Curriculum for
Tool and Die Making-1

(Certificate Level - 6 months)

Contents

Tool and Die Making-1

Overall objective of the course

To enable students to produce sheet metal processing dies and imparting basic knowledge of re-sharpening the cutting tools.

Competencies gained after completion of the course

- Ability to understand drawings and to make the parts accordingly.
- Ability to select the speed, feed according to the materials to be machined.
- Ability to operate the conventional machine tools, such as lathe, drilling, milling and grinding.
- Ability to work on CNC machine tools, like lathe, vertical machining milling etc.
- Ability to acquire dexterity in non conventional machining, like wire cut.
- Ability to produce dies components.
- Ability to polish the die components.
- Ability to understand quality control procedures.
- Ability to understand heat treatment techniques.
- Ability to assemble and disassemble the dies.
- Ability to maintain the dies and tools.

Job opportunities available immediately and in the future

- Automobile Industry
- Machine tool industry
- Defence industry
- Agricultural equipment industry
- Home appliances industry

Curriculum Salient Points

Duration of the Course	Six months
Total working days:	132 (22 weeks)
One working day	6 working hours
Total Hours of the course:	792 hours
Level of the course;	Vocational
Entry Qualification:	Matric / equivilant

Overview about the program – Curriculum for Tool & Die Making-1

Module Title and Aim	Learning Units	Theory hours	Workplace hours
Module 1: Foundation Essentials Aim: Prepare the students to achieve the skills of interpreting the drawings for the programming of CNC machines, reading the measuring instruments & selecting the materials for tools and dies.	LU1 - Technical Drawing LU2 Measuring instruments LU3-Materials for Dies & Tools LU4- CNC Programming	6-hours 6-hours 6-hours 6-hours	24-hours 12-hours 12-hours 30-hours
Module 2: Machine Tools-I Aim: This module will impart the complete knowledge of these machine tools and students will learn various lathe operations.	LU1- Lathe Machine LU2- CNC Lathe	8-hours 10-hours	42-hours 48-hours
Module 3: Machine Tools-II Aim: This module will enable the students to understand the conventional milling m/c & CNC vertical machining center, their cutters and operations. They will get the skills of milling operations.	LU1- Milling Machine LU2- CNC Milling Machine	15-hours 15-hours	48-hours 72-hours
Module 4: Machine Tools-III Aim: To operate drilling machine with digital read out (DRO) attachment, surface grinding machine and cylindrical machine to perform different operations.	LU1- Drilling Machine with DRO LU2- Grinding Machines	6-hours 6-hours	18-hours 36-hours

Module 5: Wire Cut Machine Aim: To enable the students to understand the use of wire cutting machine.	LU1- Wire Cut	6-hours	24-hours
Module 6: Tool and Die Making Aim: To enable the students to produce die components, tools and assemble the die.	LU1- Die Making LU2- Tool Making	18-hours 6-hours	120-hours 42-hours
Module 7: Auxiliaries Aim: To enable the students to apply the knowledge of the tolerances and skill of inspection. To apply the heat treatment techniques.	LU1- Engineering Limits & Fits, and Surface Finish LU2- Heat Treatment	12-hours 12-hours	Nil 42-hours
Module 8: Maintaining Too and Dies Aim: To enable the students to polish the die components and repair the dies and tools.	LU1- Polishing operations L U2- Maintenance of Dies & Tools	6-hours 6-hours	24-hours 48-hours

Tool & Die Making-1 Curriculum Contents (Teaching and Learning Guide)

