishing, grooving and threading command • Programme end turn exercise, with stock, removal, finishing, grooving, threading, center drilling and drilling command. • Adopt safety precautions and guidelines on CNC Machine. | | | |

3.8 MODULE-8: PERFORM GRINDING MACHINE OPERATIONS

Objective of the Module: Be able to perform on grinding machines (Off-hand, surface, cylindrical and tool & cutter grinding machines)

Duration: 210 hours **Theory:** 30 hours **Practice:** 180 hours

| Learning Unit | Learning Outcome | Learning Elements | Duration | Material Required | Learning Place |
|---------------------------------|---|---|---|--|--|
| LU-1: Perform Off-hand Grinding | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Construction of grinding machine. • Setting and application on grinding machine • Perform on grinding machine apply proper methods and techniques • Produce component according to work operations. • Perform on grinding machine • Observe safety and workplace precautions to avoid any injuries. | <ul style="list-style-type: none"> • Understand of grinding machine and its function. • Identify of different type of grinding machine • Knowledge of kinds of grinding wheel & its application. • Testing and mounting of wheel • Knowledge of setting of tool rest • Knowledge of care & maintenance of grinding machine • Understand the use of drill grinding attachment • Understand the importance of coolant. • Understand the setting of tool rest and tool grinding procedures. • Identify the standing position during grinding. • Perform tool grinding on pedestal | <p>Total: 46 hrs.</p> <p>Theory: 06 hrs.</p> <p>Practical: 40 hrs.</p> | <p>D-type bevel protector</p> <p>Grinding Machine</p> <p>Personal Protective Equipment</p> <p>Coolant</p> <p>Wheel Dresser</p> | <p>Theory: Class room</p> <p>Practical: Lab/workshop</p> |

| Learning Unit | Learning Outcome | Learning Elements | Duration | Material Required | Learning Place |
|--|--|--|---|---|---|
| | | grinding machine. <ul style="list-style-type: none"> • Right hand roughing tool, Right hand side tool • Centre punch, Scriber, Flat chisel, Round nose smoothing tool, Twist drill • Angle of common tools • Safety on grinding machine • Apply safety rule grinding • Importance of Personal Protective Equipment on tool grinding machine • Observe tool and safety rule. | | | |
| LU-2: Perform Surface Grinding. | Trainee should be able to: <ul style="list-style-type: none"> • Construction of surface grinding machine. • Select the suitable size and type of grinding wheel. • Mount the work piece over the holding devices to ensure proper clamping. • Dress the wheel with diamond dresser if required. • Identify reference points on work piece before grinding. • Adjust depth of cut according to | <ul style="list-style-type: none"> • Understand the surface grinding machine and its function. • Identify different types of grinding machine and its uses. • Knowledge of kinds of grinding wheel & its application. • Testing and mounting of wheel. • Apply proper methods and techniques for surface grinding • Understand the mounting of workpiece on required holding device. (Magnet Table, Vice, Angle Plate) | Total: 46 hrs. Theory: 06 hrs. Practical: 40 hrs. | Surface Grinding Machine Holding Devices Wheel Dresser Grinding Wheels Wheel Dresser Stand Measuring Tools Adjustable | Theory: Class room Practical: Lab/workshop |

| Learning Unit | Learning Outcome | Learning Elements | Duration | Material Required | Learning Place |
|--|---|--|---|--|--|
| | <p>speed of machine table.</p> <ul style="list-style-type: none"> Use coolant continuously to avoid over heating of the job. Type and size of wheels and abrasive. Specific safety precautions and guidelines. | <ul style="list-style-type: none"> Understand the dressing of grinding wheel as requirement of workpiece. Demonstrate the setting of table feed and depth of cut. Identify the importance of continuously use coolant, Safety on surface grinding machine Apply safety rule surface grinding Importance of Personal Protective Equipment on tool surface grinding machine | | <p>Wrench</p> <p>Allen Key Set</p> | |
| <p>LU-3: Perform Universal Cylindrical Grinding</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> Construction of Universal Cylindrical grinding machine. Internal and external grinding Select the suitable size and type of grinding wheel. Mount work piece according to procedure (e.g. between two centres, chuck, collet, face plate). Ensure the grinding wheel is balanced. Follow suitable method for universal cylindrical grinding | <ul style="list-style-type: none"> Understand the Universal Cylindrical grinding machine and its function. Understand the internal and external grinding methods Identify different types of grinding machine and its uses. Knowledge of different kinds and types of grinding wheel for internal and external grinding & its application. Testing and mounting of wheel. Apply proper grinding methods and techniques for Universal Cylindrical | <p>Total: 58 hrs.</p> <p>Theory: 08 hrs.</p> <p>Practical: 50 hrs.</p> | <p>Universal Cylindrical Grinding Machine.</p> <p>Measuring Instruments</p> <p>Grinding Wheels</p> <p>Wheel Dresser</p> <p>Dog Carrier</p> <p>Screw Wrench</p> <p>Coolants</p> | <p>Theory: Class room</p> <p>Practical: Lab/workshop</p> |

| Learning Unit | Learning Outcome | Learning Elements | Duration | Material Required | Learning Place |
|---|--|--|----------------------|---|-----------------------|
| | <p>(internal or external) to ensure work specifications.</p> <ul style="list-style-type: none"> • Use coolant continuously to avoid overheating of job. • Observe personal and workplace safety. • Types of grinding. • Types and sizes of grinding wheels. • Procedure of mounting of work piece according to requirements: <ul style="list-style-type: none"> ○ Between Two Centres; ○ Chuck; ○ Collet; and ○ Face Plate • Importance of balancing of grinding of wheel. • Procedure of universal cylindrical grinding. • Safety precautions and guidelines specific to cylindrical grinding. | <p>grinding. (Taper grinding, parallel, step grinding).</p> <ul style="list-style-type: none"> • Understand the mounting of workpiece on required holding device. (Between Two Centres; Chuck; Collet; and Face Plate) • Understand the dressing of grinding wheel as requirement of workpiece. • Demonstrate the setting of table feed and depth of cut. • Identify the importance of continuously use coolant, • Safety on Universal Cylindrical grinding machine • Apply safety rule Universal Cylindrical grinding • Importance of Personal Protective Equipment on tool surface grinding machine | | <p>ALLEN key Set</p> <p>Personal Protective Equipment</p> | |
| <p>LU-4: Perform Tool and Cutter</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Construction of Tool and cutter | <ul style="list-style-type: none"> • Understand the Tool and cutter | <p>Total:</p> | <p>Diamond</p> | <p>Theory:</p> |

| Learning Unit | Learning Outcome | Learning Elements | Duration | Material Required | Learning Place |
|---------------|---|---|--|--|---|
| Grinding | <p>grinding machine</p> <ul style="list-style-type: none"> • Select the suitable size, type and shape of grinding wheel. • Mount work piece onto related attachment according to procedure. • Adjust the attachments according to different types of tools and cutter grinding. • Follow procedure for sharpening of tools and cutter that is safe and appropriate. • Observe personal and safety precautions. • Different tools and cutter angles. • Safety guidelines and precautions. | <p>grinding machine and its function.</p> <ul style="list-style-type: none"> • Identify different types of grinding machine and its uses. • Knowledge of kinds of grinding wheel & its application. • Knowledge of tool and cutter grinding attachments. • Demonstrate the mounting of work piece onto related attachment according to procedure. • Demonstrate the setting of attachments according to different types of tools and cutter grinding. • Perform cutter grinding end mill and cutter, side and face cutter, shell end mill cutter and surfacing cutter • Testing and mounting of wheel according to job requirement. • Demonstrate the procedure of sharpening of tools and cutters. • Safety on Tool and cutter grinding machine • Apply safety rule Tool and cutter grinding | <p>60 hrs.</p> <p>Theory: 10 hrs.</p> <p>Practical: 50 hrs</p> | <p>dresser tool</p> <p>Grinding attachment Universal bevel protector</p> <p>Tool and Cutter Grinding Machine</p> | <p>Class room</p> <p>Practical: Lab/workshop</p> |

| Learning Unit | Learning Outcome | Learning Elements | Duration | Material Required | Learning Place |
|---------------|------------------|---|----------|-------------------|----------------|
| | | <ul style="list-style-type: none"> • Importance of Personal Protective Equipment on tools and cutter machine • Safety guidelines and precautions. | | | |

