

Module Descriptions

Department of Mechanical Skills

Industrial Machining Skills

Module Descriptions

Department of Mechanical Skills

Industrial Machining Skills

2009



DEGREE PLAN

Industrial Machining Skills (IMCH)

Level 1

| Sr. | Module Code | Module Name | Contact Hours |
|--------------------|-------------|-------------------------|---------------|
| 1 | IMCH133 | Mechanical Drawing | 56 |
| 2 | IMCH134 | Engineering Materials | 32 |
| 3 | IMCH135 | Metrology and Gauging | 32 |
| 4 | IWLD126 | Welding for Non Welders | 32 |
| 5 | IMCH136 | Fitting and Bench Work | 40 |
| 6 | IMCH137 | Sawing and Shaper Work | 48 |
| 7 | ENGC102 | English Communication 1 | 24 |
| TOTAL HOURS | | | 264 |

Level 2

| Sr. | Module Code | Module Name | Contact Hours |
|--------------------|-------------|--------------------------|---------------|
| 1 | IMCH238 | Machine Tooling Theory | 32 |
| 2 | IMCH239 | Drill Press Operations | 32 |
| 3 | IMCH240 | Basic Lathe Operations | 112 |
| 4 | IMCH241 | Basic Milling Operations | 32 |
| 5 | IMCH242 | Tool and Cutter Grinding | 32 |
| 6 | ENGC203 | English Communication 2 | 24 |
| TOTAL HOURS | | | 264 |

Level 3

| Sr. | Module Code | Module Name | Contact Hours |
|--------------------|-------------|----------------------------------|---------------|
| 1 | IMCH343 | Advanced Lathe Operations | 72 |
| 2 | IMCH344 | Advanced Milling Operations | 64 |
| 3 | IMCH345 | Surface and Cylindrical Grinding | 40 |
| 4 | IMCH346 | Refurbish Work | 32 |
| 5 | IMCH347 | Machine Elements | 32 |
| 6 | TRWT304 | Technical Report Writing 1 | 24 |
| TOTAL HOURS | | | 264 |

Level 4

| Sr. | Module Code | Module Name | Contact Hours |
|--------------------|-------------|----------------------------|---------------|
| 1 | IMCH448 | Heat Treatment | 32 |
| 2 | IMCH449 | Manufacturing Projects | 64 |
| 3 | IMCH450 | CNC EDM Operations | 32 |
| 4 | IMCH451 | CNC Milling | 64 |
| 5 | IMCH452 | CNC Lathe | 48 |
| 6 | TRWT405 | Technical Report Writing 2 | 24 |
| TOTAL HOURS | | | 264 |

Coop (15 Weeks)

| Sr. | Module Code | Module Name | Equivalent Contact Hours |
|-----|-------------|------------------------------|--------------------------|
| 1 | IMCH553 | Cooperative Training Program | 128 |

Prerequisite —

Level 1

Contact Hours: 56

Module Description

Quality of industrial products depends upon as to how technical information is conveyed through working drawings. To manufacture the machine components, machinist, should have a thorough knowledge of Mechanical Drawing.

Objectives

The course is designed to :

- develop trade related concept to produce a machine part or in accordance with the dimensions given in the drawing
- interprets drawing

Learning Outcomes

After completion of this course, students will be able to:

- Prepare drawing of turned parts
- Reproduction of drawings of damaged mechanical components
- Apply limits of tolerances of dimensions
- Understand assembly drawings
- Recognized the views of machined parts
- Prepare drawings of machine elements such as fasteners, bearings, pulleys, gear wheels, and couplings

Contents

- Drawing exercise of key joints
- Drawing exercise of threaded parts
- Drawing of locking device
- Preparing drawings of turned parts from models
- Preparing assembly drawings from detailed drawings for jigs and fixtures
- Preparing detailed drawings from assembly jigs and fixtures
- Preparing drawings of couplings from models
- Introducing ISO System of Tolerance, Fits
- Giving all the necessary dimensions, surface finish symbols and geometrical tolerance on the drawing complex shafts and manifolds
- Preparing detail drawing of a spur gear
- Preparing detail drawing of bevel gear

Pacing Schedule

| Contact hours | Contents | Skills Gained |
|---------------|--|---|
| 2 | Drawing Exercise of key joints | Able to sketch, layout, and draw mechanical components |
| 4 | Drawing exercise of thread parts | |
| 4 | Drawing of locking device | |
| 8 | Preparing drawing of turned parts from models | |
| 8 | Preparing assembly drawing from detailed drawings for jigs and fixtures | |
| 6 | Preparing drawings of couplings from models | |
| 6 | Preparing detailed drawing from assembly of jigs and fixtures | Understand symbols and able to interpret drawing as specification |
| 6 | Introducing ISO System of Tolerances, Fits | |
| 4 | Giving all the necessary dimensions, surface finish symbols and geometrical tolerance on the drawing of complex shafts and manifolds | |
| 4 | Preparing detail drawing of a spur gear | Perform drawing as specified in the working drawing of a mechanical parts |
| 4 | Preparing detail drawing of bevel gear | |

Reference: In-house made book on Mechanical Drawing

Prerequisite —

Level 1

Contact Hours: 32

Module Description Machinist manufactures the parts of the machines from the materials by means of machine tools and by non-conventional machining methods. Adequate knowledge of materials which include industrial standard based on their properties and suitability is necessary for producing desirable components.

Objectives The course introduces a variety of engineering materials which covers the physical and mechanical properties as well as practical uses.

Learning Outcomes After completion of this course, students will be able to:

- Identify different materials
- Select the suitable material for specific part
- Demonstrate a good understanding to the terms used for strength of material
- Classify different sections
- Specify their standard sizes
- Test and judge their properties by outer features.

Contents

- Ferrous Materials. (High, Medium, Low carbon steels – Alloy steel, High Strength Low-Alloy Steels (HSLA) – Cast Iron, Stainless-steels, High Speed Steel)
- Non- Ferrous Metals. (Aluminum, Copper, Bronze, and Brass).
- Non-Metallic Materials and Non-Metallic Reinforcing Materials (Plastics, Thermosetting Plastic, Thermoplastics, Woods, Glass, Ceramics).
- Material Properties (Hardness, Brittleness, Toughness, Ductility, Malleability, Corrosion Resistance, Electrical Conductivity and Insulation, Magnetic and Non Magnetic)
- Serviceability of Materials (Scale Inclusion, Surface Cracks, Blowholes, Distortion, Corrosion, Oxidation, Knots, Split in temper, and separation of layers).
- Standard shapes of structural steel and their specification
- Workshop test procedure of steel (Spark test, breaking and sound test, cold bending test and resilience hardening test)