Module 1 Title: Foundation Essentials
Objective of the Module: Prepare the students to achieve the skills of interpreting the drawings for the programming of CNC machines, reading the measuring instruments & selecting the materials for tools and dies.
Duration: 102 hours **Theory:** 24 hours **Practice:** 78 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1- TECHNICAL DRAWING	Prepare the job according to the specifications	Students will be able to: i) Know the technical drawing. ii) Know types of drawings (pictorial & orthographic) iii) Know the principal planes and quadrants. iv) Know angle methods of projection. v) Use the drawing instruments vi) Draw orthographic views of at least five die components	Th. 6-hrs Pr. 24-hrs	Drawing sheets	Drawing hall
LU2- MEASURING INSTRUMENTS	Check the dimensions of the job	Students will be able to: i) Know the purpose of measuring instruments. ii) Read traditional and digital vernier caliper, micrometer, height gauge, depth micrometer, dial test indicator, bevel protector. iii) Check the accuracy of the components produced in the machine shop.	, Th.6-hrs Pr. 12-hrs	Measuring instruments	Workshop
LU3- MATERIALS FOR TOOLS AND DIES	Select the material for the job	Students will be able to: i) Understand the common steels used in tool and die making & their mechanical properties. ii) Identify the metals & die steels. iii) Test the hardness of steel. iv)Select the appropriate tool & die steels for the specific job	Th. 6-hrs Pr. 12-hrs	Instructional material	Class room Lab.
L U4- CNC PROGRAMMING	Set the machine & job	Students will be able to: i) Know the control panel of the machine. ii) Set the machine at home position. iii) Set the work reference, iv) Operate the CNC m/c according to various functions/programmes.	Th. 6-hrs Pr. 30-hrs	Instructional material	Class room Lab.

The tools, equipment and machinery for this module may include:-

LU1- Drawing tables and drawing instruments.
LU2- Traditional & digital: Vernier caliper, micrometer, height gauge, depth micrometer, dial test indicator, vernier bevel protractor,Tri-square, etc.
LU3- Samples of alloy steels, brass, aluminum, copper etc., and various die steels
LU4- CNC machines

Module 2 Title: Machine Tools 1
Objective of the Module: This module will impart the complete knowledge of these machine tools and students will learn various lathe operations.
Duration: 108 hours **Theory:** 18 hours **Practice:** 90 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1- LATHE MACHINE	Perform operations on conventional lathe machine	Students will be able to: i) Know the purpose of the lathe m/c & its major parts. ii) Know the turning operations on it. iii) Understand the speed, feed, and depth of cut. iv) Select the cutting tool according to operation. v) Apply the various work holding devices i.e. 3-jaws chuck, 4-jaws chuck, collet chuck & face plate etc. vi) Perform turning, facing, taper turning, step turning drilling, boring & knurling operations etc.	Th. 8-hrs Pr. 42-hrs	Bars of various diameters	Workshop
LU2- CNC LATHE	Perform operations on CNC lathe machine	Students will be able to: i) Know the principal parts of CNC lathe & their working. ii) Know the x-axis & z-axis movements. iii) Know the machine codes. iv) Set the tools in sequence v) Run the programme on CNC lathe vi) Prepare the jobs according to the given programme .	Th. 10-hrs Pr. 48-hrs	Bars of various diameters	Workshop

The tools, equipment and machinery for this module may include:-

LU1- Conventional lathe machine with accessories, single point cutting tools, drill sets, knurling tools power saw, vernier calipers, micrometers, safety gear & equipment
LU2- CNC lathe machine, CNC cutting tools, vernier calipers, micrometer, safety gear

Module 3 Title: Machine Tools 2
Objective of the Module: This module will enable the students to understand the conventional milling m/c and CNC vertical machining center, their cutters and operations. They will get the skills of the various milling operations.
Duration: 150 hours **Theory:** 30 hours **Practice:** 120 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1- MILLING MACHINES	Perform operations on conventional milling machines	Students will be able to: i) Know the purpose of the milling machine & the movement of various parts. ii) Know the use of various milling cutters. iii) Understand the speed, feed, and depth of cut. iv) Apply the various work holding devices i.e., rotary table, dividing head, machine vice & universal vice. v) Apply various milling attachments. vi) Perform various milling operations i.e., face milling, profile milling, pocket milling, slitting etc.	Th. 15-hrs Pr. 48-hrs	Plates of various thickness	Workshop
LU2- CNC VERTICAL MACHINING CENTER	Perform operations on CNC vertical machining center	Students will be able to: i) Know the principal parts of CNC milling machine & their working. ii) Know the principal axis of CNC milling m/c i.e., the x-axis, y-axis & z-axis. iii) Know the milling machine codes. iv) Set the job & machine. v) Set the tools in sequence for a particular job. vi) Run the programme on CNC milling machine. vii) Prepare the jobs according to the given programme. viii) Adjust the tool wear compensation.	Th.15-hrs Pr. 72-hrs	Plates of various thickness	Workshop

