

MACHINST

**NATIONAL OCCUPATIONAL ANALYSIS (2005)
Integrated With
INDIVIDUALIZED LEARNING MODULES**

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**Government
of Alberta** ■



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DOCUMENT DESCRIPTION

Tasks that are performed by skilled workers in this trade across Canada.

Block: A group of related tasks.

This number indicates the percentage of exam questions on the topic.

A → OCCUPATIONAL SKILLS → 17%

1 → USES TOOLS, EQUIPMENT AND MATERIAL →

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
1.01	Uses hand tools	<ul style="list-style-type: none"> •→ ability to use measuring and layout tools (tapes, rules, squares, dividers, sliding T bevel, protractor, trammel points, callipers) •→ ability to sharpen and maintain tools •→ ability to use cutting tools (saws, files, rasps) •→ ability to use fastening tools (hammers, wrenches, screwdrivers, staplers) •→ ability to use hand chisels and planes •→ ability to use hand drills •→ ability to use abrading tools (sandpaper) •→ ability to use dismantling tools (nail pullers, wrecking bars) 	020103a	Hand Tools

Subtask Number

Small divisions, when combined, describe the duties constituting a task.

The essential skills and knowledge required to perform the task and subtask.

Module name and number where information is available on the subtask/enabling objective.

A OCCUPATIONAL SKILLS

13%

1 USES TOOLS AND EQUIPMENT

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
1.01	Uses hand tools	<ul style="list-style-type: none">• knowledge of types of hand tools• knowledge of imperial and metric systems• ability to apply hand-eye coordination• ability to organize hand tools• ability to maintain hand tools• ability to store hand tools• ability to recognize worn, damaged or defective hand tools	150101b 150101c 150101d 150101e 150101f 150101g 150101h	Basic Measuring Tools Precision Measuring Tools Angular Measuring Tools Inspection Gauges Layout Tools and Procedures Non-Cutting Hand Tools Hand Held Cutting Tools
1.02	Uses power tools	<ul style="list-style-type: none">• knowledge of types of power tools such as electric, pneumatic and hydraulic• knowledge of operating procedures• ability to apply hand-eye coordination• ability to organize power tools	150101s 150101n 150301g 150401j	Power Saws and Cut-Off Machines Hand Grinding Machines Grinding Machines and Processes Basic Hydraulics

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • ability to maintain power tools • ability to store power tools • ability to recognize worn, damaged or defective power tools 		
1.03	Uses measuring tools	<ul style="list-style-type: none"> • knowledge of types of measuring devices such as micrometers, vernier calipers, gear tooth verniers, protractors, sine bars and gauge blocks • knowledge of imperial and metric systems • ability to organize measuring devices • ability to maintain measuring devices • ability to store measuring devices • ability to recognize worn, damaged or defective measuring tools 	150101b 150101c 150101d 150101e 150101f 150101g	Basic Measuring Tools Precision Measuring Tools Angular Measuring Tools Inspection Gauges Layout Tools and Procedures Non-Cutting Hand Tools
1.04	Uses hoisting, lifting and rigging equipment	<ul style="list-style-type: none"> • knowledge of types of hoisting and lifting equipment such as jacks, chain hoists and overhead cranes • knowledge of applications of hoisting, lifting and rigging procedures 	150101tA 150101tB	Machine Shop Rigging - Part A Machine Shop Rigging - Part B

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • knowledge of limitations of lifting equipment • knowledge of hoisting and lifting equipment maintenance • knowledge of hand signals • ability to recognize worn, damaged or defective hoisting and lifting equipment 		
1.05	Uses layout tools and equipment	<ul style="list-style-type: none"> • knowledge of types of layout tools and equipment such as height gauges, angle plates, scribes and surface tables • knowledge of imperial and metric systems • ability to organize layout tools and equipment • ability to maintain layout tools and equipment • ability to store layout tools and equipment • ability to recognize worn, damaged or defective layout tools and equipment 	150101f 150101g	Layout Tools and Procedures Non-Cutting Hand Tools

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
1.06	Uses personal protective equipment (PPE) and safety equipment	<ul style="list-style-type: none"> • knowledge of types of PPE such as respiratory, hearing, eye and body protection • knowledge of PPE and safety equipment operations • knowledge of workplace safety and health regulations • knowledge of location of PPE and safety equipment • ability to inspect and maintain PPE and safety equipment • ability to store PPE and safety equipment • ability to recognize worksite hazards • ability to recognize worn, damaged or defective PPE and safety equipment 		Considered on the Job Training
1.07	Uses basic welding equipment	<ul style="list-style-type: none"> • knowledge of types of welding equipment such as oxyacetylene and metal inert gas (MIG) • knowledge of basic welding operating procedures 	150102bA 150102bB <u>Plus Welder</u> 120103b	Oxyacetylene Equipment - Part A Oxyacetylene Equipment - Part B <u>Modules</u> GMAW Filler Metals,

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • ability to perform basic welding and heating applications such as bending, heat treating, and tacking • ability to apply hand-eye coordination • ability to organize welding equipment • ability to maintain welding equipment • ability to store welding equipment • ability to recognize worn, damaged or defective welding equipment 	120103c	Shielding Gases and Safety GMAW Equipment Maintenance and Troubleshooting

2 ORGANIZES WORK

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
2.01	Interprets documentation	<ul style="list-style-type: none"> • knowledge of first and third angle projection • knowledge of symbols such as surface finishes, scales and tolerances <p>knowledge of types of documentation such as</p>	150104a 150104b 150104c 150104d 150104e	Introduction to Print Reading Dimensioning Methods Isometric Drawings Sections Applied Print Reading

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> work orders, technical data and reference manuals ability to use reference material such as <i>Machinery's Handbook</i>, tool specifications and material specifications ability to read and interpret drawings such as blueprints, engineering drawings and sketches 	<p>150205a</p> <p>150205b</p> <p>150205c</p> <p>150304a</p> <p>150304b</p> <p>150304c</p>	<p>Interpret and Sketch Prints</p> <p>Symbols and Abbreviations</p> <p>Assembly and Sub-Assembly Drawings</p> <p>Interpret and Sketch Prints</p> <p>Print Reading: Casting</p> <p>Print Reading: Jigs and Fixtures</p>
2.02	Plans sequence of operation	<ul style="list-style-type: none"> knowledge of machining operations such as turning, milling and grinding knowledge of material characteristics such as composition, properties, application and machinability knowledge of time required to complete each operation knowledge of heat treatment required ability to plan work procedures ability to prioritize operations 	<p>150101q</p> <p>150201h</p> <p>150201i</p> <p>150201j</p> <p>150201k</p> <p>150301h</p> <p>150401k</p>	<p>Speeds, Feeds and Cutting Tools</p> <p>Advanced Cutting Tool Materials</p> <p>Inserts and Tool Holders</p> <p>Using Carbide Inserts</p> <p>Shapers and Slotters</p> <p>Boring Mills</p> <p>Non-Traditional Manufacturing Processes</p>
2.03	Maintains safe work environment	<ul style="list-style-type: none"> knowledge of Workplace Hazardous Materials Information System 	<p>150101a</p>	<p>WHMIS</p>