3.9 MODULE-9: PERFORM SHAPER MACHINE OPERATIONS

Objective of the Module: Be able to perform on Shaper machines (Square & V shaping on shaper machine)

Duration: 90 hours

Theory: 20 hours

Practice: 70 hours

| Learning Unit | Learning Outcome | Learning Elements | Duration | Material Required | Learning Place |
|--|---|---|---|---|--|
| LU-1: Perform Squared Shape Work Piece | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Explain the construction of Shaper machine and their uses • Identified the Shaper Tools and their settings. • Selection clamping device for different Shaper operations. • Mount and dial the machine vice according to job requirement • Mount single point cutting tool and work piece in the machine. • Ensure all the required squaring operations have been completed to the given specification. • Check size and angle after each step. • Identify safety hazards related with Shaper operations and take appropriate steps to avoid any | <ul style="list-style-type: none"> • Understand the Shaper machine • Enlist the main part of Shaper machine and their uses • Deduct the small fault and repair them. • Selection of tool for required operation • Calculate and set cutting speed, RPM and feed. • Interpreting information given in the engineering drawings and job specifications • Mount right hand side cutting tool for squaring. • Mount machine vice and dial with Dial indicator. • Perform clamping for squaring as proper procedure. • Perform square shaping procedure. • Perform Deburring. | <p>Total: 40 hrs.</p> <p>Theory: 10 hrs.</p> <p>Practical: 30 hrs.</p> | <p>Shaper machine</p> <p>Machine Vice</p> <p>Tri square</p> <p>Vernier Caliper</p> <p>Dial indicator with magnet stand</p> <p>Single Point cutting tools</p> <p>Personal Protective Equipment</p> | <p>Theory: Class room</p> <p>Practical: Lab/workshop</p> |

| Learning Unit | Learning Outcome | Learning Elements | Duration | Material Required | Learning Place |
|--|--|--|---|---|---|
| | injury or accident. | <ul style="list-style-type: none"> • Checking size and right angle with the measuring tool & tri square. • Safety guidelines and procedures for Shaper machine. • Safety checks for operating on shaper machine. • Tools equipment used cleaned and stored as specified. • Keep working space clean from oil and chips. | | | |
| LU-2: Perform V shape work piece. | Trainee should be able to: <ul style="list-style-type: none"> • Identified the Shaper Tools and their settings for squaring & V shaping. • Selection clamping device for different Shaper operations. • Mount and dial the machine vice according to job requirement • Set the machine speed and feed according to Job & tool material. • Set the Cutting Tool and Tool Slide at an Angle according to drawing. • Mark the workpiece as given in the engineering drawings and job | <ul style="list-style-type: none"> • Deduct the small fault and repair them. • Selection of tool for required (Squaring & V shaping) operation • Calculate and set cutting speed, RPM and feed. • Interpreting information given in the engineering drawings and job specifications • Mount right hand side cutting tool for squaring. • Mount machine vice and dial with Dial indicator. • Perform clamping for squaring & V | Total: 50 hrs. Theory: 10 hrs. Practical: 50 hrs. | Shaper machine Machine Vice Tri square Vernier Caliper Dial indicator with magnet stand Single Point cutting tools (Right hand side & Round nose tool) | Theory: Class room Practical: Lab/workshop |

| Learning Unit | Learning Outcome | Learning Elements | Duration | Material Required | Learning Place |
|---------------|--|--|----------|--------------------------------------|----------------|
| | <p>specifications</p> <ul style="list-style-type: none"> • Ensure all the required squaring operations have been completed to the given specification. • Check size and angle after each step. • Identify safety hazards related with Shaper operations and take appropriate steps to avoid any injury or accident. | <p>shaping as proper procedure.</p> <ul style="list-style-type: none"> • Perform square & V shaping as prescribeprocedure. • Perform Deburing. • Checking size and right angle with the measuring tool & tri square. • Safety guidelines and procedures for Shaper machine. • Safety checks for operating on shaper machine. • Tools equipment used cleaned and stored as specified. • Keep working space clean from oil and chips. | | <p>Personal Protective Equipment</p> | |

4. ASSESSMENT GUIDANCE

Assessment is the process of collecting evidence and making judgments on whether competence has been achieved. This confirms that an individual can perform to the standard expected in the workplace as expressed in the nationally endorsed competency standards (where they exist). Good assessment practices should be adopted for sessional and final assessments. Such practices by vocational training providers during sessional and final assessments will form the basis of qualifying the trainees.

4.1 Differences between sessional and final assessments

Sessional assessment shall be on an all-time basis. Its purpose is to provide feedback on what students are learning:

- To the student: It will identify achievement and areas for further teaching and its level.
- To the teacher: It will evaluate the effectiveness of teaching, and guide to determine the future plan.

Assessors need to advise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy.

Final assessment is the assessment, usually carried out on completion of a course or module. This determines whether or not the student has "passed". It is - or should be - undertaken with reference to all the objectives or outcomes of the course, and is often fairly formal. Considerations of security - ensuring that the student who gets the credit is the person who did the work - assume considerable importance in final assessment.

4.2 Methods of assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For work place lessons, assessment will focus on the quality of planning and executing the related process along with the quality of the product and/or evaluation of the process.

4.2.1 Direct assessment:

Direct assessment is the most desirable form of assessment. For this, evidence shall be obtained by directly observing the student's performance.

Examples for direct assessment of a Machinist will include:

- Work performances, for example the application of sawing techniques

- Demonstrations, for example demonstrating the appropriate method of drilling on drill machine.
- Direct questioning, where the assessor will ask the student how to select the tool for step turning before any performance
- Paper-based tests, such as multiple choice or short answer questions at entrepreneurship, hygienic and safety issues, communicating and working with others and types of Milling Machine etc.
- Portfolio of evidence , such as compilation of all work done during the course

4.2.2 Indirect assessment

Indirect assessment shall be used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of a Machinist will include:

- Selection of accurate products on the basis of market survey
- Taking all health and safety measures inworkplace.
- Maintenance of machine: the methods adopted to maintain the machine & tools and housekeeping.
- Indirect assessment should only be a second choice. (In some cases, it may not even be guaranteed that the work produced by the person being assessed).

4.3 Principles of assessment

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information. Provide all learners with an equal opportunity for and access to assessment

Validity means that a valid assessment assesses what it claims to assess. For example, if the ability to do a specific gear cutting, the assessment should involve performance criteria that are directly related to gear cutting techniques. An interview about setting of milling machine would not meet the performance criteria.

Reliability means that the assessment is consistent and reproducible. For example, if the preparation procedure of workplace/services area has been assessed, another assessor (e.g. the future employer) should be able to see the same work performance and witness the same level of achievement.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the students' needs.

4.4 Assessment strategy for Machinist Curriculum

This curriculum consists of 8 modules:

- Module 1: Perform Basic Bench work
- Module 2: Drilling Machine Operations
- Module 3: Apply Occupational Health & Safety Procedures at Workplace
- Module 4: Carry Out Maintenance of Tools and Machines
- Module 5: Perform Lathe Machine Operations
- Module 6: Perform Milling Machine Operations
- Module 7: Apply Carry out Basic CNC Machine Operations
- Module 8: Perform Grinding Machine Operations
- Module 9: Perform Shaper Machine Operations

4.5 Suggestions for sessional assessment

- The sessional assessment for all modules shall be in two parts: theoretical assessment and practical assessment. The sessional marks shall contribute to the final qualification.
- Theoretical assessment for all learning modules must consist of a written paper lasting at least one hour per module. This can be a combination of multiple choice and short answer questions.
- For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided under the title “Planning for assessment”.

4.6 Suggestions of final assessment

Final assessment shall be in two parts:

- **Theoretical assessment**

The final theoretical assessment shall consist of multiple choice and short answer questions, covering all modules

- **Practical assessment.**

For practical assessment, proper procedures of services, management of stock, health & safety shall be selected to assess the competencies of student expected to be gained after this training course.