The tools, equipment and machinery for this module may include:-

LU1- Universal milling machine with all standard accessories and attachments, milling cutters, micrometer, vernier caliper, dial test indicator, power saw. general hand tools, safety gear and equipment.
LU2- CNC vertical machining center & cutters, lever gauge, power saw, micrometer, vernier caliper, dial test indicator, general hand tools, safety gear and equipment.

Module 4 Title: Machine Tools 3
Objective of the Module: To operate drilling machine with digital read out (DRO) attachment, surface grinding machine and cylindrical machine to perform different operations.
Duration: 66 hours **Theory:** 12 hours **Practice:** 54 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1- DRILLING MACHINE	Perform operations on drilling machine with DRO attachment	Students will be able to: i) Know the purpose of drilling machine. ii) Know the use of standard drills, reamers, counter-bores, countersinks & spot facing tools. iii) Perform the drilling operations. iv) Perform counter boring, counter sinking, spot facing, and reaming operations.	Th. 6-hrs Pr. 18-hrs	Plates of various thickness & drills	Workshop
LU2- GRINDING MACHINE	Perform operations on surface and cylindrical grinding machines	Students will be able to: i) Know the purpose of the grinding machine. ii) Perform the surface grinding & cylindrical grinding operations. iii) Perform grinding of holes using grinding bits.	Th. 6-hrs Pr. 36-hrs	Bars of various diameters. Plates of various thickness & grinding wheels	Workshop

The tools, equipment and machinery for this unit may include:-

LU1- Drilling machine with digital read out (DRO), standard drill sets, center drills, counter boring tool, counter sinking tool, spot facing tool, and reamers.
LU2- Surface grinding machine, cylindrical grinding machine with all standard attachments, bench grinder, various grinding wheels, tool kit, safety goggles.

Module 5 Title: Wire cut machine
Objective of the Module: To enable the students to understand the use of wire cut machine.
Duration: 30 hours **Theory:** 6 hours **Practice:** 24 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1- WIRE CUT	Perform operations on wire cut machine	Students will be able to: i) Know the purpose of the wire cut machine. ii) Understand the parameters related to wire cut machine, select tool path for wire cutting operation. iii) Set the job on the machine. iv) Adjust the current for desired finish of job. v) Cut regular and irregular outline on metallic sheets observing the safety precautions.	Th. 6-hrs Pr. 24-hrs	Sheets of various thicknesses	Workshop

The tools, equipment and machinery for this unit may include:-

LU1- i) Wire cut machine, tungsten wire, and standard accessories.
ii) Safety gear and equipment.
iii) Measuring tools.

Module 6 Title: Tool and Die Making
Objective of the Module: To enable the students to produce die components, tools and assemble the die.
Duration: 186 hours **Theory:** 24 hours **Practice:** 162 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1- DIE MAKING	Produce die components, & assemble them to evolve at a complete set of die	Students will be able to: i) Understand the function of a die. ii) Know the various types of sheet metal dies and their difference e.g., Blanking, Forming, Draw, piercing and trimming dies. iii) Understand the main components of a die i.e., die punch, blank holder, stripper plate, top & bottom plate, guiding system. iv) Assemble the components of the die. v) Disassemble the various dies for maintenance.	Th. 18-hrs Pr. 120-hrs	Plates of various thicknesses & bars of various diameters.	Workshop
LU2- TOOL MAKING	Grind cutting angles on single point & multiple point cutting tools	Students will be able to: i) Understand the various single points & multiple point cutting tools. ii) Understand the cutting tool angles. iii) Recognize the various tools and their angles with respect to operations and material being cut. iv) Grind the angles on single point cutting tools & multiple point cutting tools.	Th. 6-hrs Pr. 42-hrs	Single point cutting tools for lathe & shaper machines. Milling cutters, drills, reamers etc.	Workshop

The tools, equipment and machinery for this unit may include:-

LU1- i) Spanners, screw drivers, set of Allen keys, set of files, needle files (diamond), disc grinder with grinding discs, pin grinding m/c & pin grinding wheels, mallet, bench vice, rotary burrs, bench work stations (one bench per four students), safety goggles etc.
LU2- ii) Universal tool & grinding machine with standard accessories, abrasive wheels, safety goggles.