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<p>(WHMIS)</p> <ul style="list-style-type: none"> • knowledge of federal and provincial/territorial safety regulations such as the <i>Occupational Health and Safety Act</i> (OHSA) • knowledge of types and operation of fire extinguishing equipment • knowledge of disposal and recycling procedures • knowledge of work hazards such as those associated with the operation of hand and power tools, cutting, grinding and machining equipment • knowledge of workplace housekeeping procedures and practices • knowledge of absorbent materials • knowledge of lockout procedures • ability to recognize potential hazards specific to each machining and work location • ability to handle and store hazardous 		<p>Considered on the Job Training</p>

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		materials <ul style="list-style-type: none"> • ability to organize and maintain a clean and safe work area 		
2.04	Communicates with others	<ul style="list-style-type: none"> • knowledge of technical terminology • knowledge of verbal and written communication • ability to use communication equipment and media such as Internet, email and fax • ability to translate technical information into layperson's terms • ability to gather information from customers about workpiece • ability to communicate with other related professionals such as engineers, supervisors and co-workers • ability to communicate with customers 		Considered on the Job Training

3 PROCESSES MATERIAL

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
3.01	Selects workpiece material	<ul style="list-style-type: none"> • knowledge of types and grades of material • knowledge of material characteristics such as composition, properties, application and machinability • knowledge of identification markings such as ASME systems, ANSI systems, colour codes and number systems • knowledge of material measurements • ability to determine material type and shape required • ability to visually inspect material for faults such as bends, cracks and size deviations 	150203a 150203b	Base Metals and Alloys Metal Specifications and Testing
3.02	Performs layout	<ul style="list-style-type: none"> • knowledge of layout procedures • knowledge of layout media such as dyes, paint, markers and coating • ability to apply geometry and trigonometry principles 	150104a 150104b 150104c 150104d	Introduction to Print Reading Dimensioning Methods Isometric Drawings Sections

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> ability to use charts and scientific calculators 	150104e 150205a 150205b 150205c 150304a 150304b 150304c	Applied Print Reading Interpret and Sketch Prints Symbols and Abbreviations Assembly and Sub-Assembly Drawings Interpret and Sketch Prints Print Reading: Casting Print Reading: Jigs and Fixtures
3.03	Marks workpiece for identification	<ul style="list-style-type: none"> knowledge of marking procedures such as etching, engraving, colour coding and stamping ability to mark workpiece without compromising the integrity of the workpiece 	150101f 150101g	Layout Tools and Procedures Non-Cutting Hand Tools
3.04	Performs basic heat treatment	<ul style="list-style-type: none"> knowledge of metallurgy knowledge of types of heat treatment processes such as hardening, normalizing, annealing and stress relieving 	150102a 150203a 150203b	Metallurgy Base Metals and Alloys Metal Specifications and Testing

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • knowledge of tempering colours • ability to perform basic procedures such as flame hardening and quenching • ability to apply hardness tests such as scratch, Brinell and Rockwell 		
3.05	Applies material testing	<ul style="list-style-type: none"> • knowledge of metallurgy • knowledge of types of defects and faults • ability to visually inspect material • ability to perform basic non-destructive testing (NDT) such as dye penetrant 	150102a 150203a 150203b	Metallurgy Base Metals and Alloys Metal Specifications and Testing
3.06	Deburrs workpiece	<ul style="list-style-type: none"> • knowledge of deburring techniques • ability to use deburring tools such as files, chisels, rotary deburrers, scrapers and abrasive stones • ability to assess and identify burrs and rough edges • ability to remove burrs to meet specifications 	150101h	Hand Held Cutting Tools

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • ability to secure workpiece 		
3.07	Inspects workpiece	<ul style="list-style-type: none"> • knowledge of inspection procedures and techniques such as incoming, in-process and final • knowledge of required dimensions and dimensional accuracy • knowledge of geometric dimensioning and tolerancing • ability to perform inspection techniques such as visual and manual verification using inspection equipment • ability to measure gears 	150401L 150401m 150401n 150401o 150401p	Introductions to Limits and Fits Surfacing Finish Precision Measurement Gauges and Comparators Calibration of Measuring Tools
3.08	Sketches parts	<ul style="list-style-type: none"> • knowledge of sketching techniques • knowledge of third angle projection • knowledge of dimensioning practices • ability to sketch in third angle projection 	150205a 150304a	Interpret and Sketch Prints Interpret and Sketch Prints

4 MAINTAINS MACHINES AND TOOLING

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
4.01	Cleans machines	<ul style="list-style-type: none"> • knowledge of manufacturers' specifications • knowledge of cleaning techniques and requirements • knowledge of cleaning solvents • knowledge of cleaning equipment • knowledge of machine lockout procedures • knowledge of sensitive components • ability to clean chips from inactive machine 	150101m	Machine Lubrication and Cutting Fluids
4.02	Lubricates machines	<ul style="list-style-type: none"> • knowledge of manufacturers' specifications • knowledge of types of lubricants • knowledge of lubrication points • knowledge of maintenance schedule • ability to use lubrication equipment 	150101m	Machine Lubrication and Cutting Fluids

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<p>such as grease gun, oil gun and oil feeders</p> <ul style="list-style-type: none"> • ability to check oil levels • ability to perform preventative maintenance 		
4.03	Sharpens tooling	<ul style="list-style-type: none"> • knowledge of tool geometry such as rake angles, relief angles and chip breakers • knowledge of types of tool sharpening equipment such as tool and cutter, pedestal and drill grinders • ability to set up grinding equipment • ability to perform sharpening operations 	<p>150101h</p> <p>150101n</p> <p>150101o</p> <p>150301f</p> <p>150301g</p>	<p>Hand Held Cutting Tools</p> <p>Hand Grinding Machines</p> <p>Drilling Machines</p> <p>Abrasives</p> <p>Grinding Machines and Processes</p>
4.04	Applies cutting fluid and coolant	<ul style="list-style-type: none"> • knowledge of types of cutting fluids such as oil and water soluble fluids • knowledge of types of coolants and application techniques • knowledge of mixing procedures • ability to maintain concentration of 	150101m	Machine Lubrication and Cutting Fluids

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		soluble fluids <ul style="list-style-type: none"> • ability to follow a maintenance schedule • ability to determine when to apply cutting fluid and coolant 		
4.05	Troubleshoots equipment	<ul style="list-style-type: none"> • knowledge of machine operations and components • knowledge of previous problems and potential machine malfunctions • ability to visually inspect equipment • ability to identify and isolate problem • ability to take corrective action 	150101n 150101s 150201a 150201b 150201c 150201d 150201h 150201i 150201j 150301a 150301f 150301g	Hand Grinding Machines Power Saws and Cut-Off Machines Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts Advanced Milling Abrasives Grinding Machines and Processes

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150301i	Jig Boring and Grinding
4.06	Maintains machine alignment	<ul style="list-style-type: none"> • knowledge of types of alignment equipment such as dial indicator, precision level and square • ability to make adjustments • ability to determine where and when alignment is required 	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j 150301i 150301k	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operations Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts Jig Boring and Grinding Jigs and Fixtures

B BENCH WORK**9%****5 PERFORMS HAND PROCESSES**

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
5.01	Files workpiece	<ul style="list-style-type: none">• knowledge of types of cuts such as coarse, bastard and smooth• knowledge of types of files such as single cut, double cut and needle files• knowledge of shapes and size of files such as round, flat and square• ability to select file types and file material for job requirement• ability to select filing technique for job requirement• ability to install handle onto file	150101h	Hand Held Cutting Tools
5.02	Saws workpiece	<ul style="list-style-type: none">• knowledge of tooth pitch of saw blades• knowledge of saw blade tooth set such as raker, wave and straight• knowledge of sawing techniques	150101s 150101q	Power Saws and Cut-Off Machines Speeds, Feeds and Cutting Tools

