

INDUSTRIAL TECHNOLOGY

MECHANICAL ENGINEERING LEVEL 7

Topic	Skills	Knowledge	Understanding	Attitude	Content	Method/ Strategies	Evaluation	Area of Integration
Introduction to Mechanical Engineering Technology		<p>History of industries, types of industries.</p> <p>Careers corners in Engineering Mechanical Technology e.g.</p> <ul style="list-style-type: none"> • Lathe • Milling machine operator • Layout worker • Plumber fitter • Welder • Mechanical technician 	Recognize importance of Mechanical Engineering Technology Industries.	Appreciate the importance of Mechanical Engineering Technology in our society.	<p>Classes of workers</p> <ul style="list-style-type: none"> • Unskilled • Semi-skilled • Skilled • Technician <p>Metals used in Engineering.</p>	<p>Invite students to express their understanding of industries.</p> <p>With students involvement teacher lists on chalkboard some industries -large and small in Guyana.</p> <p>Teacher explains and lists types of materials and the industries.</p>	<p>Written:-</p> <p>Students write three sentences to describe each class of workers.</p> <p>Oral questioning Written assignment.</p>	<p>Mathematics</p> <p>Science</p> <p>Physics</p> <p>Reading</p>

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Safety	<p>Correct use of layout tools</p> <ul style="list-style-type: none"> - rule - scribe - scratch awl - dividers - square <p>Perform their work safely in the workshop.</p>	<ul style="list-style-type: none"> - Explain the difference between personal safety and protection against personal injuries. - Environmental safety i.e materials are placed on rack, on oil and grease spill on floor. - Explain what is meant by good housekeeping - Material storage after lessons. - Storage of tools - Material storage - Cleaning up after classes - Storage of tools. 	<p>The need for protection against personal injury.</p> <p>The necessity to act safely in the workshop.</p>	<p>Follow correct work procedures and work well with other students</p> <p>Strict adherence to safety rules.</p> <ul style="list-style-type: none"> - Place metals to their proper storage rack immediately after use. - Return tools to cupboard at the end of each period. - Wipe tools to remove grease/dirt before and after use - Place metals to their proper storage rack immediately after use. - Return tools to cupboard at the end of each period. - Wipe tools to remove grease/dirt before and after use. 	<ul style="list-style-type: none"> - Difference between personal and environmental safety. - Personal clothing, goggles and acceptable behaviour in workshop. - Good housekeeping - Storage of materials. - Storage of tools. - Cleaning up i.e clearing scrap materials from floor. - Cleaning up oil spill and grease from floor.. 	<p>Teacher displays photographs on how to dress safely.</p> <ol style="list-style-type: none"> 1. Teacher explains each aspect of safety. 2. Organise video show on safety in the workshop. 	<p>Paper and pencil test.</p> <p>Questioning – oral</p> <p>Observe students while they work and point out what is safe and unsafe practices.</p>	<p>Health Education</p> <p>Environmental Studies</p> <p>Integrated Science.</p>

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Measuring Tools i) Engineers Rule ii) Steel Tape	Identify measuring tools - Steel rule - Steel tape	Identify measuring tools ▪ Steel rule ▪ Steel tape	Relationship between millimeters and centimeters.	Appreciate that accurate measurement (straight line) is the key to the production of metal products.	Graduations on engineer's rule ▪ Whole millimeters ▪ Half millimeters ▪ Centimeters Use and care of: ▪ engineers rule ▪ steel tape	Show students large diagram of steel rule with the various gradations. Teacher marked off specific lengths using the scales ▪ half mm ▪ whole mm ▪ centimeters	Students were given various lengths of scrap material (sheet metal to measure).	Mathematics

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Layout Out Tools	Select the correct/best tool for the specific job.	State the names of four laying out tools. State the use of each laying out tool.	Tools are classified according to their uses.	Appreciate that each tool has specific use.	Define the term laying out tools. Names of (5) five laying out tools:- <ul style="list-style-type: none"> ▪ scribe ▪ rule ▪ odd leg caliper ▪ try square use(s) of each tool.	i) Teacher show students each tool. ii) Demonstrates the use of each tool. Students sketch tool and label the parts.	List basic laying out tools and their uses. Students demonstrate use of tools.	Technical Drawing Wood work