Module 7 Title: Auxillaries
Objective of the Module: To enable the students to apply the knowledge of the tolerances and skill of inspection.To apply the heat treatment techniques.
Duration: 66 hours **Theory:** 24 hours **Practice:** 42 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1- ENGINEERING LIMITS, FITS & TOLERANCES	Maintain the quality of the mating parts of dies	Students will be able to: i) Understand the limits, fits & tolerances. ii) Know the purpose of applying the limits & fits on the die components. iii) Practice of calculating tolerances.	Th. 12-hrs Pr. Nil	Instructional material	Workshop
LU2- HEAT TREATMENT	To enhance the life of the die components	Students will be able to: i) Know the purpose of the heat treatment. ii) Understand the various heat treatment processes. iii) Perform the stress relieving, hardening, quenching, tempering processes.	Th. 12-hrs Pr. 42-hrs	Bars and plates	Workshop

The tools, equipment and machinery for this unit may include:-

LU1- Nil
LU2- Muffle furnace, quenching oils and safety gear

Module 8 Title: Maintaining Tools and Dies
Objective of the Module: To enable the students to polish the die components and repair the dies and tools.
Duration: 84 hours **Theory:** 12 hours **Practice:** 72 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1- POLISHING OPERATIONS	Polish the various punches & die blocks.	Students will be able to: i) Know the purpose of the polishing operation. ii) Know the techniques for polishing die & punch. iii) Perform polishing operations using polishing mediums i.e., polishing stones, emery papers & emery pastes etc.	Th. 6-hrs Pr. 24-hrs	Die blocks & punches	Workshop
LU2- MAINTENANCE OF TOOLS & DIES	Repair the dies and regrind the tools	Students will be able to: i) Identify the defects of tools and dies. ii) Analyse the defects. iii) Suggest the remedial measures. iv) Repair & regrind the die block. v) Replace the defective components.	Th. 6-hrs Pr. 48-hrs	Used and defective dies	Workshop

The tools, equipment and machinery for this unit may include:-

LU1- Polishing stones, emery papers, and emery pastes of different grades.
LU2- Spanners, screw drivers, set of Allen keys, set of files, needle files (diamond), disc grinder with grinding discs, pin grinding m/c & pin grinding wheels, mallet, bench vice, rotary burrs, bench work stations (one bench per four students), safety goggles etc.

Assessment

Module 1: Foundation Essentials

Learning Units	Theory hours	Workplace hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
LU1- TECHNICAL DRAWING	6 hrs	24 hrs	i) Know the technical drawing. ii) Know types of drawings (pictorial & orthographic) iii) Know the principal planes and quadrants. iv) Know angle methods of projection. v) Use the drawing instruments vi) Draw orthographic views of at least five die components	i) Oral questioning ii) Short Q/A iii) Short Q/A iv) Short Q/A v) Demonstration vi) Demonstration	
LU2- MEASURING INSTRUMENTS	6 hrs	12 hrs	i) Know the purpose of measuring instruments. ii) Read traditional and digital vernier caliper, micrometer, height gauge, depth micrometer, dial test indicator, bevel protector. iii) Check the accuracy of the components produced in the machine shop.	i) Oral questioning ii) Demonstration iii) Demonstration	
LU3- MATERIALS FOR TOOLS AND DIES	6 hrs	12 hrs	i) Understand the common steels used in tool and die making & their mechanical properties. ii) Identify the metals & die steels. iii) Test the hardness of steel. iv)Select the appropriate tool & die steels for the specific job	i) Oral questioning ii) Demonstration iii) Demonstration iv) Short Q/A	
LU4- CNC PROGRAMMING	6 hrs	30 hrs	i) Know the control panel of the machine. ii) Set the machine at home position. iii) Set the work reference, iv) Operate the CNC m/c according to various functions/programmes.	i) Oral questioning ii) Demonstration iii) Demonstration iv) Demonstration	