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • knowledge of holding techniques • ability to select saw blade • ability to install and tension blade 		
5.03	Performs hole making operations	<ul style="list-style-type: none"> • knowledge of holding techniques • knowledge of types of tooling such as drills, reamers and hones • ability to select drill size such as fractional, metric, letter and number 	150101o 150101q	Drilling Machines Speeds, Feeds and Cutting Tools
5.04	Performs threading operations	<ul style="list-style-type: none"> • knowledge of holding techniques • knowledge of taps such as taper, plug, bottom and pipe • knowledge of thread, pitch and form • knowledge of thread cutting techniques • ability to calculate and select tap drill size • ability to cut threads • ability to adjust die • ability to repair threads using tools 	150101h 150101i 150101j 150101k	Hand Held Cutting Tools Screw Thread Terminology Screw Thread Measurement and Gauging Fasteners and Locking Devices

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<p>such as nut dies and thread files</p> <ul style="list-style-type: none"> • ability to apply cutting fluids for cooling and chip removal 		
5.05	Installs thread inserts	<ul style="list-style-type: none"> • knowledge of types of inserts such as single coil, double coil, key insert and tabbed insert • knowledge of special taps • ability to select hole size for inserts • ability to use installation tools 	<p>150101h</p> <p>150101i</p> <p>150101j</p> <p>150101k</p>	<p>Hand Held Cutting Tools</p> <p>Screw Thread Terminology</p> <p>Screw Thread Measurement and Gauging</p> <p>Fasteners and Locking Devices</p>
5.06	Broaches workpiece	<ul style="list-style-type: none"> • knowledge of keyseat and other broach forms • knowledge of types and sizes of keys • ability to select broaches, bushings and shims • ability to produce a keyway and other broach forms • ability to perform calculations such as depth of keyway 	150301j	Machine Broaching
5.07	Performs pressing operations	<ul style="list-style-type: none"> • knowledge of types of presses such as 	150301j	Machine Broaching

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		arbour and hydraulic <ul style="list-style-type: none"> • knowledge of supporting techniques • ability to regulate pressure • ability to align parts 	150401L	Introductions to Limits and Fits
5.08	Bends workpiece	<ul style="list-style-type: none"> • knowledge of holding techniques • ability to determine bending temperature • ability to shape workpiece 	150102a 150203a 150203b	Metallurgy Base Metals and Alloys Metal Specifications and Testing
5.09	Finishes workpiece	<ul style="list-style-type: none"> • knowledge of lapping and honing techniques • knowledge of polishing and blending techniques • knowledge of abrasives • ability to select lapping and honing abrasives • ability to maintain lapping tables and plates 	150401m	Surface Finish

6 REFURBISHES COMPONENTS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
6.01	Analyzes components	<ul style="list-style-type: none"> • knowledge of fits, clearances and tolerances • ability to troubleshoot and document defect • ability to perform visual inspection • ability to perform basic NDT such as dye penetrant 	150401L	Introductions to Limits and Fits
6.02	Plans procedures	<ul style="list-style-type: none"> • knowledge of original specifications and application of components • knowledge of repair techniques • ability to plan and implement repair sequence 		Considered on the Job Training
6.03	Disassembles components	<ul style="list-style-type: none"> • knowledge of retention techniques such as snap rings, blocking collars and interference fits • ability to remove mechanical components such as bearings, seals and adapters 	150401h 150401i	Bearings and Seals Belts and Pulleys Considered on the Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • ability to determine damage requiring repair 		
6.04	Assembles components	<ul style="list-style-type: none"> • knowledge of bearings • knowledge of types of oil seals • knowledge of adhesives and joining techniques • ability to install mechanical components • ability to test fit and function 	<p>150401h</p> <p>150401i</p>	<p>Bearings and Seals</p> <p>Belts and Pulleys</p> <p>Considered on the Job Training</p>

C DRILL PRESSES

9%

7 SETS UP DRILL PRESSES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
7.01	Selects drill press types	<ul style="list-style-type: none">• knowledge of drill press types such as radial arm drill, sensitive drill press and pedestal drill• knowledge of capacity of drill press• knowledge of work holding devices and their applications	150101o 150101q	Drilling Machines Speeds, Feeds and Cutting Tools
7.02	Plans drill press sequence	<ul style="list-style-type: none">• knowledge of size and types of cutting tools• knowledge of drill press operations such as centre drilling, drilling, counterboring, countersinking, spot facing, tapping and reaming• knowledge of order of drill press operations• knowledge of capacity of drill press• ability to prioritize sequence of drill	150101o 150101q	Drilling Machines Speeds, Feeds and Cutting Tools

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		press operations		
7.03	Selects jigs, fixtures and work holding devices	<ul style="list-style-type: none"> • knowledge of types of work holding devices such as vises, V-blocks and angle plates • knowledge of types of jigs and fixtures • knowledge of clamping pressure • knowledge of capacity of work holding device • ability to match jig, fixture and work holding devices for the job setup 	150101o 150101q 150301i 150301k	Drilling Machines Speeds, Feeds and Cutting Tools Jig Boring and Grinding Jigs and Fixtures
7.04	Sets up jigs, fixtures and work holding devices	<ul style="list-style-type: none"> • knowledge of types of work holding devices such as vises, V-blocks, angle plates and clamps • knowledge of types of jigs and fixtures • ability to position, align and secure jigs and fixtures in work holding devices 	150101o 150101q 150301i 150301k	Drilling Machines Speeds, Feeds and Cutting Tools Jig Boring and Grinding Jigs and Fixtures
7.05	Selects tooling	<ul style="list-style-type: none"> • knowledge of types of tooling such as drills, reamers and taps • knowledge of cutting tool characteristics such as shape, grade, 	150101o 150101q 150301i	Drilling Machines Speeds, Feeds and Cutting Tools Jig Boring and Grinding

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		geometry and capacity <ul style="list-style-type: none"> • ability to select cutting tools and tool holders to match machining operation and material of workpiece 	150301k	Jigs and Fixtures
7.06	Sets up tooling	<ul style="list-style-type: none"> • knowledge of types of tooling such as drills, reamers and taps • knowledge of cutting tool characteristics such as shape, grade, geometry and capacity • knowledge of installation and positioning techniques • ability to mount tooling in holders and in spindles 	150101o 150101q 150301i 150301k	Drilling Machines Speeds, Feeds and Cutting Tools Jig Boring and Grinding Jigs and Fixtures
7.07	Sets up workpiece	<ul style="list-style-type: none"> • knowledge of workpiece characteristics such as shape, material and size • knowledge of clamping pressure • ability to position and secure workpiece in work holding device 	150101o 150101q 150301i 150301k	Drilling Machines Speeds, Feeds and Cutting Tools Jig Boring and Grinding Jigs and Fixtures
7.08	Selects speeds and feeds	<ul style="list-style-type: none"> • knowledge of cutting tool capacities such as depth of cut and chip load • knowledge of cutting tool materials 	150101o 150101q	Drilling Machines Speeds, Feeds and Cutting Tools