(The final assessment marks shall contribute to the final qualification)

It is also proposed that the assessment may take place in such a way that covers each of the modules. Time and markings may be distributed according to the importance of module that is reflected from the time invested during teaching. The distribution of time and markings for assessment are given below:

| Distribution of time and markings for assessment | | | |
|---|--------------|------------------------------------|------------------|
| Modules | Total | Out of total hrs / markings | Practical |
| Module 1 | | | |
| Module 2 | | | |
| Module 3 | | | |
| Module 4 | | | |
| Module 5 | | | |
| Module 6 | | | |
| Module 7 | | | |

| | | | |
|-----------------|--|--|--|
| Module 8 | | | |
| Module 9 | | | |
| Total | | | |

Few examples that examiner may use for the assessment are given below:

| MODULES | PRACTICAL | THEORY |
|--------------------------------|--|--|
| MODULE 1 | Perform Basic Bench work | |
| LU-1: Carry out Sawing. | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Select the blade according to material of workpiece. • Setting blade in the frame of hacksaw as per procedure. • Perform marking as per drawing. • Perform sawing as per procedure. • Use of measuring tools. • Observe personal and workplace safety at all times. • Understand and interpret basic drawings. • Understand and use of marking tools • Perform marking as given drawing • Sawing as per procedure with hand hacksaw. • Emphasise the importance of clamping of work piece • Understand and use of measuring tools. • Adopt safety precaution. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Explain the kind of hand hacksaw blade hand hacksaw. • Discussion on how to set hacksaw blade. • Importance of selection of blade. • Importance of marking tools and method. • Discussion on reading and interpreting basic drawings. • Discussion about clamping workpiece. • Type of tools used for measuring. • Demonstrate the marking and sawing operation • Importance of safety precaution |
| | Trainee should be able to: | Trainee will be asked for: |

| MODULES | PRACTICAL | THEORY |
|---|--|---|
| <p>LU-2: File the Work Piece to Produce required Smoothness</p> | <ul style="list-style-type: none"> • Identified the bench workshop tools. • Identified the kind of file and their uses. • Identified the clamping workpiece properly. • Perform and select files according to dimension and finishing. • Perform measuring • Observe personal and tool safety. • Perform different filing operation, parallel filing, curved edge, even surface and square filling. • Profile filing with key file needle file set • Perform clamping of workpiece as required. • Understand and use of measuring tools • Importance of safety precaution. | <ul style="list-style-type: none"> • Explain the bench workshop tools. • Explain the kind of file and their uses. • Discussiontheclamping workpiece properly. • Discussion the selection files according to dimension and finishing. • Explain different filling operation, parallel, curved edge, even surface and square filling. • Explain the kind ofmeasuringtools and their use. • Demonstrate The marking and filing operation • Explain the personal and tool safety. |
| <p>LU-3: Produce Threads on Work Piece</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Identify different kind of taps & die according to requirement • Identify the workpiece clamping method. • Application of tap and die alignment. • Apply lubricants while threading. • Adopt proper threading procedure. • Observe personal and workplace safety at all times. • Knowledge of different kind of taps & die according to requirement • Knowledge of calculation for drill size for internal threading. • Perform clamping of workpiece as required. • Ensure tap and die alignment. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Explain the kind of taps & die according to requirement. • Discussionthe clamping workpiece properly. • Importance of alignment of tap and dies. • Calculate drill size for internal threading. • Demonstrate internal threading and external as prescribe procedure. • Adopt safety during threading. |

| MODULES | PRACTICAL | THEORY |
|---|---|--|
| | <ul style="list-style-type: none"> • Ensure use of lubricants during threading. • Knowledge of threading procedure for accurate and dimensionally correct. . | |
| LU-4: Perform Hand Reaming | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Identify different kind of reamer standard according to requirement • Identify the workpiece clamping method. • Apply reamer alignment. • Avoid unwanted engraving and slips. • Observe personal and workplace safety at all times. • Knowledge of different kind of reamer standard according to requirement • Importance use of lubricants during reaming. • Adopt personal and tool safety during reaming. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Explain different kind of reamer standard according to requirement • Discussionthe clamping workpiece properly. • Importance of alignment of reamer. • Calculate drill size for reaming. • Demonstratereaming procedure for accurate and dimensionally correct. • Adopt safety during threading. |
| MODULE 2 | Drilling Machine Operations | |
| LU-1: Produce Holes using Drilling Machine | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Perform basic mathematical calculation for drilling operations.(cutting speed, feed and RPM) • Identify machine controls. • Perform proper clamping the workpiece. • Identify the produce to required quality and within the specified dimensional accuracy. • Perform drilling on drilling machine • Perform measuring | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Explain the construction of different type of drills machine and their use. • Calculate basic mathematical calculation for drilling operations. (cutting speed, feed and RPM) • Discussionthe clamping workpiece properly. • Discussion marking as per drawing and perform marking. |

| MODULES | PRACTICAL | THEORY |
|---|--|--|
| | <ul style="list-style-type: none"> • Identify the marking as per drawing. • Perform drilling on marked point. • Understand the use of coolant. • Apply safety on drill machine • Understand and use of measuring tool | <ul style="list-style-type: none"> • Demonstrate drilling on drilling machine mind the marked point. • Importance of coolant. • Explain safety on drill machine. |
| <p>LU-2:Perform Counter Boring and Counter Sinking</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Knowledge of calculation for feed & R.P.M for Counter Boring and Counter Sinking On drill machine. • Perform proper clamping the workpiece. • Identify the produce to required quality and within the specified dimensional accuracy. • Understand marking tools and perform as per drawing. • Perform Counter Boring and Counter Sinking on drill machine • Understand measuring tools and perform measuring • Perform Counter Boring and Counter Sinking on marked point. • Understand the use of coolant. • Apply safety on drill machine • Adopt machine tool & personal safety. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Calculate basic mathematical calculation for Counter boring and Counter Sinking On drill machine.(cutting speed, feed and RPM) • Discussionthe clamping workpiece properly. • Discussion marking as per drawing and perform marking. • Demonstrate counter boring and Counter Sinkingon drilling machine mind the marked point. • Discussmeasuring tools and perform measuring. • Discuss Importance of coolant. • Explain safety on drill machine. |
| | | |

| MODULES | PRACTICAL | THEORY |
|--|---|--|
| LU-3 Perform Machine Reaming | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Knowledge of calculation for feed & R.P.M for reaming on drill machine. • Perform proper clamping the workpiece. • Identify the produce to required quality and within the specified dimensional accuracy. • Understand marking tools and perform as per drawing. • Perform reaming on drill machine as specify producer. • Understand measuring tools(plug gauge) and perform measuring • Perform reamingon marked point. • Understand the use of coolant. • Apply safety on drill machine • Adopt machine tool & personal safety. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Calculate basic mathematical calculation for reamingon drill machine.(cutting speed, feed and RPM) • Discussionthe clamping workpiece properly. • Discussion marking as per drawing and perform marking. • Demonstrate reaming on drilling machine mind the marked point. • Discussmeasuring tools and perform measuring. • Discuss Importance of coolant. • Explain safety on drill machine. |
| MODULE 3 | Apply Occupational Health & Safety Procedures at Workplace | |
| LU-1: Identify hazards in workplace environment | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Identify drawing and interpret work processes and procedures correctly. • Identify risk of hazards at workplace. • Recognize engineering processes, tools, equipment and consumable materials that have the potential to cause harm. • Identify any potential hazards and take appropriate action to minimize the risk. • Health and safety precautions of the company. • Techniques and methods to identify the risks of hazards at workplace. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Explain drawing and interpret work processes and procedures. • Discussion on risk of hazards at workplace. • Discuss engineering processes, tools, equipment and consumable materials that have the potential to cause harm. • Identify any potential hazards and take appropriate action to minimize the risk. • Discuss on safety precautions of the company. |