Pacing Schedule

| Contact hours | Contents | Skills Gained |
|---------------|--|---|
| 2 | Introduction to engineering materials: Ferrous metal, and non-ferrous metal Advantage of having more carbon steel in steel. | Identify Ferrous materials and their uses |
| 2 | Ferrous Metal Low Carbon steel Medium Carbon steel High Carbon Steel Its percentage and properties with its uses. | |
| 2 | Alloy steel High Strength Low-alloy steel (HSLA) Cast iron, Their carbon percentage, Chemical composition, Their properties and uses. | |
| 2 | Stainless steel High speed steel Their carbon percentage Chemical composition Properties and their uses | |
| 2 | Non-ferrous materials Aluminum and copper. Their properties and uses | Differentiate the non-ferrous materials |
| 2 | Bronze and Brass, Their properties and Uses | Differentiate non-metallic materials |
| 2 | Non-Metallic Materials Thermosetting plastics Thermoplastics Wood Their properties and uses | |
| 2 | Non-Metallic Reinforcing Materials Glass and Ceramics Its properties Limitations of its uses | |

Prerequisite —

Level 1

Contact Hours: 32

Pacing Schedule

| Contact hours | Contents | Skills Gained |
|---------------|---|---|
| 2 | Materials Appearance and Properties Ferrous Materials Non- Ferrous Materials Thermoplastics and thermosetting plastics | Visual inspection of material appearance |
| 2 | Material Properties Hardness Brittleness Toughness Ductility | Materials properties related to their strength and intended use |
| 2 | Malleability Corrosion resistance, Electrical conductivity and insulation | |
| 2 | Magnetic and non- magnetic | |
| 2 | Serviceability of materials Scale inclusion, Surface cracks and distortion | Material flaws defects and their preservation against corrosion and decay |
| 2 | Corrosion and oxidation, Knots and splits in timber Separation of layers | |
| 1 | Standard shapes of structural steel and their specification | Learn how to specify the material |
| 3 | Workshop test procedure of steel Spark test Breaking and sound test Cold bending test Resilience hardening test | Workshop tests that give idea of strength of steel |

Reference: In-house made book on Engineering Materials

Module Description This course introduces the use and care of precision measuring instruments and checking instruments used for the purpose of inspection of machine parts

Objectives The course is designed to develop:

- Sense of measuring and checking
- Skills of produce parts in close tolerances
- Quality assurance and inspection of mechanical components
- Application of the metrological instruments

Learning Outcomes After completion of this course, students are able to:

- Select right measuring instruments
- Control dimensions and tolerances
- Read the measuring instruments
- Acquire industry standard skills
- Develop confidence to manufacture a component as per drawing
- Learn maintenance and handling of the instruments

Contents

- Differentiate Measuring and checking methods for quality control and inspection.
- Errors in measuring and their elimination
- Application of screw pitch gauge on screws
- Measuring with Gear Tooth Vernier Caliper
- Measuring with inside Micrometer both inches and mm
- Calibration of Micrometers
- Measuring angles by precision Universal Protractor within 5 minutes accuracy
- Dimension and size building with Block Gauges within accuracies of 0.0005mm
- Application of block Gauges in the calibration of measuring instruments
- Use of Dial Indicator for checking parallelism, concentricity, roundness, evenness of flat surfaces and alignment of sliding guides
- Checking of mass produces parts for both internal and external diameters by Snap Gauges and Plug Gauges
- Measuring tapers with Sine Bars
- Checking of deep bores with Telescopic Gauges

Prerequisite —

Level 1

Contact Hours: 32

Pacing Schedule

| Contact hours | Contents | Skills Gained |
|---------------|--|---|
| 2 | Differentiate Measuring and Checking methods for quality control and inspection | Differentiate Measuring and Gauging |
| 2 | Errors in measuring and their elimination | |
| 2 | Application screw pitch gauge | |
| 2 | Measuring with Gear Tooth Vernier Caliper | Perform measurement with the accuracy of 0.02 mm and 0.001" |
| 2 | Measuring with Inside Micrometer both inches and millimeter | |
| 1 | Calibration of Micrometers | |
| 2 | Measuring angles by precision Universal Protractor within 5 minutes accuracy | Able to calibrate micrometers |
| 2 | Dimensioning and size building with block Gauges within accuracies of 0.0005 mm | Perform gauging and checking of mechanical components confidently |
| 2 | Application of limit Gauges in the calibration of measuring instruments | |
| 8 | Use of dial indicator for checking parallelism, concentricity, roundness, evenness of flat surfaces and aligning of sliding guides | |
| 3 | Checking of mass produces for both external and internal diameters by Snap Gauges and Plug Gauges | Aligned and check the alignment and roundness and evenness of mechanical components |
| 3 | Measuring tapers with Sine Bars | |
| 2 | Checking of deep bores with Telescopic Gauges | |

Reference: In-House made book on Metrology and Gauging

Module Description This course is designed for the Machinists to handle minor repair works (build up) that is generally faced due to breakage or wear and tear of the mechanical parts. Students are made familiar with basic welding techniques applied to Arc Welding.

Objectives This course introduces basic welding processes. Emphasis is placed on beads with shielded arc welding. Adequate practice exercises are given to acquaint the students how horizontal, flat and vertical head position welding skills.

Learning Outcomes The student should be able to:

- Set up welding machine and choose correct electrodes
- Perform arc welding of mild steel.
- Perform Arc Welding of mild steel flat and round stocks.
- Prepare joint chamfering of round stocks

Contents

- Welding Symbols and Drawing
- Welding Safety
- Shielded-metal Arc Welding
- Welding Practice Exercise in Flat and Round Workpieces

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|--|--|
| 3 | Introduction to shielded metal arc welding | Operates and handling of Arc Welding Equipment |
| 3 | Beads welding plus practical | |
| 3 | The 5 essentials plus practical | |
| 3 | Striking and controlling the arc | |
| 3 | Electrode selection plus practical | Work techniques to prepare the jobs to be weld Types of welding joints |
| 3 | Practical Exercises | |
| 3 | Pad of beads plus practical | |
| 3 | Flat position | Can weld mild steel plates and round stock independently |
| 2 | Power sources | |
| 3 | Vertical position | |
| 3 | Practical Exercises | |

Reference: In-house made book on Welding Practices

Prerequisite —

Level 1

Contact Hours: 40

Module Description

This is to appreciate that multifarious types of mechanical tasks are also carried out by machinist for either preparation of jobs before machining or after machining using hand tools whose scope is classified as bench work

Objectives

This course is designed to enhance:

- analytical abilities of the students for finding practical solution of the problem from time to time are faced in the allied mechanical industries.
- craftsmanship for mechanical field of work

Learning Outcomes

After completion of this course, students will be able to:

- Acquire a good craftsmanship to handle bench tools
- Assemble and dismantle mechanical components for routine servicing work
- Work as machine setter and assist in the periodic maintenance of machine tools
- Considerably develop their sense of thinking and explore working techniques