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<p>such as carbide, high speed steel (HSS) and ceramic</p> <ul style="list-style-type: none"> • knowledge of size and types of cutting tools such as drills and reamers • ability to determine rigidity of machine tool, workpiece and setup • ability to calculate speeds and feeds 	<p>150301i</p> <p>150301k</p>	<p>Jig Boring and Grinding</p> <p>Jigs and Fixtures</p>

8 OPERATES DRILL PRESSES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
8.01	Drills holes	<ul style="list-style-type: none"> • knowledge of drilling techniques such as pecking, trepanning and deep-hole drilling • knowledge of tool geometry and material • ability to recognize tool wear 	<p>150101o</p> <p>150101q</p> <p>150301i</p> <p>150301k</p>	<p>Drilling Machines</p> <p>Speeds, Feeds and Cutting Tools</p> <p>Jig Boring and Grinding</p> <p>Jigs and Fixtures</p>
8.02	Cuts countersinks, counterbores, chamfers and spot	<ul style="list-style-type: none"> • knowledge of reference material to determine fastener size and types • knowledge of reference material to 	<p>150101o</p> <p>150101q</p>	<p>Drilling Machines</p> <p>Speeds, Feeds and Cutting Tools</p>

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
	faces	determine counterbore diameter and corresponding pilot diameter <ul style="list-style-type: none"> • knowledge of required surface finish • ability to select countersinks and spot faces • ability to apply cutting fluids for lubrication and chip removal 	150301i 150301k	Jig Boring and Grinding Jigs and Fixtures
8.03	Performs tapping	<ul style="list-style-type: none"> • knowledge of tap types such as spiral flute, straight flute, spiral point and skip tooth • knowledge of thread types such as UNF, UNC, Acme, NPT, NPS and metric • knowledge of required surface finish • ability to apply tapping procedures such as use of tapping attachments and manual centering • ability to apply cutting fluids for lubrication and chip removal • ability to make adjustments to tapping attachments 	150101o 150101q 150301i 150301k	Drilling Machines Speeds, Feeds and Cutting Tools Jig Boring and Grinding Jigs and Fixtures

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
8.04	Finishes holes	<ul style="list-style-type: none"> • knowledge of hole finishing techniques such as boring, honing and reaming • knowledge of required surface finish of hole • ability to recognize tool wear • ability to apply cutting fluids for lubrication and chip removal 	150101o 150101q 150301i 150301k	Drilling Machines Speeds, Feeds and Cutting Tools Jig Boring and Grinding Jigs and Fixtures

D LATHES**22%****9 SETS UP LATHES**

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
9.01	Selects lathe types	<ul style="list-style-type: none">• knowledge of lathe types such as engine lathes, turret lathes and vertical lathes• knowledge of capacity of lathe such as swing and size• knowledge of work holding devices	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
9.02	Plans lathe sequence	<ul style="list-style-type: none">• knowledge of lathe operations such as turning, threading, boring and grinding• knowledge of machining capacity of lathe• knowledge of sequence of lathe operations	150101p 150101q 150101r 150201f 150201g	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> ability to prioritize sequence of lathe operations 	150201h 150201i 150201j	Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
9.03	Selects work holding devices	<ul style="list-style-type: none"> knowledge of types of work holding devices such as four-jaw chuck, three-jaw chuck, face plate and fixtures knowledge of clamping pressure knowledge of capacity of work holding device ability to select work holding device to match workpiece requirements 	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
9.04	Sets up work holding devices	<ul style="list-style-type: none"> knowledge of types of work holding devices such as four-jaw chuck, three-jaw chuck, face plate and fixtures knowledge of mounting types such as cam lock and threaded spindle nose ability to position, align and secure work holding device 	150101p 150101q 150101r 150201f 150201g	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150201h	Advanced Cutting Tool Materials
			150201i	Inserts and Toolholders
			150201j	Using Carbide Inserts
9.05	Selects tooling	<ul style="list-style-type: none"> • knowledge of types of tooling such as indexable insert and HSS • knowledge of cutting tool characteristics such as shape, grade, geometry and capacity • ability to select cutting tools and tool holders to match machining operation and material of workpiece 	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
9.06	Sets up tooling	<ul style="list-style-type: none"> • knowledge of types of tooling such as turning, boring, drilling and grinding • knowledge of cutting tool characteristics such as shape and dimensions • knowledge of installation and positioning techniques 	150101p 150101q 150101r 150201f 150201g	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> ability to mount tooling in holders and in lathes 	150201h 150201i 150201j	Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
9.07	Selects lathe accessories	<ul style="list-style-type: none"> knowledge of types of accessories such as taper attachments, steady rests and follower rests knowledge of contact material for steady rests and follower rests such as bronze pads, brass pads and rollers ability to select accessory to match workpiece requirements 	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
9.08	Sets up lathe accessories	<ul style="list-style-type: none"> knowledge of types of accessories such as taper attachments, steady rests and follower rests knowledge of setup and alignment techniques ability to position, fasten and adjust accessories 	150101p 150101q 150101r 150201f 150201g	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> ability to perform calculations such as taper and parallelism correction 	150201h 150201i 150201j	Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
9.09	Sets up workpiece	<ul style="list-style-type: none"> knowledge of workpiece characteristics such as shape, material and size knowledge of setup and alignment techniques such as dialling-in and shimming ability to position and secure workpiece in work holding device 	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
9.10	Selects speeds and feeds	<ul style="list-style-type: none"> knowledge of cutting tool capacities such as depth of cut and chip load knowledge of cutting tool materials such as carbide, HSS and ceramic knowledge of size and types of cutting tools such as boring bars, facing tools and turning tools 	150101p 150101q 150101r 150201f 150201g	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> ability to determine rigidity of machine tool, workpiece and setup ability to calculate speeds and feeds 	150201h	Advanced Cutting Tool Materials
			150201i	Inserts and Toolholders
			150201j	Using Carbide Inserts

10 OPERATES LATHES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
10.01	Turns surfaces	<ul style="list-style-type: none"> knowledge of required surface finish knowledge of tool geometry ability to prepare workpiece for machining operations using procedures such as centre drilling, machining steady rest band and facing ability to turn internal and external surfaces ability to recognize tool wear 	150101p	Types of Lathes
			150101q	Speeds Feeds and Cutting Tools
			150101r	Lathe Operation
			150201f	Advanced Threading
			150201g	Lathe Attachments & Accessories
			150201h	Advanced Cutting Tool Materials
			150201i	Inserts and Toolholders
			150201j	Using Carbide Inserts
10.02	Faces surfaces	<ul style="list-style-type: none"> knowledge of required surface finish 	150101p	Types of Lathes