The following operations are included in the units:-

LU1- Interpretation of drawing and practice of the drawings.
LU2- Practice of reading the measuring instruments.
LU3- Identification of different materials.
LU4- Programme writing

The tools, equipment and machinery for this module may include:-

LU1- Drawing tables and drawing instruments.
LU2- Traditional & digital: Vernier caliper, micrometer, height gauge, depth micrometer, dial test indicator, vernier bevel protractor,Tri-square, etc.
LU3- Samples of alloy steels, brass, aluminum, copper etc., and various die steels
LU4- CNC machines

Critical aspects:-

- Extensive drawing practice
- Correct reading of drawing
- Onerous attention to handle the measuring instruments and their applications
- Accuracy in taking the measurements
- Perception of materials/metals

Module 2: Machine Tools 1

Learning Units	Theory hours	Workplace hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
LU1- LATHE MACHINE	8 hrs	42 hrs	i) Know the purpose of the lathe m/c & its major parts. ii) Know the turning operations on it. iii) Understand the speed, feed, and depth of cut. iv) Select the cutting tool according to operation. v) Apply the various work holding devices i.e. 3-jaws chuck, 4-jaws chuck, collet chuck & face plate etc. vi) Perform turning, facing, taper turning, step turning, drilling, boring & knurling operations etc.	i) Oral questioning ii) Short Q & A iii) Short Q & A iv) Demonstration v) Demonstration vi) Demonstration	
LU2- CNC LATHE	10 hrs	48 hrs	i) Know the principal parts of CNC lathe & their working. ii) Know the x-axis & z-axis movements. iii) Know the machine codes. iv) Set the tools in sequence v) Run the programme on CNC lathe vi) Prepare the jobs according to the given programme .	i) Oral questioning ii) Short Q & A iii) Short Q & A iv) Short Q & A v) Demonstration vi) Demonstration	

The following operations are included in the units:-

LU1- Facing, Taper turning, knurling, boring, eccentric turning, parallel turning, Thread cutting, drilling, reaming and profile turning.
LU2- Facing, Taper turning, knurling, boring, eccentric turning, parallel turning, Thread cutting and drilling.

The tools, equipment and machinery for this module may include:-

LU1- Conventional lathe machine with accessories, single point cutting tools, Drill sets, knurling tools power saw, vernier calipers, micrometer, safety gear & equipment
LU2- CNC lathe machine, CNC cutting tools, vernier calipers, micrometer, safety gear

Critical aspects:-

- Writing the program
- Selecting the program
- Setting the program
- Accuracy of data fed to the program
- Safety procedures

Module 3: Machine Tools 2

Learning Units	Theory hours	Workplace hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
LU1- MILLING MACHINES	15 hrs	48 hrs	i) Know the purpose of the milling machine & the movement of various parts. ii) Know the use of various milling cutters. iii) Understand the speed, feed, and depth of cut. iv) Apply the various work holding devices i.e., rotary table, dividing head, machine vice & universal vice. v) Apply various milling attachments. vi) Perform various milling operations i.e., face milling, profile milling, pocket milling, slitting etc.	i) Oral questioning ii) Short Q & A iii) Short Q & A iv) Demonstration v) Demonstration vi) Demonstration	
LU2- CNC VERTICAL MACHINING CENTER	15 hrs	72 hrs	i) Know the principal parts of CNC machining center & their working. ii) Know the principal axis of CNC machining center i.e., the x-axis, y-axis & z-axis. iii) Know the machine codes. iv) Set the job & machine. v) Set the tools in sequence for a particular job. vi) Run the programme on CNC machining center. vii) Prepare the jobs according to the given programme. viii) Adjust the tool wear compensation.	i) Oral questioning ii) Short Q & A iii) Short Q & A iv) Demonstration v) Demonstration vi) Demonstration vii) Demonstration	

The following operations are included in the units:-

LU1- Face milling, profile milling, pocket milling, slitting.
LU2- Setting the datum, setting the milling cutters in sequence, face milling, profile milling, pocket milling, slitting.