Contents

- How to remove a broken tap from a tapped hole?
- What are Drive Pin Punches and how should they be used?
- Disadvantages of open ended spanners
- Pneumatic wrenches
- Uses of Torque wrenches
- Use of double ended offset screw drivers
- How to remove a broken screw from a blind tapped hole?
- How to do Chamfering?
- Use of Chain Wrench and Pipe Wrench
- Use of tool maker Clamp
- Pipe bending
- Faring and Flanging tools
- Use of Nut and Bolt cutters
- Bending of Wires using different pliers
- Producing oil grooves with round nose chisel
- Use of Hand and Hydraulic Press
- Use of Hand Reamers
- Use of wheel pullers for dismantling and re-assembly of parts like bearing from a housing
- Lapping of flat surfaces
- Hot bending of pipe with flame
- Pop riveting and riveting tools
- Nibbling of sheet metal
- Use of Ring Spanner and Box Spanners
- Methods of precision marking with Height Gauges and templates

Prerequisite —

Level 1

Contact Hours: 40

- Contents**
- Use of Ratchet Die for cutting pipe threads
 - Use of Crimping tools
 - Tube benders
 - Tube cutter
 - Use of Spirit level
 - Use of Industrial burrs for cleaning of casting

Pacing Schedule

| Contact hours | Contents | Skills Gained | |
|---------------|--|--|---|
| 1 | How to remove a broken tap from a tapped hole | Able to identify basic hand tools and their uses and its application in the field of work. | |
| 1 | Pin Punches and Their Uses | | |
| 1 | Disadvantages of Open Ended Spanners | | |
| 1 | Pneumatic Wrenches Uses of Torque Wrenches Use of Double Ended Offset Screw Drivers | | |
| 1 | How to removed a broken tap from a blind tapped hole | | |
| 1 | How to do chamfering | | |
| 1 | Use of Chain Wrench and Pipe Wrench Use of Tool Maker Clamp | | |
| 3 | Pipe Bending | | Perform bending principles and the application of correct tools for bending, riveting, reaming, nibbling and lapping and etc. as well as the manipulation of press machines |
| 1 | Faring and Flanging Tools | | |
| 1 | Use of Nut and Bolt Cutter | | |
| 2 | Bending of Wires using different pliers | | |
| 1 | Producing Oil Grooves wit round nose chisel | | |
| 2 | Use of Hand and Hydraulic Press | | |
| 1 | Use of Hand Reamers | | |
| 3 | Use of Wheel Pullers for dismantling and re-assembly of parts like bearing from a housing | | |
| 1 | Lapping of flat surfaces | | |
| 3 | Hot bending of pipe with flame | | |
| 1 | Pop riveting and riveting tools | Able to perform the usage of basic hand tools and practices in the industrial setting | |
| 1 | Nibbling of sheet metal | | |
| 1 | Use of Ring Spanner and Box Spanner | | |
| 1 | Methods of precision marking with Height Gauges and Templates Use of Ratchet Die for cutting pipe threads | | |
| 1 | Use of Crimping tools | | |
| 1 | Tube Benders and Tube Cutters Use of Spirit Level | | |
| 1 | Use of Industrial burrs for cleaning of casting | | |

Reference: In-house made book on Fitting and Bench Work

Prerequisite —

Level 1

Contact Hours: 48

Module Description

Power driven hacksaws, circular saws, and band saws are employed to cut off material from bar stock, plates and different structural shapes sections at a great cutting speed. Shapers produce flat surface with a single point cutting tool.

Objectives

- Operate and set-up bandsaw, circular saw as well as power hacksaw safely
- Cut-off materials as specified and desired
- Select the right type of saw for the practical use
- Operate and set up shaper
- Produce flat surfaces using shaper

Learning Outcomes

After completing this module, the student will be able to:

- Select correct blades prior to the materials to be cut
- Select correct cutting speed
- Replace broken blades
- Judge performance of cutting
- Minimize breakage

Contents

- Bandsaw Features and its Operation
- Specification and Selection of Bandsaw
- Selection of Speed for Bandsaw
- Causes of Breakage of Bandsaw and its Remedy
- Power Hacksaw Features and its Operations
- Job Clamping Method for Saws
- Power Hacksaw Speed and Its Cutting Motion
- Selection of Speed for Power Hacksaw
- Cutting Material In Angles or Mitering of Section
- Causes of Breakages of Power Hacksaw blades and its Remedies
- Introduction to Shaper: Its Parts and Its Function
- Driving Mechanism of Ram
- Shaping Tools
- Shaping Machine Operations
 1. Shaping a flat surface
 2. producing slot and key ways
 3. clamping and aligning the tool and job
 4. Cutting depth and feed adjustment
- Care and Maintenance of the shaping machine

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|---|--|
| 2 | Bandsaw Features and its operation frames wheels and covers tension screws and gauges guides guideposts tables motors and drive trains | Able to operate metal cutting saws and perform good application in cutting materials applying good working techniques. |
| 2 | Bandsaw Blades Bands of Steel Blade width and thickness Tooth form Pitch Selection of Bandsaw blade Caring of Blades | |
| 1 | Causes of breakage of bandsaw blades | Operating the shaper by: setting the length of stroke, clamping of work and cutting tools Machining flat and angular surfaces |
| 6 | Care and Maintenance of Bandsaw | |
| 6 | Practicals | |
| 1 | Power Hacksaw and its operation | |
| 3 | Installation of Power Hacksaw Blades | |
| 1 | Circular Saw and its operations | |
| 1 | Care and Maintenance of Circular Saws | |
| 3 | Wet Cutting and Dry Cutting | |
| 1 | Main Parts of Shaper and Their Function | |
| 4 | Operation of Shaper | |
| 1 | Adjustment of Length of Stroke | |
| 4 | Clamping of Workpiece | |
| 2 | Alignment of Machine Vise | |
| 1 | Shaping Tools and Their Selection | |
| 1 | Adjusting the Feed and Depth of Cut | |
| 4 | Shaping A Rectangular Plate | |
| 4 | Making a Slot and Key Way | |

Reference: In-house made notes and shop exercise on Sawing and Shaper Work

Prerequisite **BSEL 406**Level **1**Contact Hours: **24****Module Description**

English Communication 1 is a module for level 1 students of specialization program, as part of the English communicative competence requirement for their diploma. The module is built around a communicative competency-based program that focuses on general English language skills and workplace competencies.

Objectives

- To help students build on and enhance EL proficiency achieved at level 4 of BSEL 406.
- To help them achieve target language competencies required at work.
- To help them learn and practice the same competencies for job success.