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> ability to prepare workpiece for machining operations using procedures such as centre drilling, machining steady rest band and facing ability to face internal and external surfaces ability to recognize tool wear 	150101q 150101r 150201f 150201g 150201h 150201i 150201j	Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
10.03	Turns tapers	<ul style="list-style-type: none"> knowledge of required surface finish knowledge of types of tapers such as Morse, Brown & Sharpe and non-standardized knowledge of tool geometry knowledge of procedures for turning tapers such as using taper turning attachments, using compound rests and tail stock offsets ability to calculate tapers ability to turn internal and external tapers such as machine tapers and self- 	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		holding tapers <ul style="list-style-type: none"> • ability to recognize tool wear 		
10.04	Knurls	<ul style="list-style-type: none"> • knowledge of required surface finish • knowledge of tools and tool holders • ability to select knurling wheels for pattern and size • ability to recognize tool wear affecting knurling efficiency • ability to verify that knurled surface meets specifications 	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
10.05	Parts off workpiece	<ul style="list-style-type: none"> • knowledge of required surface finish • knowledge of types of parting tools such as carbide and HSS • knowledge of tool geometry • ability to recognize tool wear 	150101p 150101q 150101r 150201f 150201g 150201h	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150201i	Inserts and Toolholders
			150201j	Using Carbide Inserts
10.06	Drills	<ul style="list-style-type: none"> • knowledge of required surface finish • knowledge of drilling techniques such as pecking, trepanning and deep-hole drilling • knowledge of tool geometry • ability to recognize tool wear • ability to set up and secure workpiece • ability to apply cutting fluids for cooling and chip removal 	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
10.07	Finishes holes	<ul style="list-style-type: none"> • knowledge of required surface finish • knowledge of hole finishing techniques such as drilling, reaming, boring and honing • ability to recognize tool wear • ability to apply cutting fluids for cooling and chip removal 	150101p 150101q 150101r 150201f 150201g 150201h	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150201i	Inserts and Toolholders
			150201j	Using Carbide Inserts
10.08	Cuts grooves	<ul style="list-style-type: none"> • knowledge of required surface finish • knowledge of types of grooving tools such as carbide and HSS • knowledge of tool geometry • ability to recognize tool wear • ability to set up and position workpiece for grooving internal and external surfaces 	150101p 150101q 150101r 150201f 150201g 150201h 150201i 150201j	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials Inserts and Toolholders Using Carbide Inserts
10.09	Cuts threads	<ul style="list-style-type: none"> • knowledge of types of common threads such as UNC, NPT, Acme and metric • knowledge of procedures and techniques to produce internal and external threads • knowledge of single and multi-start threads • ability to perform thread calculations 	150101p 150101q 150101r 150201f 150201g 150201h	Types of Lathes Speeds Feeds and Cutting Tools Lathe Operation Advanced Threading Lathe Attachments & Accessories Advanced Cutting Tool Materials

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • ability to identify left and right hand thread • ability to use die heads and tapping heads • ability to grind cutting tool to produce thread form • ability to set up machine to cut external and internal threads • ability to set up machine to cut special threads • ability to recognize tool wear 	<p>150201i</p> <p>150201j</p> <p>150301b</p> <p>150301c</p>	<p>Inserts and Toolholders</p> <p>Using Carbide Inserts</p> <p>Worm Thread</p> <p>Multiple Start Threads</p>
10.10	Turns eccentrics	<ul style="list-style-type: none"> • knowledge of procedures for turning eccentric diameter • ability to calculate centre offset • ability to recognize tool wear • ability to set up and position workpiece for turning eccentrics 	<p>150101p</p> <p>150101q</p> <p>150101r</p> <p>150201f</p> <p>150201g</p> <p>150201h</p> <p>150201i</p>	<p>Types of Lathes</p> <p>Speeds Feeds and Cutting Tools</p> <p>Lathe Operation</p> <p>Advanced Threading</p> <p>Lathe Attachments & Accessories</p> <p>Advanced Cutting Tool Materials</p> <p>Inserts and Toolholders</p>

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150201j	Using Carbide Inserts

11 SETS UP MILLING MACHINES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
11.01	Selects mill types	<ul style="list-style-type: none">• knowledge of milling machine types such as vertical, horizontal, ram and turret, and horizontal boring mill• knowledge of capacity of milling machine• knowledge of work holding devices	150201a 150201b 150201c 150201d 150301a 150301d 150301e 150401a 150401b 150401c 150401d 150401e 150401f	Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150401g	Splines
11.02	Plans milling sequence	<ul style="list-style-type: none"> • knowledge of milling techniques such as climb milling, conventional milling and boring • knowledge of milling machine operations such as facing, contouring, cutting T-slots and dovetails, and boring • knowledge of roughing and finishing operations • knowledge of machining capacity of milling machine • knowledge of sequence of milling operations • ability to prioritize sequence of milling operations • ability to operate horizontal boring mills 	150201a 150201b 150201c 150201d 150301a 150301d 150301e 150401a 150401b 150401c 150401d 150401e 150401f 150401g	Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating Splines
11.03	Selects work holding devices	<ul style="list-style-type: none"> • knowledge of clamping pressure 	150201a	Milling Machines

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • knowledge of capacity of work holding device • ability to select work holding device to match workpiece requirements 	150201b 150201c 150201d 150301a 150301d 150301e 150401a 150401b 150401c 150401d 150401e 150401f 150401g	Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating Splines
11.04	Sets up work holding devices	<ul style="list-style-type: none"> • knowledge of types of work holding devices such as vises, angle plates and V-blocks • knowledge of mounting and aligning 	150201a 150201b 150201c	Milling Machines Milling Cutters Tool and Workholding Devices

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<p>techniques and procedures</p> <ul style="list-style-type: none"> ability to position, align and secure work holding device to match workpiece requirements 	<p>150201d</p> <p>150301a</p> <p>150301d</p> <p>150301e</p> <p>150401a</p> <p>150401b</p> <p>150401c</p> <p>150401d</p> <p>150401e</p> <p>150401f</p> <p>150401g</p>	<p>Milling Operations</p> <p>Advanced Milling</p> <p>Introduction to Gearing</p> <p>Gear Manufacturing Methods</p> <p>Spur Gears and Milling</p> <p>Helical Gears</p> <p>Worm Gears</p> <p>Bevel Gears</p> <p>Cams</p> <p>Graduating</p> <p>Splines</p>
11.05	Selects tooling	<ul style="list-style-type: none"> knowledge of types of tooling such as HSS tooling, carbide tooling and carbide inserts knowledge of cutting tool characteristics such as shape, grade, geometry and capacity ability to select cutting tools and tool 	<p>150201a</p> <p>150201b</p> <p>150201c</p> <p>150201d</p> <p>150301a</p>	<p>Milling Machines</p> <p>Milling Cutters</p> <p>Tool and Workholding Devices</p> <p>Milling Operations</p> <p>Advanced Milling</p>

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		holders to match machining operation and material of workpiece	150301d	Introduction to Gearing
			150301e	Gear Manufacturing Methods
			150401a	Spur Gears and Milling
			150401b	Helical Gears
			150401c	Worm Gears
			150401d	Bevel Gears
			150401e	Cams
			150401f	Graduating
			150401g	Splines
11.06	Sets up tooling	<ul style="list-style-type: none"> • knowledge of types of tooling such as HSS tooling, carbide tooling and carbide inserts • knowledge of installation and positioning techniques • ability to mount tooling in tool holders • ability to recognize insert wear • ability to replace inserts 	150201a	Milling Machines
			150201b	Milling Cutters
			150201c	Tool and Workholding Devices
			150201d	Milling Operations
			150301a	Advanced Milling
			150301d	Introduction to Gearing
			150301e	Gear Manufacturing Methods