| MODULES | PRACTICAL | THEORY |
|--|---|---|
| | <ul style="list-style-type: none"> • Dealing with hazards to avoid any accident or injury. • Safety reporting procedures and documentation. | <ul style="list-style-type: none"> • Demonstrate with hazards to avoid any accident or injury. • Explain of any potential hazards and takes appropriate action to minimize the risk. <ul style="list-style-type: none"> ✓ Adopt health and safety precautions of work shop.(Worksite Hazardous Materials Information Systems (WHMIS), ✓ fire regulations, • Discussionsafety reporting procedures and documentation. |
| <p>LU-2: Comply with Occupational Health and Safety Precautions</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Create safe environment • Apply Occupational Health and Safety Act, Regulation and Code. • Safe own self and other. • Aware worksite hazard accident and emergency Situations • Identify chemical e.g. skin, use, storage, disposal, procedures, consequences of not following manufacturers' instructions • Use Electrical equipment their storage, maintenance and repair • Identify workshop regulations, and hygiene practices • Select, use and maintain appropriate Personal protective equipment(PPE) for workshop applications • Aware worksite hazard accident and emergency Situations • Identify workshop regulations, and hygiene practices | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Explain Occupational Health and Safety Act, Regulation and Code. • Discussion on how to prepare a working area for safe environmentsafe own self and other. • Explain worksite hazard accident and emergency Situations. • Discussion Selection, use and maintain appropriate Personal protective equipment (PPE) for workshop applications. |

| MODULES | PRACTICAL | THEORY |
|---|---|---|
| | <ul style="list-style-type: none"> Select, use and maintain appropriate Personal protective equipment(PPE) for workshop applications | |
| <p>LU-3: Apply Personal Protective and Safety Equipment</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> Selection of personal protective equipment in terms of type and quantity according to work orders. Understand wear, adjust, and maintain personal protective equipment to ensure correct fit and optimum protection in compliance with company procedures. Ensure personal protective equipment is cleaned and stored in proper place. Explain the use Personal Protective Equipment. Identify the types of PPE. Protective clothing and equipment (PPE) to be worn and where it can be obtained. Safely maintaining the PPEs. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> Explain the selection of personal protective equipment in terms of type and quality according to work orders. Discussion about wearing, adjusts, and maintains personal protective equipment to ensure correct fit and optimum protection in compliance with company procedures. Demonstrate personal protective equipment is cleaning and storing. Explain the use Personal Protective Equipment.. Explaining safety maintaining with PPEs. |
| <p>LU-4: Practice safe work habits to ensure safety at workplace</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> Knowledge of wear required clothing (not loose or torn), confine long hair, and remove watch or ring in accordance with company procedures. Apply work procedures and approaches that ensure personal safety as well as others safety. Demonstrate good housekeeping in the workplace by cleaning up spills | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> Overview and instruction of Shampoo Explain required clothing (not loose or torn), confine long hair, and remove watch or ring in workshop. Discuss working procedures and approaches that ensure personal safety as well as others |

| MODULES | PRACTICAL | THEORY |
|--|---|---|
| | <p>or leaks.</p> <ul style="list-style-type: none"> • Keep work area clean and clear from oil and chips, and storing tools or equipment, so that the potential for accident or injury is prevented. • Ensure tools or equipment are in place and available in proper place. • Importance of safety at work and its implications. • Work safety procedures and guidelines. | <p>safety.</p> <ul style="list-style-type: none"> • Demonstrate good housekeeping in the workplace by cleaning up spills or leaks. • Discuss how can work area clean and clear from oil and chips, and storing of tools, equipment, so that the potential for accident or injury is prevented. • Discuss the Importance of safety at work and its implications. • Discuss safety procedures and guidelines. |
| MODULE 4 | Carry Out Maintenance of Tools and Machines | |
| <p>LU-1: Perform Preventive Maintenance of Machines and Tools</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Prepare oiling and greasing chart (daily, weekly as machine requirement). • Prepare machine history record date of installation condition, oiling and maintenance has to done. • Inspect and assess the general condition of an assigned machine on regular basis. • Observe problems and carry out routine maintenance as per given instructions and schedules. • Report to authority that problems which are beyond the scope him. • Read maintenance schedule • Identify faulty/damaged/ worn out parts | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Overview of oiling and greasing chart (daily, weekly and as machine requirement). • Overview of machine history record date of installation condition, oiling and maintenance has to done. • Overview of general condition of an assigned machine. • Discuss about problems and carry out routine maintenance as per given instructions and schedules. • Check report to authority that problems which |

| MODULES | PRACTICAL | THEORY |
|---|---|---|
| | <ul style="list-style-type: none"> • Troubleshooting of minor faults | <p>are beyond the scope him.</p> <ul style="list-style-type: none"> • Check maintenance schedule |
| <p>LU-2 Perform General Housekeeping and Maintenance of Machines and Tools</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Clean and maintain all bench-work tools and machines as per housekeeping checklists or instructions given. • Prepare check list for daily cleanliness of the workplace. • Respond appropriately to safety hazards on all bench-work tools and machines. • Identify all the tools and material in proper place to ensure safe work. • Knowledge of methods and techniques for cleanliness and maintenance of machines and tools. • Prepare Specific guidelines and checklists to conduct maintenance and housekeeping of machines and tools. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Overview of Cleaning and maintain all bench-work tools and machines as per housekeeping checklists given by instructions given. • Discuss applying appropriately to safety hazards on all bench-work tools and machines. • Overview of all the tools and material in proper place to ensure safe work. • Overview of methods and techniques for cleanliness and maintenance of machines and tools. • Discuss Specific guidelines and checklists to conduct maintenance and housekeeping of machines and tools. |
| MODULE 5 | Perform Lathe Machine Operations | |
| <p>LU-1: Perform Facing Operations</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Knowledge of construction of lathe machine and their uses. • Understand the attachment/of lathe machine. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Explain the construction of different type of Lathe machine and their use. |

| MODULES | PRACTICAL | THEORY |
|--|--|--|
| | <ul style="list-style-type: none"> • Identified the lathe tools and their settings. • Knowledge of machine calculation. • Knowledge of jobs calculation • Perform facing operation. • Personal safety, Tool and work safety | <ul style="list-style-type: none"> • Discussion about attachment/of lathe machine and their use. • Explain the main part of lathe machine and their uses. • Calculate basic mathematical calculation on Lathe operations. (cutting speed, feed and RPM) • Discussion the clamping workpiece and tool on Lathe properly. • Demonstrate facing operation on Lathe machine. • Explain machine/tools and personal safety on lathe machine. |
| <p>LU-2: Perform Turning Operations</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Identified the lathe turning tools and their settings. • Knowledge of machine calculation. • Knowledge of use of measuring tools. • Perform turning operation. • Personal safety, Tool and work safety • Selection of cutting tool for turning • Calculate cutting speed, RPM and feed for turning. • Clamp the tool and set centre position. • Handle sharp tools with care. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Explain the lathe turning tools it use and their settings. • Explain use of measuring tools as drawing requirement. • Personal safety, Tool and work safety • Calculation of cutting speed, RPM and feed for turning operations. • Discussion of selection tool and set centre position. |

| MODULES | PRACTICAL | THEORY |
|---|--|---|
| | <ul style="list-style-type: none"> • During use measuring tools store separately. • Tools equipment used cleaned and stored as specified. • Wear specified cloths for in the work shop handle the heavy part carefully. • Keep working space clean from oil andchips | <ul style="list-style-type: none"> • Demonstrate turning operation on Lathe machine. • Handle sharp tools with care. • Discussion ofmeasuring tools store separately. • Tools equipment used cleaned and stored as specified method. • Discussion of specified cloths for in the work shop handles the heavy part carefully. • Overview of keep working space clean from oil andchips |
| <p>LU-3:Perform Drilling / Boring Operations</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Identified the drill and boring tools and their settings. • Knowledge of drilling and boring purpose on Lathe. • Knowledge of drilling and boring difference. • Knowledge of use of measuring tools. • Knowledge of procedures of drilling and boring operation. • Personal safety, Tool and work safety • Selection of drills as per drawing for drilling. • Calculate cutting speed, RPM and feed for drilling. • Mount the clamping device and clamping job property • Clamp the boring tool and set centre position. • Check size of drilled and bored workpiece. • During use measuring tools store separately. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Discussion ofdrilling and boring purpose on Lathe. • Discussion of drilling & boring as per drawing. Clamp the boring tool and set centre position. • Calculation of cutting speed, RPM and feed on Lathe. • Demonstrate drilling & boring operation on Lathe machine as prescribe procedures. • Discussion about measuring tools and its uses. • Discussion safety precautions during drilling and boring. |