Learning Outcomes

At the end of the course the students will be able to:

- Illustrate points and express preferences.
- Listen to and speak about job safety and team work.
- Participate effectively in meetings.
- Tell about cause and effect.
- Express disapproval, make counter-argument, conclude, compare and contrast statements

Contents

- Understanding Company Benefits
- Employees' Rights
- Job Safety
- Teamwork
- Meetings and Minutes
- Tools and Supplies
- Unions and Employment Contracts
- Using Business Machines
- Self-Employment

Prerequisite **BSEL 406**Level **1**Contact Hours: **24****Pacing Schedule**

| Contact Hours | Contents | Skills Gained |
|--------------------------|--|---|
| 3 | Understanding Company Benefits | Illustrating points and express preferences using appropriate words and phrases |
| 3 | Employees' Rights | Describing events chronologically and telling about past situations using past perfect tense |
| Quiz 1 | | |
| 3 | Job Safety | Predicting consequences using past simple present and past |
| 3 | Teamwork | Telling about tasks and predicting consequences using causative verbs |
| Midterm | | |
| 3 | Meetings and Minutes | Expressing indifference and disapproval and indicating order and sequence using unreal conditional with 'would' and 'could' |
| 3 | Tools and Supplies & Unions and Employment Contracts | Persuading and explaining using 'could have', 'would have' and 'however' |
| Quiz 2 | | |
| 3 | Using Business Machines | Talking about the future and inferring using passive simple future |
| 3 | Self-employment | Concluding, comparing and contrasting using 'might have', 'as---as'. |
| Final Examination | | |

Reference: Put English to Work , Level 5 by Sandra Linn

Prerequisite —

Level 2

Contact Hours: 32

Module Description

Metal cutting involves wide varieties of cutting tools and their selection depends mainly with a view to overcome of the effect of heat that is generated during metal cutting. Adequate knowledge on Machine Tooling for learning machining operation is desirable

Objectives

Machining Skill develops with the right selection and application of cutting tools. A right tool is responsible for producing a metal part with good surface finish and at minimum wear

Learning Outcomes

After completion of this module students are able to:

- Gain confidence for cutting different materials
- Learn how to improve machined surface
- Benefit to reduce production time and machining cost
- Get idea of overcoming breakages and damages of tools
- Select the tools suiting to different machining operation
- Understand machinability

Contents

- How cutting tools cut the metal
- Single point and multipoint cutting tools
- Types and formation of chips
- Judgment of performance of cutting tools
- Cutting tool material
- Concept of tool life and tool wear
- Geometry of cutting tools showing their angles
- Different types tool holders
- Cemented Carbide Tools, their classification, selection and uses
- Working with index able carbide inserts
- Calculation of cutting speed and RPM
- Maintenance of cutting tools
- Causes and remedies of breakages and damages of cutting tools
- Use of cutting fluids

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|--|---|
| 3 | How cutting tools cut the metal | Selection of cutting tools for right job and their use. |
| 2 | Single point and multipoint cutting tools | |
| 2 | Types and formation of chips | |
| 2 | Judgment of performance of cutting tools | |
| 2 | Cutting tool material | |
| 2 | Concept of tool life and tool wear | Maintenance of tools knowledge of tool grinding and their geometry. |
| 3 | Geometry of cutting tools showing their angles | |
| 2 | Different types tool holders | |
| 2 | Cemented Carbide Tools, their classification, selection and uses | Causes remedies of breakages and damages of cutting tools |
| 2 | Working with index able carbide inserts | |
| 3 | Calculation of cutting speed and RPM | |
| 2 | Maintenance of cutting tools | |
| 3 | Causes and remedies of breakages and damages of cutting tools | |
| 2 | Use of cutting fluids | |

Reference: In-house made notes on Machine Tooling Theory

Prerequisite —

Level 2

Contact Hours: 32

Module Description This course is designed to provide the students to knowledge in drill press operations. Enable them to perform drilling, countersinking, boring, counter boring, spot facing and reaming operation that is to be done in pedestal and radial arm drill press.

Objectives Operate Pedestal and Radial Arm Drill Press machines

Learning Outcomes After completing this course the student will be able to:

- Understand parts and function of drill press
- Fix drilling attachment and accessories
- RPM calculation and setting of Rpm on Drill Press
- Perform drilling operations confidently

- Contents**
- Introduction to Drill Press Machine
 - Types of Drill Press Machine
 - Attachment and Accessories
 - Work Holding Devices and Clamping Techniques
 - Mounting of large diameter drill and their ejection
 - Cutting Tools Use in the Drill Press Machine
 - Drilling Processes
 - a. Drilling of round holes
 - b. Reaming of drilled holes
 - c. Countersinking
 - d. Counterboring
 - e. Spot Facing
 - f. Machine Tapping
 - Drilling in long workpieces
 - Inspection of drilling work mistakes and causes
 - Advantage and disadvantage of drilling as a method of making holes
 - Taper sleeves for Morse Taper Shank Drill
 - Cutting Speed
 - Use and Care of Drill Press
 - To operate and set up of Radial Arm Drill Press Machine
 - Selection of feed rate

Pacing Schedule

| Contact Hour | Contents | Skills Gained | |
|--------------|---|---|--|
| 1 | Introduction to Drill Press Machine | Able to identify parts and function of the Drill Press Machine as well as to calculate and set up RPM on the machine. | |
| 1 | Types of Drill Press Machine <ul style="list-style-type: none"> • Pedestal Drill Press • Radial Drill Press | | |
| 1 | Attachment and Accessories | | |
| 1 | Work Holding Devices | | |
| 2 | Drills and Drilling of round holes | | |
| 2 | RPM Calculation and its setting on the Drill Press | | |
| 3 | Practical and Inspection of mistakes in drilling | | |
| 2 | Counterboring | | Confident in performing drilling processes safely and applied working techniques |
| 2 | Countersinking | | |
| 2 | Reaming of drilled hole | | |
| 3 | Practical and Inspection of mistakes in reaming | | |
| 2 | Spot Facing | | |
| 2 | Machine Tapping | | |
| 6 | Drilling of equal spaced holes on Radial Drill Machine | | |
| 2 | Care and Maintenance of Drill Presses | | |

Reference: In house made notes and exercises

Prerequisite —

Level 2

Contact Hours: 112

Module Description

This course prepares the machining students to learn how to operate a lathe, which is the backbone of machine tool family skillfully and efficiently.

Objectives

Operate lathe machine independently with full confidence

- Plans with proper sequence for manufacturing it on a lathe
- Demonstrate proper selection of cutting tools and work holding devices for the set up and safe operation of lathe.

Learning Outcomes

The student will be able to:

- Operate the Lathe Machine
- Set RPM, feed and Depth of Cut
- Prepare operation Plan
- Select cutting tools
- Use different lathe cutting tools for different machining processes
- Set up lathe for external and internal threading
- Cut groove and parting off
- Do taper turning by off set and compound rest method
- Employ assembly techniques

Contents

- Parts of Lathe machine and their functions
- Safety on Lathe and Material Cutting
- Centering in four jaw chuck
- Facing and straight turning
- Lathe exercises containing facing, center drilling, turning and chamfering
- Lathe exercises with countersinking
- Drilling and Boring
- Taper and Taper Turning
- Grooves and Parting
- Knurling and exercises
- Threads and thread cutting
- Threading exercises
- Assembly of machine components