The tools, equipment and machinery for this module may include:-

LU1- Universal milling machine with all standard accessories and attachments, milling cutters, micrometer, vernier caliper, dial test indicator, power saw, general hand tools, safety gear and equipment.
LU2- CNC vertical machining center & cutters, lever gauge, power saw, micrometer, vernier caliper, dial test indicator, general hand tools, safety gear and equipment.

Critical aspects:-

- Writing the program
- Selecting the program
- Setting the program
- Accuracy of data fed to the program
- Safety procedures

Module 4: Machine Tools 3

Learning Units	Theory hours	Workplace hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
LU1- DRILLING MACHINE	6 hrs	18 hrs	i) Know the purpose of drilling machine. ii) Know the use of standard drill, reamers, counter-bores, countersinks & spot facing tools. iii) Perform the drilling operation. iv) Perform counter boring, counter sinking, spot facing, and reaming operations.	i) Oral questioning ii) Short Q & A iii) Demonstration iv) Demonstration	
LU2- GRINDING MACHINE	6 hrs	36 hrs	i) Know the purpose of the grinding machine. ii) Perform the surface grinding & cylindrical grinding operations. iii) Perform grinding of holes using grinding bits.	i) Oral questioning ii) Demonstration iii) Demonstration	

The following operations are included in the units:-

LU1- i) Drilling operations using various drill sizes.
ii) Counter boring, counter sinking, spot facing, reaming.

LU2- i) Grinding operations on surface grinding machine and cylindrical grinding machine.
ii) Grinding of external cylindrical surfaces.
iii) Grinding holes using grinding bits.

The tools, equipment and machinery for this module may include:-

LU1- Drilling machine with digital read out (DRO), standard drill sets, center drills, counter boring tool, counter sinking tool, spot facing tool, and reamers.
LU2- Surface grinding machine, cylindrical grinding machine with all standard attachments, bench grinder, various grinding wheels, tool kit, safety goggles.

Critical aspects:-

- Selection of appropriate drill size
- Setting the rpm with respect to drill size and the material of job
- Use of the coolant
- Selection of an appropriate grinding wheel
- Setting of machine parameters
- Personal safety gear during the operation is essential

Module 5: Wire cut

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
LU1- WIRE CUT	6 hrs	24 hrs	i) Know the purpose of the wire cut machine. ii) Understand the parameters related to wire cut machine, select tool path for wire cutting operation. iii) Set the job on the machine. iv) Adjust the current for desired finish of job. v) Cut regular and irregular outline on metallic sheets observing the safety precautions.	i) Oral questioning ii) Short Q & A iii) Demonstration v) Demonstration	

The following operations are included in the units:-

LU1- i) Wire cutting operations

The tools, equipment and machinery for this module may include:-

LU1- i) Wire cut machine, tungsten wire, with standard accessories.
ii) Safety gear and equipment.
iii) Measuring tools.

Critical aspects:-

LU1-

- Correct setting of machine parameters
- Accuracy of the programme
- Interpretation of drawings
- Safety procedure

Module 6: Tool & Die Making

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
LU1- DIE MAKING	12 hrs	90 hrs	i) Understand the function of a die. ii) Know the various types of sheet metal dies and their difference e.g., Blanking, Forming, Draw, piercing and trimming dies. iii) Understand the main components of a die i.e., die punch, blank holder, stripper plate, top & bottom plate, guiding system. iv) Assemble the components of the die. v) Disassemble the various dies for maintenance.	i) Oral questioning ii) Short Q & A iii) Short Q & A iv) Demonstration v) Demonstration	
LU2- TOOL MAKING	6 hrs	42 hrs	i) Understand the various single points & multiple point cutting tools. ii) Understand the cutting tool angles. iii) Recognize the various tools and their angles with respect to operations and material being cut. iv) Grind the angles on single point cutting tools & multiple point cutting tools.	i) Short Q & A ii) Oral questioning iii) Short Q & A iv) Demonstration	

The following operations are included in the units:-

LU1- i) Assembling of dies.
LU2- i) Grinding of angles on tool blanks and re-sharpening of tools.