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Sheet Metal Cutting Tools -Hand Shears or Snips	To use snips to cut sheet metal straight. Using the hollow punch to cut large holes in (thin) sheet metal.	1. List the various types of snips. 2. Describe various snips used in metal work. 3. Give the use of hollow punch. 4. Describe a hollow punch.	Recognise that snips are used to cut sheet metal 20 gauge or thinner. Recognise that hollow punches are used for cutting holes in sheet metal.	Carry out safe work practices when using snips and punches.	Types of snips -use of various snips. -use of hollow punch. -safety precautions associated with snips and punches.	1. Display the cutting tools. 2. Chart showing types of snips and the hollow punch. 3. Demonstrate how to use the tools. 4. Allow students to use the tools on scrap pieces of metals. 5. Let students make notes on snips and punches.	Questioning after discussion and demonstration . Let students make sketches of the tools. Let students demonstrate the use of the tools.	Craft Mathematics Agriculture Science

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Bend Cutting Tools	1. Using the hacksaw to cut metal.	Describe the parts of the hacksaw, name the	Recognise how to use the hacksaw and cold chisel.	Work safely with cutting tools.	Types of hacksaw , parts of the hacksaw , use of hacksaw , kinds of cold chisel, use and care of cold chisel.	1. Discussion 2. Demonstrate how the hacksaw and cold chisel are used. 3. Let students use the tools. 4. Give notes on the cutting tools.	Ask questions, let students demonstrate. Let students draw the tools.	Agriculture Science Integrated Science Mathematics
Hacksaw	2. Using the flat cold chisel to cut sheet metal chisel.	kinds of cold chisels. Define a chisel.	Safely precautions associated with the cutting tools. How the tools cut metals.	Taking care of the tools after use.				
Cold Chisels	3. Free hand sketching the punch, snips, hacksaw.							

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Cold Chisel	Shearing of sheet metal. Sketch each chisel.	The head of a chisel is not hardened.	Explain the use of cold chisels. Angle of cutting edge is dependent on metal being cut.	Appreciate that cold chisels have their use in mechanical engineering technology.	Sizes of Cold Chisels <ul style="list-style-type: none"> ▪ angle of cutting edge ▪ sharpening cold chisels ▪ purpose of cold chisel i.e. shearing. 	Demonstrate how chisel should be held.	Display chisels on chalkboard and let students write the names of each chisel.	

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Files e.g - Flat file - Square files - Round files - Three square file - Hardened file	Sketch files	Identify parts of a file. State use of file. File cut all metals except hardened steel.	Describe a file. The file is the main cutting tool used by the fitter.	Care of files. Accept that the file is a hardened tool except the tang. Ensure that file is fitted with handle when being used.	Parts of a file ▪ tang, point heel, edge, safe edge. Safety in the use of file. Shapes of file, use of file. Grades rough, second cut, smooth, gastard. Names of files:- Flat, hand files, round, half round file, 3-square and square file.	Teacher displays labelled diagram with file and show students a real file. Draw shapes (cross sections) of files for students to see difference in shape.	Sketch file on chalkboard and allow students to identify parts. Students will sketch cross section (shape) of files.	

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Sources of Ferrous Metal		List sources of ferrous metal. Identify the ore which has greater % of iron.	The object of all manufacturing is to start with a raw material in this case iron-ore e.g <ul style="list-style-type: none"> ▪ haematite ▪ magnetite ▪ limonite and goethite. 	Appreciate that metals are important elements in the life of society.	Sources and types of iron-ore Haematite- Spain, Canada, USSR, USA. Magnetite 56-72% iron Sweden. Siderite- England, USSR, USA, Canada 20-30%iron.	Map showing sources of iron ore. View slides and other visual materials if available. Display various types of metals.	Oral:- students will be asked to name types of iron ores and their sources.	Reading Integrated Science

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Classification of Metals- Ferrous		Name the classes of metal that contain iron:-	There are three (3) types of ferrous metal <ul style="list-style-type: none"> ▪ wrought iron ▪ cast iron ▪ steel 	Appreciate the importance of metals as it relates to industries and in the home.	Define ferrous metals state the different classes; Wrought iron Cast iron Steel iron	Initiate discussion on things in and out of the home.	Oral:- Explain the term ferrous metal.	

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Non-Ferrous Metals (N.F.M)	<p>Make simple chart of (N.F.M)</p> <ul style="list-style-type: none"> ▪ using and specimen and label. ▪ Using cardboard and marker and labelled specimen 	<ul style="list-style-type: none"> ▪ Define non-ferrous metals. ▪ List the various groups of non-ferrous metals. ▪ List the characteristics of non-ferrous metals. ▪ Identify aluminium, copper, lead. ▪ List sources of non-ferrous metals. ▪ List uses of non-ferrous. ▪ Describe how aluminium lead, copper, tin and zinc are obtained. 	<ul style="list-style-type: none"> ▪ Become aware of characteristic of N.F.M. ▪ Recognize that N.F.M. are used for domestic and industrial purposes. 	<ul style="list-style-type: none"> ▪ Willingness to participate in group activities. ▪ Inculcate safe work habits when using non-ferrous metal. 	<p>Definition of N.F.M. Groups of N.F.M. Characteristics of N.F.M Common types of N.F.M Sources of N.F.M Uses of N.F.M.</p>	<ul style="list-style-type: none"> ▪ Discussion Prepare chart of N.F.M ▪ World map showing sources of N.F.M. ▪ Display specimen of N.F.M. ▪ Project of N.F.M (ferrous used for each production) 	<p>Set appropriate questions to aid to topic review.</p>	<p>Integrated Science</p> <p>Agricultural Science Home Economics</p> <p>Geography</p> <p>Wood Work</p> <p>Electricity</p>