Pacing Schedule

| Contact Hour | Contents | Skills Gained | |
|--------------|--|---|--|
| 4 | Parts of lathe machine and their functions | Operate lathe Setting RPM, Feed and depth of cut | |
| 6 | Setting of RPM, Feed and Depth of cut | | |
| 6 | Safety on Lathe and Material Cutting | | |
| 6 | Centering in Four Jaw chuck | | |
| 6 | Facing and Straight turning | | |
| 6 | Selection of Lathe cutting tools | | |
| 6 | Lathe exercises containing facing, center drilling, and chamfering | | Selection and application of different kind of cutting tools |
| 6 | Lathe exercises with countersinking | | |
| 6 | Drilling and Boring | | |
| 6 | Reaming in the Lathe | | Able to calculate and set-up the machine for machining processes |
| 6 | Taper and Taper turning | | |
| 6 | Lathe exercises | | |
| 6 | Grooves and Parting | | |
| 6 | Knurling and Exercises | | Thread cutting (external and internal) |
| 6 | Threads and Thread Cutting | | |
| 6 | Threading Exercises | | |
| 6 | Threading Exercises | | |
| 6 | Assembly Machining | | |
| 6 | Lathe exercise | | |

Reference: In house made notes and shop exercise

Prerequisite —

Level 2

Contact Hours: 32

Module Description

This module on basic milling operation is totally hands on based. Students are demonstrated entry level skills on basic operation of milling machine and students are taught to set up milling machine operation. They are taught how to identify cutters for various milling operation and how to select proper machining parameters for maximum efficiency

Objectives

- Secure work pieces manually and/or with a hoist.
- Interpret blueprint to determine sequence of operation
- Select proper cutting speed feed rate, depth of cut
- Determine the types of cutters to be used on the work pieces.
- Expected to learn proper alignment of work pieces within prescribed limits of tolerance
- Set up, adjust, and operate the milling machine skillfully.

Learning Outcomes

After completing this module, the student will be able to:

- Achieve machining skills expose to milling machine operations

Contents

- Part of Milling Machine and Manipulation
- Safety in Milling Machine
- Demonstration on Various job Clamping Method
- Introduction of Standard Attachment and Accessories of the Milling Machine
- Introduction on Milling Cutters
- Concept of Up and Down Machining
- Selection of RPM, Feed and Feed Rate for Different Conditions
- Milling Flat Surfaces Practice
- End Milling Practices
- Angular Milling
- Composite Exercises on Milling Machine

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|---|--|
| 8 | <ul style="list-style-type: none"> • Introduction Milling Cutters • Parts of Milling Machine and Manipulation • Safety in Milling Machine | Operate Milling Machine |
| 8 | <ul style="list-style-type: none"> • Setting of Machine for Job Clamping • Concept of UP and Down Machining (conventional and climb) • Selection of RPM, Feed and Feed Rate for different conditions | Selection and use of different milling cutters |
| 8 | <ul style="list-style-type: none"> • Milling Flat Surfaces • End Milling Practices • Angular Milling | Clamping devices of milling cutters and work pieces Selection and calculation of RPM, Feed and Depth of cut Milling of flat and angular surfaces |
| 8 | <ul style="list-style-type: none"> • Composite Exercises on Milling Machine | |

Reference: In house made notes and shop exercises

Prerequisite —

Level 2

Contact Hours: 32

Module Description Long use of cutting tools causes to loose their sharpness and they become blunt. Re-sharpening therefore is often done by Machinist himself on Pedestal and Tool Cutter Grinding Machine.

Objectives Machinist is to acquire practical skills to prepare cutting tools to machine the materials as needed

Learning Outcomes After completion this module the student will be able to;

- Demonstrate their ability to grind the lathe cutting tools
- Understand the tool angles suitable for machining different materials
- Learn to operate and setup tool and cutter grinder machine
- Resharpener the twist drill and form tools, taps and hand reamers

Contents

- Abrasive wheel shapes
- Selection of wheels
- Working principles of Tool & Cutter Grinder
- Wheel dressing tools and their uses
- Operating Pedestal Grinder
- Tool rest adjustment
- Truing and dressing of grinding Wheels
- Sharpen of different types lathe tools
- Grinding of boring tools
- Re-sharpening of twist drill
- Re-sharpening of Tapes and Hand Reamer
- Grinding of Cemented Carbide Tools
- Maintenance and care of Tool & Cutter Grinder
- Causes of breakages and damages of Grinding Wheels

Pacing Schedule

| Contact hours | Contents | Skills Gained |
|---------------|--|--|
| 1 | Abrasive Wheel shapes | Operate grinding machines and enabling the students to perform truing and dressing |
| 1 | Selection of Wheels | |
| 1 | Working principles of Tool and Cutter Grinder | |
| 2 | Wheel Dressing tools and Their Uses | |
| 1 | Operating Pedestal Grinder | |
| 1 | Tool rest adjustment | |
| 2 | Truing and Dressing Grinding Wheel | |
| 6 | Sharpening of different types of lathe tools | Grind cutting tool and understand its cutting angles |
| 2 | Grinding of boring tools | |
| 6 | Re-sharpening of twist drill | Care and Maintenance of the Machine |
| 6 | Re-sharpening of Taps and Hand Reamers | |
| 2 | Grinding of Cemented Carbide Tools | |
| 1 | Maintenance and Care of Tool and Cutter Grinder | |
| 1 | Causes of breakages and damages of Grinding Wheels | |

Reference: In-house made book on Off-Hand Grinding

Prerequisite **ENG 102**Level **2**Contact Hours: **24****Module Description**

English Communication 2 is a module for level 2 students of specialization program that builds on English Communication 1 as part of the communicative competence requirement for their diploma. The module is built around a communicative competency-based program that focuses on communication skills and workplace competencies.

Objectives

- To consolidate the students' communicative competence achieved at level 1 of the skill program.
- To develop language skills, document literacy, critical thinking and problem solving in workplace situations.
- To develop purposeful use of language in realistic contexts and communicative competence.

Learning Outcomes

At the end of the course the students will be able to:

- Check assumptions, express values and understand social systems
- Express wishes and confirming conjectures
- Summarize, bargain and predict things
- Analyze and express values and judgments, negotiate and talk about causes and effects.

Contents

- Career Planning and Self-Assessment
- Taxes and Tax Forma
- Rights, Responsibilities and Benefits.
- Performance Reviews
- Health Problems on the Job
- Emergency Procedures
- Scheduling and Budgeting
- Using Computers
- Job Promotions

Pacing Schedule

| Contact Hours | Contents | Skills Gained |
|--------------------------|-------------------------------------|--|
| 3 | Career Planning and Self-Assessment | Checking assumptions, expressing values and analyzing using tag questions and appropriate noun clauses |
| 3 | Taxes and Tax forms | Paraphrasing and confirming conjectures using past subjunctive and direct speech |
| Quiz 1 | | |
| 3 | Rights and Responsibilities | Summarizing, bargaining and predicting using future perfect and future conditional |
| 3 | Performance Reviews | Reporting information and complimenting using passive simple future and passive present perfect |
| Midterm | | |
| 3 | Health Problems on the Job | Predicting and analyzing using future perfect continuous. |
| 3 | Emergency Procedures | Expressing values, requesting information and predicting consequences using present continuous conditional and embedded questions. |
| Quiz 2 | | |
| 3 | Scheduling and Budgeting | Compromising and negotiating using clauses with 'although' and 'unless'. |
| 3 | Using Computers and Job Promotions | Talking about possibility, cause and effect and expressing judgment using causative and past unreal conditional |
| Final Examination | | |

Reference: Put English to Work – Level 6 by Sally Gearhart

Prerequisite —

Level **3**

Contact Hours: **72**

Module Description This course deals with the advance operations of Lathe Machine using various types of tooling and accessories.