| MODULES | PRACTICAL | THEORY |
|---|---|--|
| | <ul style="list-style-type: none"> • Wear specified cloths for in the work shop handle the heavy part carefully. • Keep working space clean from oil and chips. | |
| LU4:Perform Taper Turning Operations | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Knowledge of the different taper turning method. • Knowledge of internal & external taper turning setting angle. • Knowledge of procedures of taper turning operation setting of taper. • Calculate and set setting angle for taper. • Adopted taper turning method as per workpiece required. • Select taper turning tools for internal & external taper turning. • Clamp the tool and set Centre position. Perform internal & external taper turning. • Calculate cutting speed, RPM and feed for taper turning. • Check taper size as per drawing with Vernier caliper then check taper with taper gauge. • Perform resetting if required. • Tools equipment used cleaned and stored as specified. • Wear specified cloths for in the work shop handle the heavy part carefully. • Keep working space clean from oil and chips. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Discussion about the different type of taper turning method and its procedures. • Discussion internal & external taper turning method and setting angle. • Selection of taper turning method as per workpiece required. • Calculate cutting speed, RPM, feed for taper turning and taper angle. • Demonstrate internal and external taper turning as prescribe procedures. • Discussion the taper checking procedures. • Discussion Tools equipment used cleaned and stored as specified. • Discussion specified cloths for in the work shop handling the heavy part carefully. Keep working space clean from oil and chips. |
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| MODULES | PRACTICAL | THEORY |
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| LU5:Perform Knurling Operations | Trainee should be able to: <ul style="list-style-type: none"> • Knowledge of the different Knurling tools. • Knowledge of different type of Knurling. • Knowledge of knurling purpose. • Knowledge of procedures of knurling operation. • Personal safety, Tool and work safety. • Select type of knurling tool as per workpiece required. • Clamp and set Knurling tool straight and Centre position. • Adopted Knurling procedures • Check impression if ok complete in one cut. • Apply coolant during Knurling • Check Knurling size as per drawing with Vernier caliper. • Tools equipment used cleaned and stored as specified. • Wear specified cloths for in the work shop handle the heavy part carefully. | Trainee will be asked for: <ul style="list-style-type: none"> • Type and of knurling. • Kind of knurling tools. • Purpose of Knurling. • Discussed clamp and set Knurling tool straight and Centre position. • Demonstrate the Knurling operation as prescribe procedures • Checking the impression • Adopt tool and personal safety. |
| LU6:Perform Threading Operations | Trainee should be able to: <ul style="list-style-type: none"> • Describe the kind of threads as per standard. <ul style="list-style-type: none"> ○ Metric thread (American National Standard Thread) ○ Metric fine thread ○ Unified Thread - UNC Unified Course Thread Series - UNF ○ Unified Fine Thread Series - UNEF extra fine thread series • Describe the kind of threads as per shape. <ul style="list-style-type: none"> ○ Vee thread ○ Acme thread. | Trainee will be asked for: <ul style="list-style-type: none"> • Type and of threads as standard. • Kind of thread as shape. • Purpose of threading. • Discussed the Characteristics (angles) of threads. • Calculation of the Characteristics of threads. • Discussed the setting of gear for thread cutting. • Demonstrate the Internal and external grinding |

| MODULES | PRACTICAL | THEORY |
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| | <ul style="list-style-type: none"> ○ Square thread ○ Buttress thread ● Identify the Characteristics of threads. ● Calculate the Characteristics of threads ● Grind the threading tools Internal/ External according to thread angle. ● Describe the kind of thread cutting tools metric, metric fine , pipe, acme, square buttress threads (internal/external ● Thread cutting by die and tap on lathe ● Calculate and set lead for thread. ● Perform mount of workpiece. ● Perform grinding of thread tools angles. ● Clamp the tool and set Centre position ● Perform Procedure for setting up of machine lead (change gears). ● Ensure all the required threading cutting Procedure and completed. ● Perform checking with thread gauge. ● Mind the safety precautions involved in threading operations. | <p>of tool and thread cutting as prescribe procedures.</p> <ul style="list-style-type: none"> ● Checking the internal & external thread with gauge. ● Mind the safety precautions involved in threading operations. |

| MODULES | PRACTICAL | THEORY |
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| Module -6 | Perform Milling Machine Operations | |
| LU1: Produce a Squared Shape Work Piece | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Explain the construction of milling machine and their uses • Understand the attachment of milling machine. • Identified the milling cutters and their settings. • Selection clamping device for different milling operations. • Mount and dial the machine vice according to job requirement • Mount cutters and work piece in the machine. • Ensure all the required squaring operations have been completed to the given specification. • Check size and angle after each step. • Identify safety hazards related with milling operations and take appropriate steps to avoid any injury or accident. • Identify safety hazards related with milling operations and take appropriate steps to avoid any injury or accident. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Kind of milling Machine it attachment and their uses. • Discussed kind of milling cutters and their uses. • Discussed selection of clamping device and cutter according to workpiece. • Discussed prescribe procedures for clamping of workpiece and mount of cutter. • Demonstrate the squaring operations as prescribe procedures. • Discussed about measure ring tool and check size after each step. • Discussed safety hazards related with milling operations and take appropriate steps to avoid any injury or accident. |
| LU2: Perform Spur Gear Cutting | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Calculate the all kind of gears characteristics • Set the gear blank on the mandrel according to job requirement. • Set the dividing, as per requirements. • Hold the mandrel between indexing head and tail stock. • Calculate the and set indexing | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Calculation of gears characteristics • Setting of dividing head and mounting of gear blank. • Selection of cutter and mount on milling. • Calculation of indexing. |

| MODULES | PRACTICAL | THEORY |
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| | <ul style="list-style-type: none"> • Enlist the required cutter for job. • Mount the cutter on the arbor centre position of workpiece to procedure. • Perform the gear cutting according to the given specifications. • Perform indexing with care after each tooth. • Check depth with tooth Vernier. • Shut down the machine at safe position after finishing the work. • Identify safety hazards related with gear cutting and take appropriate steps to avoid any injury or accident. | <ul style="list-style-type: none"> • Demonstrate the gear cutting operations as prescribe procedures. • Discussed the adopt care during indexing • Discussed the checking of gear with tooth Vernier. • Discussed safety hazards related with gear cutting and take appropriate steps to avoid any injury or accident. |
| <p>LU-3: Perform Slotting / Grooving on Work Piece</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Identify Material, tools and equipments • Identify setting of workpiece for slotting. • Identify setting of machine vice and dial with dial indicator. • Select and mount cutter for grooving or slotting as per drawing. • Adopt produce for slotting or grooving on the work piece to the required quality. • Identify the checking method for slotting or grooving on the work piece. • Check the final size. (Length + depth). • Observe personal and workplace safety at all time. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Material, tools and equipments: • Setting of workpiece for slotting. • Discussed the selection of cutter for slotting. <p>And mount cutter for grooving or slotting as per drawing.</p> <ul style="list-style-type: none"> • Demonstrate the grooving or slotting operations as prescribe procedures. • Discussed the checking method for slotting or grooving on the work piece. • Discussed safety hazards related with gear cutting and take appropriate steps to avoid any injury or accident. |

| MODULES | PRACTICAL | THEORY |
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| <p>LU-4:Perform Drilling / Boring using Milling Machine</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Identify Material, tools and equipments • Select drill according to drawings. • Knowledge of mounting of drill method. • Identified and set the required work-holding devices. • Identified set the required drill holding devices hold the drill as required. • Perform marking as per drawing. • Knowledge of calculation and set cutting speed, RPM and feed for drilling. • Set drill on marked point and drilled. • Identified holding devices hold the boring head and boring bit as required. • Knowledge of calculation and set cutting speed, RPM and feed for boring. • Perform boring as Procedure. • Perform check with micrometre. • Observe personal and workplace safety during drilling and boring. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Material, tools and equipments: • Selection Drill / Boring tool for workpiece for Drilling / Boring. • Discussed the selection of drill & cutter and set the required work-holding devices, set the required tool holding devices. • Calculation and set cutting speed, RPM and feed for drilling / Boring. • Demonstrate the drilling / boring operations as prescribe procedures. • Discussed the checking tools and method for drilling / boring on the work piece. • Discussed safety hazards related with drilling / boring and take appropriate steps to avoid any injury or accident. |
| MODULE 7 | Apply Carry out Basic CNC Machine Operations | |
| <p>LU-1:Set CNC Machine according to Job Requirements</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Understanding the construction of CNC Machine • Understanding the main part of CNC machine and their functions. • Enlist the advantages and disadvantages of CNC machine. • Brief introduction of CNC program. | <p>Trainee will be asked for:.</p> <ul style="list-style-type: none"> • Understanding the construction of different type of CNC machine and main part of CNC machine and their functions. • Discussed the advantages and disadvantages of |