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> ability to mount tool holder in machines 	150401a 150401b 150401c 150401d 150401e 150401f 150401g	Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating Splines
11.07	Selects milling accessories	<ul style="list-style-type: none"> knowledge of types of accessories such as rotary tables and indexing heads ability to select accessory to match workpiece requirements 	150201a 150201b 150201c 150201d 150301a 150301d 150301e 150401a 150401b	Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150401c	Worm Gears
			150401d	Bevel Gears
			150401e	Cams
			150401f	Graduating
			150401g	Splines
11.08	Sets up milling accessories	<ul style="list-style-type: none"> • knowledge of types of accessories such as rotary tables and indexing heads • knowledge of setup and alignment techniques • ability to position, fasten and adjust accessories to match workpiece requirements • ability to perform calculations such as direct, simple, angular and differential indexing 	150201a 150201b 150201c 150201d 150301a 150301d 150301e 150401a 150401b 150401c 150401d	Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150401e	Cams
			150401f	Graduating
			150401g	Splines
11.09	Sets up workpiece	<ul style="list-style-type: none"> • knowledge of workpiece characteristics such as shape, material and size • knowledge of setup and alignment techniques such as dialling-in workpiece • ability to position and secure workpiece in work holding device • ability to establish workpiece zero reference point • ability to align machine to datum using edge finder and digital readout system 	150201a 150201b 150201c 150201d 150301a 150301d 150301e 150401a 150401b 150401c 150401d 150401e 150401f	Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150401g	Splines
11.10	Selects speeds and feeds	<ul style="list-style-type: none"> • knowledge of cutting tool capacities such as depth of cut and chip load • knowledge of cutting tool materials such as carbide, HSS and ceramic • knowledge of size and types of cutting tools such as boring bars, end mills and face mills • ability to determine rigidity of machine tool, workpiece and setup • ability to calculate speeds and feeds 	150201a 150201b 150201c 150201d 150301a 150301d 150301e 150401a 150401b 150401c 150401d 150401e 150401f 150401g	Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating Splines

12 OPERATES MILLING MACHINES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
12.01	Faces surfaces	<ul style="list-style-type: none"> • knowledge of required surface finish • knowledge of methods of milling such as climb milling and conventional milling • knowledge of tool geometry • ability to machine vertical, horizontal and angled surfaces • ability to recognize tool wear • ability to calculate dimensions from reference point 	150201a 150201b 150201c 150201d 150301a 150301d 150301e 150401a 150401b 150401c 150401d 150401e 150401f 150401g	Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating Splines
12.02	Mills profiles and	<ul style="list-style-type: none"> • knowledge of required surface finish 	150201a	Milling Machines

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
	pockets	<ul style="list-style-type: none"> • knowledge of types and applications of specialized cutters • knowledge of tool geometry • knowledge of procedures for cutting pockets and profiles such as T-slots, dovetails and keyways • ability to recognize tool wear • ability to perform profile calculations • ability to apply cutting fluids for cooling and chip removal • ability to cut profiles using accessories such as rotary tables and indexing heads 	150201b 150201c 150201d 150301a 150301d 150301e 150401a 150401b 150401c 150401d 150401e 150401f 150401g	Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating Splines
12.03	Drills holes	<ul style="list-style-type: none"> • knowledge of drilling techniques such as pecking, trepanning and deep-hole drilling • knowledge of tool geometry and 	150201a 150201b 150201c	Milling Machines Milling Cutters Tool and Workholding Devices

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		composition <ul style="list-style-type: none"> • ability to recognize tool wear • ability to apply cutting fluids for cooling and chip removal 	150201d 150301a 150301d 150301e 150401a 150401b 150401c 150401d 150401e 150401f 150401g	Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating Splines
12.04	Cuts countersinks, counterbores, chamfers and spot faces	<ul style="list-style-type: none"> • knowledge of reference material to determine fastener size and types for selected operation • knowledge of reference material to determine counterbore diameter and corresponding pilot diameter • knowledge of required surface finish 	150201a 150201b 150201c 150201d 150301a	Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • ability to select countersinks and spot faces • ability to apply cutting fluids for cooling and chip removal 	150301d 150301e 150401a 150401b 150401c 150401d 150401e 150401f 150401g	Introduction to Gearing Gear Manufacturing Methods Spur Gears and Milling Helical Gears Worm Gears Bevel Gears Cams Graduating Splines
12.05	Performs tapping	<ul style="list-style-type: none"> • knowledge of types of threads such as UNF, UNC and metric • knowledge of required surface finish • ability to apply tapping procedures such as use of tapping head and manual centering • ability to apply cutting fluids for cooling and chip removal 	150201a 150201b 150201c 150201d 150301a 150301d 150301e	Milling Machines Milling Cutters Tool and Workholding Devices Milling Operations Advanced Milling Introduction to Gearing Gear Manufacturing Methods

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150401a	Spur Gears and Milling
			150401b	Helical Gears
			150401c	Worm Gears
			150401d	Bevel Gears
			150401e	Cams
			150401f	Graduating
			150401g	Splines
12.06	Finishes holes	<ul style="list-style-type: none"> • knowledge of hole finishing techniques such as drilling, reaming, boring and honing • knowledge of required surface finish of hole • ability to recognize tool wear • ability to apply fluids for cooling and chip removal 	150201a	Milling Machines
			150201b	Milling Cutters
			150201c	Tool and Workholding Devices
			150201d	Milling Operations
			150301a	Advanced Milling
			150301d	Introduction to Gearing
			150301e	Gear Manufacturing Methods
			150401a	Spur Gears and Milling
			150401b	Helical Gears

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150401c	Worm Gears
			150401d	Bevel Gears
			150401e	Cams
			150401f	Graduating
			150401g	Splines

F SAWS**6%****13 SETS UP POWER SAWS**

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
13.01	Selects saw types	<ul style="list-style-type: none">• knowledge of saw types such as vertical, horizontal and reciprocating• knowledge of capacity of saw such as speed, feed and size• knowledge of work holding devices• knowledge of shape and composition of workpiece material	150101s	Power Saws and Cut-Off Machines
13.02	Selects saw blades	<ul style="list-style-type: none">• knowledge of types and capabilities of power saws• knowledge of types of workpiece material and shapes to be cut• knowledge of blade sizes, set, tooth pitch and composition• knowledge of blade length and width• knowledge of blade effect on cutting	150101s	Power Saws and Cut-Off Machines

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<p>rate, tool life, finish and accuracy</p> <ul style="list-style-type: none"> • knowledge of break-in period of new blades 		
13.03	Installs blades	<ul style="list-style-type: none"> • knowledge of installation techniques and procedures for various saws • ability to handle coiled saw blades • ability to measure and cut blade to size • ability to join and grind saw blades • ability to position blade in machine • ability to set and adjust blade tension • ability to set and position blade guides • ability to break in saw blade 	150101s	Power Saws and Cut-Off Machines
13.04	Selects speeds and feeds	<ul style="list-style-type: none"> • knowledge of type and capacity of saw • knowledge of saw blade parameters such as size, tooth pitch, set and composition • ability to determine rigidity of machine, workpiece and setup 	150101s	Power Saws and Cut-Off Machines

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • ability to calculate speeds and feeds 		
13.05	Makes saw adjustments	<ul style="list-style-type: none"> • knowledge of types of saws • ability to adjust saw settings such as angles, guides, stops, speeds and feeds 	150101s	Power Saws and Cut-Off Machines
13.06	Sets up workpiece	<ul style="list-style-type: none"> • knowledge of workpiece characteristics such as shape, material and size • knowledge of clamping pressures • ability to position and secure workpiece in work holding device • ability to position work support device 	150101t	Machine Shop Rigging