Objectives Machining big shaft using steady rest and follower rest. Also making different kinds of threads

Learning Outcomes After the completion of this course, the students are able to:

- Use follower and steady rest
- Work on big size shafts
- Machine Square threads, Acme threads and double start threads

- Contents**
- Use of follower rest and steady rest
 - To machine between center
 - To use four Jaw chuck
 - Machining Square threads
 - Machining Acme threads
 - Machining Double start threads

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|---|--|
| 15 | Machining a big diameter shaft using steady rest or follower rest | Use of steady rest and follower rest and working between center. Producing different kinds of threads. |
| 15 | Machining between center using face plate and lathe dog. | |
| 15 | Machining in four jaw chuck | |
| 15 | Exercise containing square thread or Acme thread | |
| 12 | Exercise containing double start thread | |

Reference: In-house made book on Milling Machine and shop exercises

Module Description This course deals with the operation of milling machine.

Objectives This course develops basic conceptual and hands-on skills in the use of milling machine. Concentration will be on the practical exercises for the student to be able to perform milling .

Learning Outcomes After the completion of this course, the students are able to:

- Perform milling operation such as
 - face milling,
 - angular milling,
 - slotting
 - gearing
- They may also be able to grind in surface finish with surface grinders.

Contents Advanced Milling Exercises including

- Practical exercise containing face milling, angular and slotting
- Direct Indexing
- Simple Indexing
- Angular Indexing
- Types of gears
- Gear terminology
- Formulas for Spur Gear
- Metric Module gear Cutters
- Machining Spur Gear

Prerequisite —

Level **3**

Contact Hours: **64**

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|--|---|
| 10 | Introduction to the Milling machine | |
| | Clamping and Aligning the vise | |
| | Clamping and Aligning the work piece | |
| | Feed and speed setting | |
| 18 | First practical Exercise <ul style="list-style-type: none"> • Study Drawing • Planning • Selection of cutting tools • Face Milling • Side Milling • Angular Milling | Face Milling, Side Milling and Angular Milling. |
| 2 | Direct Indexing | Different types of Indexing |
| 2 | Simple Indexing | |
| 2 | Angular Indexing | |
| 13 | Second practical exercise containing Indexing | |
| 2 | <ul style="list-style-type: none"> • Types of gears • Gear terminology | Study about gears and Producing Spur Gear |
| 15 | Third practical exercise making Spur Gear <ul style="list-style-type: none"> • Formulas for Spur Gear • Metric Module gear Cutters • Required calculations for Spur Gear • Machining Spur Gear | |

Reference: In-house made book on Milling Machine

Module Description Grinding flat, angular and Cylindrical surfaces within tolerances using Surface Grinders and Cylindrical Grinders.

Objectives To grind surfaces within given tolerances, different grinding wheel abrasive and their behavior on different hardened steel.

Learning Outcomes After the completion of this course, the students are able to:

- Work on Surface Grinders
- Work on Cylindrical Grinders
- Grinding work pieces within tolerance
- Dressing and balancing of wheels

- Contents**
- Types of abrasives
 - Abrasive wheels
 - Specifying a grinding wheel
 - Types of grinders
 - Loading, chattering and glazing of grinding wheels
 - Dressing with diamond dresser
 - Purpose of Surface Grinding
 - Main parts of Surface Grinder
 - Cleaning and Lubrication
 - Grinding Flat surfaces
 - Grinding to specific angle
 - Purpose of Cylindrical Grinding
 - Main parts of Cylindrical Grinding Machine
 - Cleaning and Lubrication
 - Cylindrical Grinding between chuck and center
 - Cylindrical Grinding of steps
 - Cylindrical Grinding between centers

Prerequisite —

Level **3**

Contact Hours: **40**

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|--|---|
| 2 | Types of abrasives | Knowledge about different types of abrasives, Grinding Wheels and their specification, problem while grinding and remedy |
| 2 | Abrasive wheels | |
| 3 | Specification of Grinding Wheel | |
| 2 | Types of Grinders | |
| 1 | Loading, chattering and glazing of grinding wheels | |
| 1 | Dressing with diamond dresser | |
| 1 | Purpose of Surface Grinders | Operate Surface Grinder and make exercises with given sizes. Clamping work piece using Magnetic table. Dressing of Grinding wheels. |
| 2 | Main parts of Surface Grinders | |
| 2 | Cleaning and Lubrication | |
| 3 | Grinding Flat Surfaces | |
| 4 | Grinding to specific angle | |
| 1 | Purpose of cylindrical Grinding | Operate Cylindrical Grinder. Speed and feed ratio. Grinding diameters with given sizes and tolerances. Dressing wheels |
| 2 | Main parts of Cylindrical Grinding Machine | |
| 2 | Cleaning and Lubrication | |
| 4 | Cylindrical Grinding between chuck and center | |
| 4 | Cylindrical Grinding of steps | |
| 4 | Cylindrical Grinding between Centers | |

Reference: In-house made book on Surface and Cylindrical Grinding

Module Description

Sometimes it is not as simple as to just replace a worn out part. Cost consideration may dictate that the repairs to be done. Very often worn out parts to be rebuilt and re machined to size. This industrial refurbishment work involves a combination of metal cutting processes like drilling, Lathe work, Grinding and precision Bench work fitting skills

Objectives

- To develop a sense of understanding among students to apply their knowledge to rehabilitate the equipment.
- To train the students on the sequential work stage that call for systematic planning of machining operations

Learning Outcomes

After completion of this module the student will be able to;

- Determine what must be done from the requirement of the job
- Select the tools, machines and other equipment on re-working of the damage part
- Learn with the process planning
- Apply skill knowledge effectively

Contents

- Repair of worn out Shafts and Rotors
- Boring of damaged holes in pulleys and gear wheels
- Facing of brake drums
- Facing of pressure plates
- Cylindrical grinding of rollers
- Milling of repaired gear teeth on Gear Wheels
- Use of slotting head for internal keyway
- Boring of bearing housing
- Fitting of key in key seats
- Fixing of sleeves and bushings
- Repairing of Moulds
- Machining of grooves and undercuts
- Grinding of Engine valves
- Boring of connecting rods

Prerequisite —

Level **3**Contact Hours: **32****Pacing Schedule**

| Contact hours | Contents | Skills Gained |
|---------------|--|---|
| 3 | Repair of worn out Shafts and Rotors | Serviceability of worn out parts. |
| 3 | Boring of damaged holes in pulleys and gear wheels | |
| 4 | Facing of brake drums and pressure plates | Apply Machining techniques and gain a firm understanding. |
| 2 | Cylindrical grinding of rollers | |
| 3 | Milling of repaired gear teeth on Gear Wheels | |
| 2 | Use of slotting head for internal keyway | Machining skill enhanced. |
| 2 | Boring of bearing housing | |
| 2 | Fitting of key in key seats | Analytical abilities improved. |
| 2 | Fixing of sleeves and bushings | |
| 2 | Repairing of Moulds | |
| 2 | Machining of grooves and undercuts | They gain connectivity with industrial related work. |
| 3 | Grinding of Engine valves | |
| 2 | Boring of connecting rods | |

Reference: In-house made work exercises

Module Description This course is designed to provide essential knowledge and skills in the Industrial Machinists trade. Fundamental principles of assembling parts. Acquaint the students to select the finished and the manufactured basic mechanical components and develop a better understanding and consciousness.