| MODULES | PRACTICAL | THEORY |
|---------|--|--|
| | <ul style="list-style-type: none"> • Understanding and used of control panel, operating knob and keys, mode system and their function. • Execute program on CNC and check via simulation • Observe the uncertainties and deviations and prepare report to concerned person. • Clamp the job and tool set “0” position • Knowledge of G commands and M commends programming. • Demonstrate the basic computer programming. • Select and set the machine reference point • Knowledge of clamping of workpiece and tools on machine, • Knowledge to select and set feed, speed on control panel. • Demonstrate the Checking procedure as drawing requirement. • Knowledge of X, Y, and Z axis. • Observe the uncertainties and deviations and report to concern. • Adopt safety precautions and guidelines required on CNC machine.. | <p>CNC machine.</p> <ul style="list-style-type: none"> • Brief knowledge of CNC program. • Execute program on CNC and check via simulation. • Discussed used of control panel, operating knob and keys, mode system and their function. • Knowledge observes the uncertainties and deviations and prepares report to concerned person. • Clamping the job and tool set “0” position • Knowledge of G commands and M commends programming. • Discussed the basic computer programming. • Select and set the machine reference point • Discussed of clamping of workpiece and tools on machine, • Calculate select and set feed, speed on control panel. • Discussed of X, Y, and Z axis. • Demonstrate the checking procedure as drawing requirement. • Adopt safety precautions and guidelines required on CNC machine. |

| MODULES | PRACTICAL | THEORY |
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| <p>LU-2:Perform Milling Operations Using CNC Machine</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Understand of CNC milling machines and safety precaution • Execute program on CNC and check via simulation • Select and set the machine reference point • Knowledge of clamping of workpiece and tools on machine. • Knowledge of G commands and M commends programming. <ul style="list-style-type: none"> ○ How does CNC work ○ Coordinate system ○ G commands and m commends ○ Programming with linear interpolation ○ Programming with rotary interpolation ○ Mathematics (trigonometry) ○ Programming with tool path • Perform checking programming and simulation on computer and machine. • Knowledge of and used of operating knob and keys • Knowledge of the mode system and their function • Knowledge of operate and handling of CNC milling machine • Select and set the machine reference point • Knowledge of clamp the material on machine table • Knowledge of select and set feed, speed on control panel • Mill the surface and side of work piece by hand wheel • Mill the surface and side of work piece by machine feed | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Understanding the construction of different type of CNC Milling machine and main part of CNC machine and their functions. • Execute program on CNC milling machine and check via simulation • Discussed of clamping of workpiece and tools on machine. • Discussed of G commands and M commends programming. <ul style="list-style-type: none"> ○ How does CNC work ○ Coordinate system ○ G commands and m commends ○ Programming with linear interpolation ○ Programming with rotary interpolation ○ Mathematics (trigonometry) ○ Programming with tool path • Discussed the used of operating knob and keys andmode system and their function. • Discussed the operating of CNC milling machine, setting of the machine reference point. • Discussed the clamp the workpiece on clamping device, of selection and seting feed, speed on |

| MODULES | PRACTICAL | THEORY |
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| | <ul style="list-style-type: none"> • Knowledge of edge finder and its safety precaution • Select and set work piece reference point x and y with edge / finder • How to set the reference point of z axis with tool. • Knowledge of install the programme in control panel • Programme and mill the exercise, with linear absolute dimension • Knowledge of safety precautions and guidelines for CNC Milling Machine and apply it all time | <p>control panel.</p> <ul style="list-style-type: none"> • Knowledge of edge finder, select and set work piece reference point x and y with edge / finder. • Demonstrate the milling operation, with linear absolute dimension. • Discussed the safety precautions and guidelines for CNC Milling Machine and apply it all time |
| <p>LU-3:Perform Turning Operations Using CNC Machine</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Identify and examine the dry and damage hair • Knowledge of how does CNC work. coordinate system, use of operating knobs and keys, • Knowledge of select and set feed, speed on control panel • Set reference points (machine, work piece and tools) • Knowledge of G commands and M commends programming. • Demonstrate the basic computer programming. • Demonstrate to clamp the workpiece on machine, • Select and set tools on turret head • Handle the machine manually on both axes • Knowledge to rotate the turret head manually • Measure and put the value of tools in tool off set geometry • Calculate and put the value of work piece length in work shift. • Programme and turn exercise, with longitudinal turning • Programme and turn exercise, with step turning | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Understanding the construction of different type of CNC Lathe machine and main part of CNC machine and their functions. • Execute program on CNC Lathe machine and check via simulation • Discussed of clamping of workpiece and tools on CNC Lathe machine. • Discussed of G commands and M commends programming. <ul style="list-style-type: none"> ○ How does CNC work ○ Coordinate system ○ G commands and m commends ○ Programming with linear interpolation ○ Programming with rotary interpolation ○ Mathematics (trigonometry) |

| MODULES | PRACTICAL | THEORY |
|---------------------------------------|---|--|
| | <ul style="list-style-type: none"> • Programme and turn exercise, with stock removal command step turning, corner bevelling • Programme and turn exercise, with stock, removal command and finishing command (step turning, corner bevelling, radius, under cut) • Programme and turn ex with stock, removal command, finishing command and grooving • command • Programme and turn exercise, with stock, removal, finishing, grooving and threading command • Program and turn exercise, with stock, removal, finishing, grooving, threading, center drilling and drilling command. • Adopt safety precautions and guidelines on CNC Machine. | <ul style="list-style-type: none"> ○ Programming with tool path • Discussed the used of operating knob and keys and mode system and their function. • Discussed the operating of CNC Lathemachine, setting of the machine reference point. • Discussed the clamp the workpiece on clamping device, of selection and setting feed, speed on control panel. • Knowledge of edge finder, select and set work piece reference point x and y with edge / finder. • Demonstrate the CNC Lathe operation, with linear absolute dimension. • Discussed the safety precautions and guidelines for CNC LatheMachine and apply it all time |
| MODULE 8 | Perform Grinding Machine Operations | |
| LU-1:Perform Off-hand Grinding | Trainees will be able to: <ul style="list-style-type: none"> • Understand of grinding machine and It function. • Identify of different type of grinding machine • Knowledge of kinds of grinding wheel &it application. • Testing and mounting of wheel • Knowledge of setting of tool rest • Knowledge of care & maintenance of grinding machine • Understand the use of drill grinding attachment | Trainee will be asked for: <ul style="list-style-type: none"> • Understand the construction of different type of grinding machine and it main part and their functions. • Understand the different kinds of grinding wheel &it application. • Testing and mounting of grinding wheel. • Discussed the importance of coolant during |

| MODULES | PRACTICAL | THEORY |
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| | <ul style="list-style-type: none"> • Understand the importance of coolant. • Understand the setting of tool rest and tool grinding procedures. • Identify the standing position during grinding. • Perform tool grinding on pedestal grinding machine. • Right hand roughing tool, Right hand side tool, Centr punch, Scriber, Flat chisel, Round nose smoothing tool, Twist drill, • Angle of common tools • Safety on grinding machine • Apply safety rule grinding • Importance of Personal Protective Equipment on tool grinding machine | <p>grinding.</p> <ul style="list-style-type: none"> • Demonstrate the offhand grinding operations as prescribe procedures. (Grinding of tools or drill etc.) • Safety on grinding machine.(standing position during grinding) • Discussed the Importance of Personal Protective Equipment on tool grinding machine |
| <p>LU-2:Perform Surface Grinding.</p> | <p>Trainees will be able to:</p> <ul style="list-style-type: none"> • Understand the surface grinding machine and its function. • Identify different types of grinding machines and their uses. • Knowledge of kinds of grinding wheels & their applications. • Testing and mounting of wheels. • Apply proper methods and techniques for surface grinding • Understand the mounting of workpiece on required holding device. (Magnet Table, Vice, Angle Plate) • Understand the dressing of grinding wheels as required for workpieces. • Demonstrate the setting of table feed and depth of cut. • Identify the importance of continuously using coolant, • Apply safety rules for surface grinding | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Understand the construction of surface grinding machines and their main parts and functions. • Understand the different kinds of grinding wheels & their applications. Testing and mounting of grinding wheels • Discussed the mounting of workpiece on required holding device. (Magnet Table, Vice, Angle Plate) • Discussed the importance of coolant during surface grinding. • Demonstrate the surface grinding operation as prescribed procedures. |