14 OPERATES POWER SAWS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
14.01	Saws straight and angle cuts	<ul style="list-style-type: none"> • knowledge of types of saws such as horizontal, vertical and reciprocating • knowledge of sawing procedures • ability to cut test piece to verify 	150101s	Power Saws and Cut-Off Machines

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<p>workpiece</p> <ul style="list-style-type: none"> • ability to apply cutting fluid for cooling and chip removal 		
14.02	Cuts irregular shapes	<ul style="list-style-type: none"> • knowledge of types of saws such as horizontal, vertical and reciprocating • knowledge of sawing procedures • ability to lay out workpiece • ability to feed material and follow contour layout line • ability to apply cutting fluid for cooling and chip removal 	150101s	Power Saws and Cut-Off Machines

G GRINDERS**8%****15 SETS UP GRINDERS**

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
15.01	Selects grinder types	<ul style="list-style-type: none">• knowledge of types of grinding machine such as surface, cylindrical, centreless, and tool and cutter• knowledge of capacity of grinding machine• knowledge of work holding devices• knowledge of grinding machine accessories such as support rests and power heads	150101s 150101n 150301f 150301g 150301i	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes Jig Boring and Grinding
15.02	Plans grinding sequence	<ul style="list-style-type: none">• knowledge of types and grades of grinding wheels such as cubic boron nitride (CBN), aluminium oxide and silicon carbide• knowledge of grinding machine operations such as surface, cylindrical, tool and cutter, and centreless grinding• knowledge of sequence of grinding	150101s 150101n 150301f 150301g 150301i	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes Jig Boring and Grinding

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<p>machine operations</p> <ul style="list-style-type: none"> • knowledge of grinding capacity of grinding machines • ability to prioritize the sequence of grinding operations 		
15.03	Selects work holding devices	<ul style="list-style-type: none"> • knowledge of types of work holding devices such as centres, four-jaw chuck, three-jaw chuck, face plate, fixtures, magnetic chuck and magnetic sub-plates • knowledge of clamping pressure • knowledge of capacity of work holding device • ability to select work holding device to match workpiece requirements 	<p>150101s</p> <p>150101n</p> <p>150301f</p> <p>150301g</p> <p>150301i</p>	<p>Power Saws and Cut-Off Machines</p> <p>Hand Grinding Machines</p> <p>Abrasives</p> <p>Grinding Machines and Processes</p> <p>Jig Boring and Grinding</p>
15.04	Sets up work holding devices	<ul style="list-style-type: none"> • knowledge of types of work holding devices such as centres, four-jaw chuck, three-jaw chuck, face plate, fixtures, magnetic chuck and magnetic sub-plates • knowledge of mounting techniques • ability to position, align and secure 	<p>150101s</p> <p>150101n</p> <p>150301f</p> <p>150301g</p> <p>150301i</p>	<p>Power Saws and Cut-Off Machines</p> <p>Hand Grinding Machines</p> <p>Abrasives</p> <p>Grinding Machines and Processes</p> <p>Jig Boring and Grinding</p>

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		work holding devices		
15.05	Selects grinding wheel	<ul style="list-style-type: none"> • knowledge of types, grades and sizes of grinding wheels • ability to interpret standard grading system • ability to determine abrasive type, grain size, grade, structure and bond 	150101s 150101n 150301f 150301g 150301i	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes Jig Boring and Grinding
15.06	Mounts grinding wheel	<ul style="list-style-type: none"> • knowledge of types, grades and sizes of grinding wheels • knowledge of techniques and procedures for storing, handling and mounting grinding wheels • knowledge of blotter applications • knowledge of balancing techniques and procedures • knowledge of truing and dressing techniques and procedures such as contour dressing and diamond dressing • ability to visually inspect and ring test grinding wheels 	150101s 150101n 150301f 150301g 150301i	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes Jig Boring and Grinding

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • ability to install grinding wheel on a balancing mandrel • ability to balance grinding wheel • ability to install grinding wheel on grinding machine • ability to select truing and dressing tools • ability to dress and true grinding wheel 		
15.07	Selects grinding accessories	<ul style="list-style-type: none"> • knowledge of types of accessories such as rests, tail stock, internal grinding head, wheel dressers, laminated blocks, magnetic spring clamps, chucks, drive dogs and mandrels • ability to select accessory to match workpiece requirements 	150101s 150101n 150301f 150301g 150301i	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes Jig Boring and Grinding
15.08	Sets up grinding accessories	<ul style="list-style-type: none"> • knowledge of types of accessories such as rests, tail stock, internal grinding head, wheel dressers, laminated blocks, magnetic spring clamps, chucks, drive dogs and mandrels • knowledge of contact material for steady rests and follower rests such as 	150101s 150101n 150301f 150301g	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		bronze pads and brass pad <ul style="list-style-type: none"> • knowledge of setup and alignment techniques • ability to position, fasten and adjust accessories • ability to perform taper calculations 	150301i	Jig Boring and Grinding
15.09	Sets up workpiece	<ul style="list-style-type: none"> • knowledge of workpiece characteristics such as shape, material and size • knowledge of setup and alignment techniques such as shimming and dialling-in • ability to clean and maintain magnetic work holding device • ability to position and secure workpiece in work holding device 	150101s 150101n 150301f 150301g 150301i	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes Jig Boring and Grinding
15.10	Selects speeds and feeds	<ul style="list-style-type: none"> • knowledge of the effect of speeds, feeds and depth of cut on finish and wheel life • knowledge of grinding wheels • ability to determine rigidity of machine 	150101s 150101n 150301f 150301g	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		tool, workpiece and setup <ul style="list-style-type: none"> • ability to calculate speeds and feeds 	150301i	Jig Boring and Grinding

16 OPERATES GRINDERS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
16.01	Grinds flat surfaces	<ul style="list-style-type: none"> • knowledge of types of surface grinders such as vertical and horizontal • knowledge of surface grinding techniques required to produce surfaces such as parallel, flat and square • ability to select grinder type • ability to identify when wheels require dressing • ability to plunge grind and traverse grind 	150101s 150101n 150301f 150301g 150301i	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes Jig Boring and Grinding
16.02	Grinds profiles	<ul style="list-style-type: none"> • knowledge of types of grinding machines • knowledge of types of profiles such as 	150101s 150101n 150301f	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		vees and radii <ul style="list-style-type: none"> • knowledge of cylindrical and surface grinding techniques to produce profiles such as angles, radii, recesses, shoulders and special forms 	150301g 150301i	Grinding Machines and Processes Jig Boring and Grinding
16.03	Grinds cylindrical and tapered surfaces	<ul style="list-style-type: none"> • knowledge of types of cylindrical grinders such as centreless, universal, external and internal • knowledge of setup and alignment techniques for drive plates, grinder carriers, drive dogs, trip dogs, tail stock, centres, chucks, work heads, wheel heads and the upper table • ability to position and secure workpiece between centres • ability to perform internal, external, plunge and traverse grinding 	150101s 150101n 150301f 150301g 150301i	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes Jig Boring and Grinding
16.04	Grinds tools and cutters	<ul style="list-style-type: none"> • knowledge of types of tool and cutter grinders such as drill grinders and end mill grinders • knowledge of accessories • knowledge of cutter types such as form 	150101s 150101n 150301f 150301g	Power Saws and Cut-Off Machines Hand Grinding Machines Abrasives Grinding Machines and Processes

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		relief cutters, reamers and end mills <ul style="list-style-type: none"> • knowledge of relief angles and clearances • knowledge of setup techniques • ability to sharpen cutters 	150301i	Jig Boring and Grinding