Objectives The course of study aims to provide and orient the Machinists with the selection and specification of basic mechanical components as to enable them to repair, replace, and assemble the machine parts during maintenance and manufacturing.

Learning Outcomes After completion of this course the students will be able to:

- To be able to specify and learn intended use of fasteners
- To identify different types of simple machine elements
- To follow standard classification and their proper selection
- To carry out simple calculations to ensure tolerance of fits.

Contents

- Screws
- Fasteners
- Keys
- Bearings
- Gears
- Belts
- Rivets
- Couplings

Prerequisite —

Level **3**Contact Hours: **32****Pacing Schedule**

| Contact Hour | Contents | Skills Gained |
|--------------|---|---|
| 2 | Mechanical components specification of screws. Types of screws | Identification of threads and fastening methods |
| 2 | Types of threads and selection of each kind of thread | |
| 3 | Calculation of depth of thread and nomenclature of different types of threads | |
| 1 | Nuts and bolts, their selection which includes their materials and sizes | |
| 2 | Introduction to rivets and their selection | |
| 2 | Uses of different types and keys and their selection | Assembly techniques and its application in the machine tools as well in the maintenance processes |
| 2 | Belts and Its Type | |
| 2 | Keys and Its Type | |
| 2 | Pins. Various types and selection of the pins | |
| 3 | Bearings. Different types and their specification | |
| 2 | Bearings. Different types and their specification. (cont.d) | |
| 3 | Gears and their specifications | |
| 2 | Gears materials and important terms on gears | |
| 2 | Use and care of gears and gear drives | |
| 2 | Introduction to coupling and various types of couplings | |

Reference: In-House made book on Machine Elements

Module Description Technical Report Writing 1, is offered to students to improve their English language proficiency in writing short technical reports which is part of their diploma requirement. The module integrates different methods of report writing with the basic mechanics organized writing.

- Objectives**
- To consolidate and extend the writing skills they have learned in ENGC 203.
 - To help technical student write short reports involving technical expression.

- Learning Outcomes** After completing this module the student will be able to:
- use writing as a means of communication in work environments
 - write short reports involving technical expression
 - organize information using the mechanics of writing

- Contents**
- Introduction to Technical Report Writing
 - Precaution Instructions
 - Operational Instructions
 - Progress Reports
 - Accident Reports
 - Industrial Visit Reports

Pacing Schedule

| Contact Hours | Contents | Skills Gained |
|--------------------------|--|---|
| 3 | Introduction to Technical Report Writing | Learning the basics of paragraph writing |
| 3 | Precaution Instructions | Sequencing precautionary instructions following the rules of writing |
| Quiz 1 | | |
| 4 | Operational Instructions | Writing operational instructions using the imperative form of verb |
| Midterm | | |
| 5 | Progress Reports | Ability to write reports on jobs completed and not completed using present perfect and past simple verb forms |
| Quiz 2 | | |
| 5 | Accident Reports | Writing short reports on causes and consequences of accidents using past tense verb forms |
| 4 | Industrial Visit Reports | Reporting industrial visit experiences using past tense verb forms |
| Final Examination | | |

Reference: Technical Report Writing 1 (In-house made)

Prerequisite —

Level 4

Contact Hours: 32

Module Description

This course is designed for the machinists to understand how the micro-structure and mechanical properties of steel are changed when it undergoes heat treatment processes. Besides learning the importance hardening for better understanding, the life of cutting tools.

Objectives

- To make students familiar with the structure changes
- To demonstrate annealing, normalizing, case hardening through chamber furnace
- To explain the application of iron-carbon equilibrium diagram
- To allow students to practice on hardness testing methods

Learning Outcomes

Students will be able to:

- Learn procedures and equipment used for the heat treatment processes
- Measure and test hardness in Brinell and Rockwell scales
- Apply heat treatment charts to find the suitable temperature for a particular tools steel
- Avoid failures take place to select cooling media.

Contents

- Necessity of Heat Treatment
- Heat Treatable Steels
- Types of Heat Treatments
- Heat Treatment Processes
- Practical Techniques employed in hardening of steels
- Hardness Testing Methods
- Nitriding

Pacing Schedule

| Contact Hour/s | Contents | Skills Gained |
|----------------|---|---|
| 2 | Necessity of heat treatment and definition of heat treatment | Visualize micro-structure of steel |
| 2 | Heat treatable steels composition and structural changes | |
| 2 | Iron-carbon equilibrium diagram, its application | Practical Application for the selection of hardening temperatures |
| 4 | Practice to construct iron carbon diagram Types of heat treatments and use of heat treatment furnace | |
| 2 | Practice on heat treatment processes | Identify hardened steel and machine able steel |
| 2 | Practice on heat treatment processes | |
| 2 | Quenching techniques | |
| 2 | Hardness measuring | Measure hardness of steel made components by using Rockwell Hardness Tester |
| 2 | Hardness testing methods | |
| 2 | Hardness tables | Conversion of Hardness scales |
| 2 | Mistakes in hardening | Learn carburizing of mild steel |
| 4 | Case hardening of mild steel by Pack Carburizing | |
| 4 | Nitriding | Learn Nitrogen instead penetration of carbon to achieve clean and hard case |

Reference: In house made book on Heat Treatment

Prerequisite —

Level 4

Contact Hours: 64

Module Description

This course is designed to exhibit all the machining skills in combination as to reflect the net achievement of the professional competency to qualify machining skills.

Objectives

The course develops:

- Analytical thinking
- Application of manufacturing techniques
- Confidence to choose the right work media to prepare a purposeful project
- Occupational competency to know the machining skills in the assembly of mechanical parts

Learning Outcomes

After completion of this course, students will be able to:

- Read assembly drawing
- Analyze the involved machining operations
- Apply tolerances to the standard fits
- Determine the manufacturing techniques
- Select correct tooling and fixture
- Apply heat treatment and material standards

Contents

- Advance composite exercises of the mechanical components following working drawing shall be given to the students
- Students will prepare this projects in groups
- The projects are designed in such a way that students could use manufacturing techniques and assemble the different components made by them

Pacing Schedule

| Contact hours | Contents | Skills Gained |
|---------------|---|---|
| 1 | Introduction of Manufacturing Project | Techniques used in manufacturing any assembly, study Assembly and Detail drawings, selection of correct tool and correct machine, use of Standard machine elements, tolerances, fits etc. |
| 6 | Study the Working Drawings of Assigned Project No: 1 | |
| 15 | Machining different parts of the designed devices prescribed as manufacturing project | |
| 10 | Assembling the parts using standard Mechanical Components | |
| 6 | Study the Working Drawings of Assigned Project No: 2 | |
| 16 | Machining different parts of the designed devices prescribed as manufacturing project | |
| 10 | Assembling the parts using standard Mechanical Components | |

Reference: JTI- In-house made machining books/Working and assembly drawings of the projects

NOTE:

Manufacturing Projects are assigned to evaluate students as to how they can competently prove to be a skilled Machinist. Projects can be changed semester to semester in order to avoid repetition.