| MODULES | PRACTICAL | THEORY |
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| | <ul style="list-style-type: none"> Importance of Personal Protective Equipment on tool surface grinding machine | <ul style="list-style-type: none"> Discussed the Importance of Personal Protective Equipment on tool grinding machine |
| <p>LU-3:Perform Universal Cylindrical Grinding</p> | <p>Trainees will be able to:</p> <ul style="list-style-type: none"> Understand the Universal Cylindrical grinding machine and its function. Understand the internal and external grinding methods Identify different types of grinding machines and their uses. Knowledge of different kinds and types of grinding wheels for internal and external grinding & its application. Testing and mounting of wheels. Apply proper grinding methods and techniques for Universal Cylindrical grinding. (Taper grinding, parallel, step grinding. Understand the mounting of workpiece on required holding device. (Between Two Centres; Chuck; Collet; and Face Plate) Understand the dressing of grinding wheel as a requirement of workpiece. Demonstrate the setting of table feed and depth of cut. Identify the importance of continuously using coolant, Safety on Universal Cylindrical grinding machine Apply safety rules for Universal Cylindrical grinding Importance of Personal Protective Equipment on tool surface grinding machine | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> Understand the construction of cylindrical grinding machines and their main parts and functions. Understand the different kinds and types of grinding wheels for internal and external grinding & its application. Testing and mounting of grinding wheels Discussed the dressing of grinding wheels as a requirement of workpiece. Discussed the mounting of workpiece on required holding devices. (Between Two Centres; Chuck; Collet; and Face Plate). Demonstrate the setting of table feed and depth of cut. (internal and external grinding) Discussed the importance of coolant during surface grinding. Demonstrate the internal or external grinding operation as prescribed procedures. Demonstrate the surface grinding operation as prescribed procedures. Discussed the Importance of Personal Protective |

| MODULES | PRACTICAL | THEORY |
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| | | Equipment on surface grinding machine |
| LU-4: Perform Tool and Cutter Grinding | Trainees will be able to: <ul style="list-style-type: none"> • Understand the Tool and cutter grinding machine and its function. • Identify different types of grinding machines and their uses. • Knowledge of kinds of grinding wheels and their applications. • Knowledge of tool and cutter grinding attachments. • Demonstrate the mounting of workpiece onto related attachment according to procedure. • Demonstrate the setting of attachments according to different types of tools and cutter grinding. • Perform cutter grinding: end mill and cutter, side and face cutter, shell end mill cutter and surfacing cutter. • Testing and mounting of wheel according to job requirements. • Demonstrate the procedure of sharpening of tools and cutters. • Safety on Tool and cutter grinding machine. • Apply safety rules for Tool and cutter grinding. • Importance of Personal Protective Equipment on tools and cutter machine. • Safety guidelines and precautions. | Trainee will be asked for: <ul style="list-style-type: none"> • Market trends. • Understand the construction of Tool and Cutter Grinding machine and its main parts and their functions. • Discussed about tool & cutter grinding attachment and its application. • Discussed the cutter grinding operation (end mill and cutter, side and face cutter, shell end mill cutter) on surfacing cutter. • Discussed the Testing and mounting of wheel according to job requirements. • Demonstrate the sharpening of tools and cutters as per prescribed procedures. • Discussed the Importance of Personal Protective Equipment on surface grinding machine. |

| MODULE 9 | Perform Shaper Machine Operations | |
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| LU-1: Perform Squared Shape Work | Trainee should be able to: <ul style="list-style-type: none"> • Explain the construction of Shaper machine and their uses. | Trainee will be asked for: <ul style="list-style-type: none"> • Explain Shaper Machine attachment and their |

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| <p>Piece</p> | <ul style="list-style-type: none"> • Explain the attachment of Shaper machine& their uses. • Identified the Shapertools and their settings. • Explain clamping device for different Shaper operations. • Demonstrate themounting & dialling of the machine vice according to job requirement • Mount tool and work piece in the machine. • Demonstrate all the required squaring operations have been completed to the given specification. • Check size and angle after each step. • Explain safety hazards related with Shaper operations and take appropriate steps to avoid any injury or accident. • Explain safety hazards related with Shaper operations and take appropriate steps to avoid any injury or accident. • | <p>uses.</p> <ul style="list-style-type: none"> • Discussed kind of Shapertools and their uses. • Discussed selection of clamping device and cutter according to workpiece. • Discussed prescribe procedures for clamping of workpiece and mount of tool. • Demonstrate the squaring operations as prescribe procedures. • Discussed about measure ring tool and check size. • Discussed safety hazards related with Shaper operations and take appropriate steps to avoid any injury or accident. |
| <p>LU-2: Perform V shape work piece</p> | <p>Trainee should be able to:</p> <ul style="list-style-type: none"> • Explain the Shaper tools and their settings. • Explain clamping device for different Shaper operations. • Demonstrate the mounting & dialling of the machine vice according to job requirement • Mount tool and work piece in the machine. • Demonstrate all the required squaring & V shaping operations have been completed to the given specification. • Check size and angle after each step. • Explain safety hazards related with Shaper operations and take appropriate steps to avoid any injury or accident. | <p>Trainee will be asked for:</p> <ul style="list-style-type: none"> • Discussed prescribe procedures for clamping of workpiece and mount of tool. • Demonstrate the V shaping operations as prescribe procedures. • Discussed about measure ring tool and check size. • Discussed safety hazards related with Shaper operations and take appropriate steps to avoid any injury or accident. |

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| | <ul style="list-style-type: none">• Explain safety hazards related with Shaper operations and take appropriate steps to avoid any injury or accident. | |
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4.7 Structure of the assessment team

The number of assessors must meet the needs of the students and the training provider. For example, where **two assessors** are conducting the assessment, there must be a maximum of **five students per assessor**. In this example, a group of 25 students shall therefore require assessments to be carried out over a five-day period.

4.8 Planning for assessment

Sessional assessment: assessors need to plan in advance how they will conduct sessional assessments for each module. The tables on the following pages are for assessors to use to insert how many hours of theoretical and practical assessment will be conducted and what the scheduled dates are.

Final assessment: Training providers need to decide ways to combine modules into a cohesive two-day final assessment programme for each group of five students. Training providers must agree the settings for practical assessments in advance.