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Holding Tools, Bench Vice, Hand Vice, Tool Maker's Clamp (Slip Joint), Slide Cutting	<ul style="list-style-type: none"> ▪ Sketching and labelling holding tools ▪ Holding/clamping working vices in clamps or marking out or cutting. 	<ul style="list-style-type: none"> ▪ Identify common holding tools. ▪ List common holding tools ▪ Describe common holding tools. e.g. bench vice, hand vice, slip-joint pliers, side cutting pliers. 	<p>Become aware that a variety of devices are used to hold work pieces.</p> <p>Recognise that the use of holding tools help to make some operations easier and safer.</p>	<p>Willingness to contribute and participate in group activities.</p> <p>Inculcate safe work habit when using holding tools.</p>	<ul style="list-style-type: none"> ▪ Definition of holding tool. ▪ Some common holding tools. ▪ Parts of holding tools. ▪ Specific use of holding tools. ▪ Sketching of holding tools. 	<ul style="list-style-type: none"> ▪ Discussion ▪ Demonstration ▪ Displaying sketches actual tools. ▪ "Hands on" use of holding tools. 	<ul style="list-style-type: none"> ▪ Project on holding tools. ▪ Set appropriate questions to aid in review or example sketch both. 	<p>Wood work</p> <p>Technical Drawing</p> <p>Electricity</p>

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Bending Sheet Metal by Hand, Folding Bars, Stakes used for Bending, Methods used for Bending	<p>Make safe edges both single and double(using cardboard).</p> <p>Make safe edges using folding bar and mallet.</p> <p>Bending safe edges using stakes and mallets.</p>	<p>Identify folding bars.</p> <p>Identify stakes and mallets.</p> <p>Name stake and mallets.</p> <p>List types of stakes and mallets.</p> <p>List types of stakes and mallets.</p> <p>Define and identify “safe edges”.</p>	<p>Recognise that Sheet metal edges are dangerously sharp therefore safe edges are made to prevent injuries.</p> <p>Safe edges are also used to strengthen the edge.</p>	<p>Apply safety rules when working with sheet metal.</p> <p>Show awareness for the care of others.</p>	<p>Definition of safe edge.</p> <p>Types of safe edges.</p> <p>Types of:</p> <ul style="list-style-type: none"> ▪ Mallets ▪ Stakes <p>Mallets</p> <ul style="list-style-type: none"> ▪ Tinman’s ▪ Rawhide ▪ Bossing ▪ Raising <p>Stakes</p> <ul style="list-style-type: none"> ▪ blow horn ▪ beak horn ▪ creasing ▪ box/square 	<p>Discussion on use of</p> <ul style="list-style-type: none"> ▪ folding bar ▪ stakes ▪ mallets ▪ safe edges ▪ wire gauge <p>Let students sketch various stakes and mallets.</p>	<p>Test students by using oral and written questions.</p> <p>Set written assignment for students.</p>	<p>Mathematics</p> <p>Agricultural Science</p> <p>Home Economics</p> <p>Technical Drawing</p> <p>Art/Craft</p>

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Safe Edges Hems, False Bead Wire Edge	Make false bead using folding bar and mallets. Sketch diagrams of ▪ folding bar	List types of safe edges. Identify hems Identify and list types of hems. State uses of hems. Identify and state the use ▪ folding bar ▪ beak horn stake ▪ blow horn stake ▪ square stake identify and state specific use of each type of mallet.	Stakes and mallets are made in a variety of shapes and are used for different purposes. These tools are used to carry out basic bending operations on sheet metal. Mallets are used for flattening and bending sheet metal over the various stakes. Raw or cut edges of sheet metal is danger.	Show appreciation for group participation. Appreciate the bending of sheet metal using hand bending process. Appreciate that mallets are used on soft metals and finished surfaces to prevent indentation or damage.	Stakes ▪ conductor ▪ blow horn ▪ hatchet ▪ beak horn stake use of the bench plate mallets: wood, rubber, raw hide plastic and special shaped mallets. Safe edges ▪ hem ▪ false bead ▪ wire edge	Let students make hems and false beads using cardboard & scotch tape. Let students make hems and false beads using folding bar. Teacher shows students various sizes of folding bars. The beak horn blow horn square stake protect stake stand for holding stakes - bench plate.	Let students explain/ Discuss the procedure for making hems and false beads. Demonstration on the ashes of the wire gauge.	Building Technology Home Economics