The tools, equipment and machinery for this module may include:-

LU1- i) Spanners, screw drivers, set of Allen keys, set of files, needle files (diamond), disc grinder with grinding discs, pin grinding m/c & pin grinding wheels, mallet, bench vice, rotary burrs, bench work stations (one bench per four students), safety goggles etc.
LU2- ii) Universal tool & grinding machine with standard accessories, abrasive wheels, safety goggles.

Critical aspects:-

LU1-

- Safety procedure
- Safe handling of the dies
- Selection of tools
- Interpretation of drawing
- Conformity to specification
- Alignment and fits of the components

LU2-

- Setting of job
- Interpretation of drawing
- Conformity to specification
- Proper selection of grinding wheel
- Safety procedures

Module 7: Auxiliaries

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
LU1- ENGINEERING LIMITS, FITS AND SURFACE FINISH	12 hrs	0 hrs	i) Understand the limits, fits & tolerances. ii) Know the purpose of applying the limits & fits on the die components. iii) Practice of calculating tolerances.	i) Oral questioning ii) Oral questioning iii) Short Q & A	
LU2- HEAT TREATMENT	12 hrs	42 hrs	i) Know the purpose of the heat treatment. ii) Understand the various heat treatment processes. iii) Perform the stress relieving, hardening, quenching, tempering process.	i) Oral questioning ii) Short Q & A iii) Demonstration	

The following operations are included in the units:-

LU1- Nil
LU2- Carburizing, tempering, annealing etc.

The tools, equipment and machinery for this module may include:-

LU1- Nil
LU2- Muffle furnace, quenching oils and safety gear

Critical aspects:-

LU1- Nil
LU2-

- Maintenance of correct temperatures
- Positioning of work piece during heat treatment

Module 8: Maintaining Tools & Dies

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
LU1- POLISHING OPERATIONS	6-hrs	Pr. 24-hrs	Students will be able to: i) Know the purpose of the polishing operation. ii) Know the techniques for polishing die & punch. iii) Perform polishing operations using polishing mediums i.e., polishing stones, emery papers & emery pastes etc.	i) Oral questioning ii)Short Q & A iii) Demonstration	
LU2- MAINTENANCE OF TOOLS & DIES	6 hrs	48 hrs	Students will be able to: i) Identify the defects of tools and dies. ii) Analyse the defects. iii) Suggest the remedial measures. iv) Repair & regrind the die block. v) Replace the defective components.	i) Short Q & A ii) Short Q & A iii) Report writing iv) Demonstration v) Demonstration	

The following operations are included in the unit:-

LU1- Filing, lapping, buffing, grinding & honing.
LU2- Turning, drilling, milling, welding & grinding

The tools, equipment and machinery for this unit may include:-

LU1- Polishing stones, emery papers, and emery pastes of different grades.
LU2- Spanners, screw drivers, set of Allen keys, set of files, needle files (diamond), disc grinder with grinding discs, pin grinding m/c & pin grinding wheels, mallet, bench vice, rotary burrs, bench work stations (one bench per four students), safety goggles etc.

Critical aspects:-

LU1- & LU2

- Polishing of items.
- Identifications of faults.
- Precision of repair.
- Safety procedures.

Supportive notes

The candidate will be required to:

- Orally, or by other methods of communications, answer the questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence.
- Present evidence related to the units.

During assessment the candidate will:

- Demonstrate safe work practices at all times.
- Communicate information about processes, events or tasks being under taken to ensure a safe and efficient working environment.
- Take the responsibility for the quality of his/her own work.
- Plan task and review task requirements at appropriate time.
- Relate to all stake holders according to accepted conventions.
- Perform all tasks in accordance with standard operating procedures.
- Perform all tasks to specifications.
- Use accepted data collection techniques, practices, and processes in line with work place procedures.

Resources required for assessment include:

All material, tools, equipment and machinery listed within the modules.

Names of the curriculum developers:

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