H COMPUTER NUMERICAL CONTROL (CNC) MACHINES

11%

17 PERFORMS BASIC CNC PROGRAMMING

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
17.01	Reviews process documentation	<ul style="list-style-type: none">• knowledge of order of CNC machining operations• ability to read and interpret workpiece documentation such as drawings and setup sheets• ability to read and interpret reference material such as charts, tables, CAM files and <i>Machinery's Handbook</i>	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402k	Set-Up Procedures
17.02	Calculates coordinates for tool path	<ul style="list-style-type: none"> • knowledge of Cartesian Coordinate System • knowledge of trigonometry • ability to perform calculations 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
				CNC Turning Centres: Tool Nose

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302e	Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
17.03	Inputs program data into control memory	<ul style="list-style-type: none"> • knowledge of CNC machine control • ability to select and load programs • ability to store and retrieve programs • ability to manually input program data 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302g	Calculations CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures
17.04	Interprets program codes	<ul style="list-style-type: none"> • knowledge of programming codes such as G, M and S codes • ability to relate program code to 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		machine movement		Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures
17.05	Edits program	<ul style="list-style-type: none"> • knowledge of programming codes such as G, M and S codes • ability to review program to verify accuracy • ability to modify and update program 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures

18 SETS UP CNC MACHINES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
18.01	Selects tooling and tool holders	<ul style="list-style-type: none"> knowledge of types of tooling such as indexable insert tooling and HSS tooling knowledge of types of tool holders 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • knowledge of cutting tool characteristics such as shape, grade, geometry and capacity • knowledge of tool holder characteristics • knowledge of cutting tool and tool holder identification system • ability to verify size and shape of cutting tool and tool holder 	150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures
18.02	Sets up tooling and tool holders	<ul style="list-style-type: none"> • knowledge of types of tooling such as indexable insert tooling and HSS tooling • knowledge of types of tool holders • ability to position and secure tooling and tool holders with techniques such as shrink fit and clamping 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		<ul style="list-style-type: none"> • ability to orient cutting tool in tool holder • ability to touch off tooling and establish offsets 	<p>150202e</p> <p>150202f</p> <p>150302a</p> <p>150302b</p> <p>150302c</p> <p>150302d</p> <p>150302e</p> <p>150302f</p> <p>150302g</p> <p>150302i</p> <p>150402c</p> <p>150402d</p>	<p>Conditions and Operations</p> <p>CNC Turning Centres: Programming and Concept Codes</p> <p>CNC Turning Centres: Program Application</p> <p>CNC Turning Centres: Program Codes and Formats</p> <p>Fixed Canned Cycles</p> <p>Linear & Circular Interpolation</p> <p>Multiple Repetitive Cycles</p> <p>CNC Turning Centres: Tool Nose Radius Compensation</p> <p>CNC Threading I: Introduction and Calculations</p> <p>CNC Threading II: Programming and Troubleshooting</p> <p>Machine Control and Operation</p> <p>Machine and Workpiece Co-Ordinate Systems</p> <p>Programming Concepts, Codes and</p>

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402e	Structure
			150402f	Machining Conditions Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures
18.03	Establishes work datum	<ul style="list-style-type: none"> • knowledge of CNC machine control • knowledge of machine codes to establish work datum • ability to read and interpret workpiece documentation such as drawings and setup sheets • ability to use probes and edge finders • ability to manually adjust machine axes 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures
18.04	Sets up workpiece	<ul style="list-style-type: none"> • knowledge of workpiece characteristics such as shape, material and size • knowledge of setup and alignment techniques such as dialling-in and shimming • ability to position and secure workpiece in work holding device 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures
18.05	Verifies program	<ul style="list-style-type: none"> • knowledge of programming codes such as G, M and S codes • ability to perform dry run and single block cycle to check tool path • ability to relate program code to machine movement 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402j	Cutter Radius Compensation
			150402k	Advanced Programming Concepts and Applications
				Set-Up Procedures

19 OPERATES CNC MACHINES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
19.01	Adjusts offsets	<ul style="list-style-type: none"> • knowledge of CNC machine control • knowledge of types of offsets and compensations such as length, diameter and tool nose radius • ability to adjust machine offset parameters 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures
19.02	Loads/unloads workpiece	<ul style="list-style-type: none"> • knowledge of clamping pressur • ability to use work holding devices such as hydraulic chucks and vises 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications
			150402k	Set-Up Procedures
19.03	Monitors machining processes	<ul style="list-style-type: none"> • knowledge of tool life expectancy • knowledge of load monitoring system • knowledge of machine alarms and alarm codes • ability to recognize signs of tool wear such as poor finish, vibration and excessive noise • ability to correct observed problems • ability to use machine overrides such as rapid override and speed and feed override • ability to recognize chip control problems • ability to ensure cutting fluid delivery 	150202a 150202b 150202c 150202d 150202e 150202f 150302a	CNC Machines: Introduction and Applications CNC Turning Centres: Machine Types, Parts and Workpiece Acc. CNC Turning Centres: Program and Machine Co-Ordinate Sys. CNC Turning Centres: Cutting Conditions and Operations CNC Turning Centres: Programming and Concept Codes CNC Turning Centres: Program Application CNC Turning Centres: Program Codes and Formats

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402j	Cutter Radius Compensation
			150402k	Advanced Programming Concepts and Applications Set-Up Procedures
19.04	Interrupts program cycle	<ul style="list-style-type: none"> • knowledge of manual cycle stop procedures • ability to move machine axes to take corrective action 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302d	Multiple Repetitive Cycles
			150302e	CNC Turning Centres: Tool Nose Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions
			150402f	Canned Cycles: Theory
			150402g	Canned Cycles: Program App.
			150402h	Linear and Circular Interpolation
			150402i	Cutter Radius Compensation
			150402j	Advanced Programming Concepts and Applications

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150402k	Set-Up Procedures
19.05	Restarts program cycle	<ul style="list-style-type: none"> • knowledge of CNC machine controls • ability to locate restart point in program • ability to position machine to avoid collision on restart 	150202a	CNC Machines: Introduction and Applications
			150202b	CNC Turning Centres: Machine Types, Parts and Workpiece Acc.
			150202c	CNC Turning Centres: Program and Machine Co-Ordinate Sys.
			150202d	CNC Turning Centres: Cutting Conditions and Operations
			150202e	CNC Turning Centres: Programming and Concept Codes
			150202f	CNC Turning Centres: Program Application
			150302a	CNC Turning Centres: Program Codes and Formats
			150302b	Fixed Canned Cycles
			150302c	Linear & Circular Interpolation
			150302d	Multiple Repetitive Cycles
				CNC Turning Centres: Tool Nose

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			150302e	Radius Compensation
			150302f	CNC Threading I: Introduction and Calculations
			150302g	CNC Threading II: Programming and Troubleshooting
			150302i	Machine Control and Operation
			150402c	Machine and Workpiece Co-Ordinate Systems
			150402d	Programming Concepts, Codes and Structure
			150402e	Machining Conditions Canned Cycles: Theory
			150402f	Canned Cycles: Program App.
			150402g	Linear and Circular Interpolation
			150402h	Cutter Radius Compensation
			150402i	Advanced Programming Concepts and Applications
			150402j	Set-Up Procedures
			150402k	