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Safe Edges Hems, False Bead Wire	Make safe edges <ul style="list-style-type: none"> ▪ hem ▪ false bead for sheet metal projects. 	State uses and importance of safe edges <ul style="list-style-type: none"> ▪ hem ▪ false bead ▪ wire edge 				<p>Teacher explains general purpose for having stakes and demonstrates specific use of each stake.</p> <p>Teacher shows students projects with each of the safe edges.</p> <p>Organise tour for students to visit sheet metal establishment where they will observe safe edges seams being made and equipment used.</p>	<p>Content: Multiple choice and restricted response.</p> <p>Paper and pencil test extended response and objective performance</p> <ul style="list-style-type: none"> ▪ students will make will edge: ▪ hem and false geak. 	

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Joining (parts of a) Sheet Metal Using Seams Wired Edge	<p>1. make sheet metal seams.</p> <p>2. geak sheet metal to make seam using stakes.</p> <p>3. sketch seams</p> <p>1. sketch wired edge.</p> <p>2. calculate allowance to form wired edge.</p>	<p>Identify sheet metal seams.</p> <p>List various type seams</p> <ul style="list-style-type: none"> ▪ plain lap seam ▪ grooved seam ▪ double seam ▪ standing seam <p>select seam that is most appropriate for a specific purpose.</p> <p>State the importance of a wired edge.</p>	<p>Allowance for seams must be accurately calculated.</p> <p>In may cases sheet metal parts are connected/ assembled with seams.</p>	<p>Appreciate the importance of safety when working with sheet metal.</p>	<p>Description of each seam:</p> <ul style="list-style-type: none"> ▪ plain lap seam ▪ folded seam ▪ grooved seam ▪ double seam ▪ standing seam <p>appropriate use of each of the above seams.</p> <p>Purpose of a wire edge. Calculating allowance to form wire edge.</p> <p>Forming/making a wire edge.</p>	<p>Teacher explains general purpose of seams which allow students to ask questions for clarity.</p> <p>Teacher shows students projects with different seams also diagram.</p> <p>Students make seam under the supervision and direction of teacher.</p> <p>Teacher shows students a project with a wired edge, a labelled diagram of a wired edge and discusses its purpose.</p> <p>Students make seams under supervision and direction of teacher.</p>	<p>Assignment to make seams using cardboard and scotch tape.</p> <p>Oral questioning paper and pencil test: M/C essay type question.</p> <p>Performance test.</p> <p>Oral questioning paper and pencil test M/C and essay type.</p>	<p>Mathematics</p> <p>Home Economics</p> <p>Technical Drawing</p>

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Practical Sheet Metal	<p>Making two or more designs of a project.</p> <p>Prepare material list for project.</p> <p>Make cardboard template of project</p> <ul style="list-style-type: none"> ▪ sheet metal 	<p>Select the best design.</p> <p>Explain reason(s) for preparing material list.</p> <p>State use of template.</p> <p>Select the appropriate stake(s) to form hem and false bead.</p>	<p>Recognise the stages for making a good project.</p> <p>The marking out procedure and the accuracy which goes with it.</p>	<p>Appreciate the value of good craftsmanship.</p> <p>Appreciate that safe work habit should be practiced continuously in Mechanical Engineering Technology.</p>	<p>The various designs and selection made by students.</p> <p>Preparation of</p> <ul style="list-style-type: none"> ▪ materials cutting list ▪ steps of procedure ▪ tools used <p>preparation/making template.</p> <p>measure work and cut</p> <p>making hem and false seam using stake(s)</p>	<p>Discussion on designs made by students.</p> <p>Explanation on reasons for preparing material cutting list and steps of procedure teacher gives written examples.</p> <p>Teacher demonstrates use of tools rule, shears, scribe.</p>	<p>Students designs.</p> <p>Ask students to explain importance of</p> <ul style="list-style-type: none"> ▪ cutting list ▪ steps of procedures <p>completed plan sheets which students submitted.</p> <p>Performance test: Re-finish projects.</p>	<p>Technical Drawing</p> <p>Building Technology</p> <p>Mathematics</p> <p>Home Economics</p>