Prerequisite —

Level 4

Contact Hours: 32

Module Description This module introduces the process components and operation of CNC EDM

Objectives This Module develops understanding and practical application of EDM

Learning Outcomes After completing this course the student will be able to:

- Make program for EDM using software
- Run EDM

- Contents**
- Introduction to EDM
 - Parameters
 - Advantages
 - Dielectric Fluid
 - Items required to EDM
 - Physical Process
 - Electrode Materials
 - Electrode Under sizing
 - Orbiting
 - Types of flushing
 - Mounting of Electrode and work piece
 - Centering of work piece
 - Making program by software
 - Eroding material with different textures
 - Machining a cavity

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|---|---|
| 1 | Introduction to EDM | Setting of Electrode and Work piece |
| 1 | Parameters | |
| 2 | Advantages | |
| 1 | Dielectric fluid | Making program and run CNC EDM. |
| 1 | Items required to EDM | |
| 2 | Physical Process | Selection of materials of Electrode. |
| 1 | Electrode Materials | |
| 1 | Electrode Under sizing | Selection of parameters according to required surface texture |
| 2 | Orbiting | |
| 2 | Types of Flushing | |
| 2 | Mounting of Electrode and work piece. | Selection of flushing |
| 2 | Centering of work piece | |
| 4 | Making program by software | Orbiting |
| 5 | Eroding material with different textures | |
| 5 | Machining a cavity which is not possible to machine with other machines | |

Reference: In house made Notes and Exercises

Prerequisite —

Level 4

Contact Hours: 64

Module Description

CNC Milling includes working on CNC Vertical and Horizontal Machining centers, CNC Lab-Volt and CNC Boxford

Objectives

- Programming of CNC Machines.
- Operating CNC Machines.

Learning Outcomes

After the completion of this course, the students are able to:

- Make program using G & M codes.
- Editing of program
- Running the CNC Machines

Contents

- Introduction to CNC Machines
- Coordinate Practice
- G90 and G91 practice
- Programming with G01 and Practical exercises on Lab Volt
- Programming with G02 and Practical exercises on Lab Volt
- Programming and Practical exercise using G01 on Machining Center
- Programming and Practical exercise using G02 on Machining Center
- Programming and Practical exercise using G40, G41 and G42 Codes
- Spot Drilling and Peck Drilling Cycles
- Sub programs

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|--|---|
| 3 | Introduction to CNC | Programming and operating of CNC Milling Trainers |
| | Introduction to CNC Mill Trainer | |
| 6 | G & M Codes | |
| | Absolute and incremental programming | |
| 3 | Setting of Machine | |
| 6 | Writing program using straight lines | |
| | Editing program using diagonal lines | |
| 6 | Programming circles and arcs | |
| | Practice on assigned exercise | |
| 8 | Introduction to FANUC system | |
| | Tool length offset setting | |
| | Work Coordinate setting | |
| 8 | Setting of Machine | |
| | Making programs using linear interpolation | |
| | Making programs using circular interpolation | |
| 4 | Programming with G41/G42 | |
| 8 | Sub Programming | |
| 6 | Canned Cycles | |
| 6 | Practical Exercise | |

Reference: Student Manual on 5600 CNC Mill by Lab-Volt

Prerequisite —

Level **4**

Contact Hours: **48**

Module Description CNC Lathe includes working on CNC Lathe trainers and CNC Lathe Boxford

- Objectives**
- Basic programming of Lathe trainers
 - Operating of CNC Lathe Machines.
 - Operating CNC Lathe Boxford by CAD/CAM

- Learning Outcomes** After completing this course the student will be able to:
- Programming using G&M codes
 - To produce parts using CNC Lab-volt trainer
 - Use CAD/CAM software and machine different shapes including Arcs, Drills and Threads.

- Contents**
- Introduction to CNC lathe Lab-Volt Machining
 - Programming with G90 and G91
 - Linear interpolation
 - Circular interpolation
 - CAD/CAM for CNC Lathe Boxford
 - Different exercises containing radius, hole and threads

Pacing Schedule

| Contact Hour | Contents | Skills Gained |
|--------------|--------------------------------------|---|
| 2 | Introduction to CNC Lathe Trainers | Programming and operating of CNC Lathe Trainers |
| 4 | G90 and G91 | |
| 4 | Setting of Machine | |
| 4 | Writing program using straight lines | |
| 3 | Practical Exercise 1 | |
| 3 | Practical Exercise 2 | |
| 6 | Programming circles and arcs | |
| 4 | Practical Exercise 1 | |
| 4 | Practical Exercise 2 | |
| 6 | Lathe CAD/CAM software | |
| 4 | Practical Exercise 1 | |
| 4 | Practical Exercise 2 | |

Reference: Student Manual on 5500 CNC by Lab-Volt

Module Description Technical Report Writing 2, is offered to students to enhance and build on their proficiency in writing short technical reports which they learnt at level 3. The module integrates less- controlled methods of report writing with practicing the skill of filling out various forms required at workplace.

- Objectives**
- To consolidate and extend the report writing skills they have learned in TRWT 304.
 - To help technical student write resumes, more work related reports, and fill out forms involving technical and general vocabulary.

- Learning Outcomes** After completing this module the student will be able to:
- use writing as a means of communication in work environments
 - fill out forms and write short reports involving technical expression
 - write resumes and work related reports

- Contents**
- Making Descriptive Requisitions
 - Curriculum Vitae
 - Letter Writing
 - Cooperative Training Report
 - Filling out Requisition Forms
 - Filling Work -Related and General Forms

Pacing Schedule

| Contact Hours | Contents | Skills Gained |
|--------------------------|--|---|
| 4 | Making Descriptive Requisitions | Making official requests in writing for materials needed at work. |
| 3 | Curriculum Vitae | Writing CV's in response to job ads |
| Quiz 1 | | |
| 4 | Letter Writing | Writing formal cover letters for different jobs |
| Midterm | | |
| 4 | Cooperative Training Report | Writing relevant reports on cooperative training to department heads |
| Quiz 2 | | |
| 5 | Filling out Requisition Forms | Ability to make different requisitions by filling out specific forms |
| 4 | Filling out Work-related and General Forms | Ability to fill out different forms - an ability required in real life situations |
| Final Examination | | |

Reference: Technical Report Writing 2 (In-house made)