5. LIST OF MACHINERY/ EQUIPMENT/ TOOLS ETC

(FOR A CLASS OF 25 STUDENTS)

| | |
|---------------------------|-----------------------------|
| Name of Trade | Mechanical Machinist |
| Duration of Course | 01 – years |

| Sr. No. | Name of tools& equipment | Quantity |
|----------------|--|-----------------|
| 1. | Universal milling machine | 10 Nos. |
| 2. | Milling Attachment (Dividing head, slotting and Universal vertical Head 02 Nos.) | |
| 3. | Lathe machine BL115 | 04 Nos. |
| 4. | Lathe machine BE165 with one taper turning attachment | 04 Nos. |
| 5. | Power Hacksaw | 01 Nos. |
| 6. | Pillar type drill machine | 01 Nos. |
| 7. | Bench drill machine | 02 Nos. |
| 8. | CNC Lathe Machine with Core i7computer (server) | 01 Nos. |
| 9. | CNC Milling Machine with Core i7computer (server) | 01 Nos. |
| 10. | Computer – Core i5 | 10 Nos. |
| 11. | Computer Table And Chairs | 10 Nos. |
| 12. | Surface grinding machine | 01 Nos. |
| 13. | Cylindrical grinding machine | 01 Nos. |
| 14. | Pedestal grinding machine | 02 Nos. |
| 15. | Bench vice with bench | 25 Nos. |
| 16. | Steel rule | 25 Nos. |
| 17. | Vernier caliper | 25 Nos. |
| 18. | Vernier height gauge | 02 Nos. |

| Sr. No. | Name of tools& equipment | Quantity |
|---------|--------------------------------------|-------------|
| 19. | Vee block | 04 Nos. |
| 20. | Centre punch | 25 Nos. |
| 21. | Scriber | 25 Nos. |
| 22. | Divider | 25 Nos. |
| 23. | Screw driver set | 6 set |
| 24. | Philips | 6 set |
| 25. | Taps set m4,m5,m6,m8,m10,m12 | 4 each size |
| 26. | Tap handle set | 4 set |
| 27. | Screw pitch gauge 60° | 4 set |
| 28. | Screw pitch gauge 55° | 4 set |
| 29. | Radius gauge 1-7,7.5-14mm | 4 Nos. |
| 30. | Combination set | 4 Nos. |
| 31. | Allen key set | 4 set |
| 32. | Double ended open spanner set 6-32mm | 4 set |
| 33. | Ring spanner set 6-32mm | 4 set |
| 34. | Ball peen hammer 500 gm | 25 Nos. |
| 35. | Cross peen hammer 500 gm | 25 Nos. |
| 36. | Marking hammer 250 gm | 6 Nos. |
| 37. | Number punch set | 4 set |
| 38. | Letter punch set | 4 set |
| 39. | Flat file 300 x1 | 25 Nos. |
| 40. | Flat file 300x2 | 25 Nos. |
| 41. | Flat file 250x2 | 25 Nos. |
| 42. | Flat file 250x3 | 25 Nos. |

| Sr. No. | Name of tools& equipment | Quantity |
|---------|---|-----------|
| 43. | Flat file 150x1 | 25 Nos. |
| 44. | Flat file 150x2 | 25 Nos. |
| 45. | Half round file 200x2 | 25 Nos. |
| 46. | Half round file 200x1 | 25 Nos. |
| 47. | Round file 200x1 | 25 Nos. |
| 48. | Round file 200x2 | 25 Nos. |
| 49. | Round file 150x2 | 25 Nos. |
| 50. | Round file 150x1 | 25 Nos. |
| 51. | Needle file set | 25 Nos. |
| 52. | Key file set | 25 Nos. |
| 53. | File brush | 25 Nos. |
| 54. | Flat chisel | 25 Nos. |
| 55. | Cross cut chisel | 25 Nos. |
| 56. | Grooving chisel | 25 Nos. |
| 57. | Hand reamer 4,6,8,k10, 12, 57 | 6 sets |
| 58. | Die M5, M6, M8, M10, M12 | 6 sets |
| 59. | Dies handles | 6 sets |
| 60. | Drills 3.0, 3.8, 4, 4.2,4. 8,5.0,5.5,6.0,6.5,7. 0,7.5,8.0,8.2,8.5,9. 0,9.5,10.0,10.2,10.5, 5.0,12mm | 10 sets |
| 61. | Drill set 1 to 10 mm with difference 0.1 mm | 12 set |
| 62. | Centre drill 2.5, 3.0 mm | 12 set |
| 63. | H.S.S tool bits 8x8x160 mm | 200 Nos. |
| 64. | H.S.S tool bits 12x12x200mm | 200 Nos. |
| 65. | H.S.S tool bits 16x16x200 mm | 200 Nos. |
| 66. | Morse taper gauge set (plug + ring) MT-2, MT-3, MT-4 | One each. |

| Sr. No. | Name of tools& equipment | Quantity |
|---------|---|----------|
| 67. | Oil cane | 12 Nos. |
| 68. | Tool centre gauge | 6 Nos. |
| 69. | Hand vice | 8 Nos. |
| 70. | Adjustable wrench 12" | 6 Nos. |
| 71. | Try angle file 200x2 | 25 Nos. |
| 72. | Try angle file 200x1 | 25 Nos. |
| 73. | Counter sink 18; x60°, 12.5x60° | 08 sets |
| 74. | Counter bore M 4, M 6, M 10, M 12 | 06 sets |
| 75. | Twist drill grinding gauge | 06 Nos. |
| 76. | Safety goggle | 25 Nos. |
| 77. | Diamond dresser with holder | 04 Nos. |
| 78. | Acme thread gauge | 06 Nos. |
| 79. | Drill drift | 06 Nos. |
| 80. | Combination pliers | 06 Nos. |
| 81. | Tool box | 25 Nos. |
| 82. | Surface plate | 3 Nos. |
| 83. | Plain milling cutter ϕ 100×50x27 | 08 Nos. |
| 84. | Plain milling cutter ϕ 63x50x22 mm | 08 Nos. |
| 85. | Plain milling cutter ϕ 63x25x27 mm | 08 Nos. |
| 86. | Side and face cutter ϕ 80x8x27 mm | 08 Nos. |
| 87. | Side ϕ 80x12x27 and face cutter ϕ 80x14x27 mm | 08 Nos. |
| 88. | Side and face cutter ϕ 80x18x27 | 08 Nos. |
| 89. | End mill cutter ϕ 4 mm two lipped | 12 Nos. |
| 90. | End mill cutter ϕ 5 mm two lipped | 12 Nos. |

| Sr. No. | Name of tools& equipment | Quantity |
|---------|--|----------|
| 91. | End mill cutter ϕ 6 mm two lipped | 12 Nos. |
| 92. | End mill cutter ϕ 8 mm two lip/four lip | 12 Nos. |
| 93. | End mill cutter ϕ 10 mm | 12 Nos. |
| 94. | End mill cutter ϕ 12 mm | 12 Nos. |
| 95. | End mill cutter ϕ 14 mm | 12 Nos. |
| 96. | End mill cutter ϕ 16 mm | 12 Nos. |
| 97. | End mill cutter ϕ 18 mm | 12 Nos. |
| 98. | Involute gear milling cutter module 1.0 mm | 03 sets |
| 99. | Involute gear milling cutter module 1.5 mm | 03 sets |
| 100. | Involute gear milling cutter module 1.75 mm | 03 sets |
| 101. | Involute gear milling cutter module 2.0 mm | 03 sets |
| 102. | Convex cutter R6x80 mm | 03 Nos. |
| 103. | Convex cutter R8x80 mm | 03 Nos. |
| 104. | Convex cutter R12x80 mm | 03 Nos. |
| 105. | Micro meter 25 mm | 04 Nos. |
| 106. | Micro meter 25-50mm | 04 Nos. |
| 107. | Micro meter 50-75mm | 04 Nos. |
| 108. | Inside micro meter 5-55 mm | 04 Nos. |
| 109. | Dial Verniercallipers | 04 Nos. |
| 110. | Dial indicator with magnetic stand | 04 Nos. |
| 111. | Digital venire callipers 160mm | 04 Nos. |
| 112. | Digital micro meter 0-25 mm | 04 Nos. |
| 113. | Digital micro meter 25-50 mm | 04 Nos. |
| 114. | Safety goggles | 25 Nos. |

| Sr. No. | Name of tools& equipment | Quantity |
|----------------|-------------------------------------|-----------------|
| 115. | Safety helmet | 25 Nos. |
| 116. | Ear plugs | 25 Nos. |
| 117. | Fire extinguisher | 25 Nos. |
| 118. | Smoke alarm | 2 Nos. |
| 119. | First aid box | 2 Nos. |

6. LIST OF CONSUMABLE SUPPLIES

1. M.S Flat (Size according to jobs)
2. M.S Round (Size according to jobs)
3. M.S Square (Size according to jobs)
4. High speed steel tool bit 3/8x3/8x6inch
5. High speed steel tool bit 1/2x1/2x 8inch
6. High speed steel tool bit 5/8x5/8x 8inch
7. High speed steel boring (Tool Bar)
8. High speed steel internal threading tool
9. Mobil Oil (For oiling and Lubricating)
10. Kerosene oil
11. Hand hacksaw blade
12. Power saw blade
13. Cotton Waste



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