INDUSTRIAL TECHNOLOGY

MECHANICAL ENGINEERING
LEVEL 9

Topic	Skills	Knowledge	Understanding	Attitude	Content	Methods/ Strategies	Evaluation	Area on Integration
Bench Cutting Tools, Hack Saws. Types of Frames and Blades. Uses of Hack Saws and safety precautions. Safety precautions associated with Hack saws	Using the saw in safe manner to cut metal stocks.	Recognise that the Hack Saw is a bench cutting tool. Sketch, label, and describe the use of the hack saw.	Appreciate that the hack saw has a hardened steel blade that will cut all metals except hardened steel. The attitude of safety must be emphasized.	Emphasise safety in relation to bench cutting tools (hack saw) listening attentively and responding appropriately to questions and discussions	Use of the hack saw types of frames, selection of frames, type of blades and selection of blades.	Demonstrate the proper use for hack saws. Explain choice of blades and correct fitting of blades. Teacher. makes sketches of hack saw and label it . Students make sketches of hack saw and label same. Allow student to use hack saw in the manner demonstrated by teacher.	Test students on the proper use of the hack saw:- holding and using a hack saw. Set questions for students to answer as home work /class work.	Woods Electricity Agricultural-Science

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Bench Cutting Tools (Cold Chisels) Types of Cold Chisels. Use of Cold Chisels. Safety associated with Cold Chisels.	Using cold chisels to cut sheet metal.	Explain that the cold chisels are bench cutting tools, sketch label and describe the use of the cold chisels.	Appreciate that the cold chisels must be struck with the correct tool. i.e hammer.	The student must appreciate that cold chisels have sharp cutting edges. Listening attentively and responding appropriately to questions and discussions.	Uses of cold chisels . Common types of cold chisels. Define chipping out, shearing and chipping. Notes and discussion on safety associated with chisels and their work process.	Discuss and demonstrate the proper use of cold chisels. Explain and show how to set up work for chiseling shearing and chipping.	Test students on the proper use of the cold chisels. Give questions for students to answer as home work.	Woods Electricity.

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Files Description and types. Uses of Files, safety and storages associated with files.	Filing metal stock held in vice. Sketching and labeling parts of a file.	Identify and descried a file. State use of various types of files. Understand safety, care and storage of files.	Recognise that the correct use of file is important. The tang of a file is not hardened. Care must be taken to avoid pinning. File must be used with a handle.	The student should use file in a safe manner (handle) asserting that files are in proper condition. Ensure that files are always stored properly, students listen attentively and respond appropriately to questions.	Types and uses of files. Classification, lengths, shape, cuts, grades, filing procedures: - cross filing -draw-filing - filing curves. - Safety precaution associated with files (pinning).	Display files on work bench. Demonstrate the proper use of files explain and show procedure in filing.	Set questions for students to answer as class work on frame work. Oral questions – explaining use of files. Sketching and labeling files.	Woods Technical Drawing Agricultural Science Electricity.

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Materials alloys and alloying elements.	1. Select suitable alloys for projects 2. Test ferrous alloys for hardness etc.	1. Naming and identifying alloys 2. Listing alloying elements used in ferrous metals	1. Alloy steels are made by combining steel (F.C.S) with one or more other elements. 2. Various alloying elements are used in ferrous metals to make it:- - harder - corrosion resistant -retention of hardness etc.	Show an awareness of the properties and uses of alloy steel in the industry and community.	Ferrous metal, alloy steel and alloying elements used in various steel. Properties of alloys.	Let students name things that are made of steel. Discussion on the use of alloys and alloying elements. Testing steel for various properties e.g. hardness.	Ask questions during lesson to test understanding. Get students to carry out test for properties in steel.	Electricity Physics Home Economics.

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Fastening devices and locking devices.	1. Make sketches of various fastening and locking devices. 2. Use simple fastening and locking devices to assemble project. Sketching various keys and keyways.	1. Identifying various locking and fastening devices. 2. Name and identify the types of fastening and locking devices. Name and identify keys e.g - square - feather.	1. The use of various fastening and locking devices. The use of various keys.	Fastening and locking devices are used on many machines. Appreciate the function of keys and keyways.	Bolts, nuts, washers, screws pins.	Let students examine machines (under teacher's supervision) to observe the mechanism. Sketching the various fastening and locking devices. Discuss the use of the various devices. Discuss use of keys identifying keys and keyways.	Ask questions during the lesson. Let students identify the types of devices on machines in the workshop or around the community.	Woods Electricity Science Agricultural Science.

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Bending Sheet Metal by Hand (Sketches).	1. Using various stakes to bend sheet metal 2. Sketching various stakes.	1. Identify various stakes 2. Define a stake.	1. Stakes are used to form various shapes on sheet metal projects.	Students must display proper safety habits when using stakes.	Types of stakes – conductor, hollow mandrel, hatchet, blow horn etc.	Discuss the uses of stakes Demonstrate how to use stakes for bending. Get students to identify various stakes.	Let students use a stake to bend sheet metal. Ask students to sketch specific stakes.	Technical Drawing

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Mallets	1. Drawing the different types of mallets to bend sheet metal.	1. Define a mallet 2. Identify types of mallets.	1. Give the use of the different types of mallets.	Students must appreciate the safety practices in using the mallet.	Mallets. Types of mallets and their uses.	Discuss – what is a mallet and the use of the different types of mallets. Demonstrate the use of mallet. Let students use mallet to perform basic operations.	Ask questions during the lesson. Written – extended response.	Woods Electricity Science.

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Seams and Edges	1. Drawing various seams and edges 2. Calculate allowance for seams and edges. 3. Sketch the hand groover.	1. Identifying various seams and edges. 2. Identifying the hand gooover.	1. Give the uses of seams and edges. 2. State use of hand groover.	Complete assigned task given by teacher.	Types of seams and edges The hand groover.	Discuss the use of various seams, edges, and the hand groover. Demonstrate the use of hand groover and hand groover sketching seams and edges. Show students seams and edges	Ask questions during the lesson. - Students sketch and name seams and state when/where it is used.	

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Drills and Drilling. Safety Parts of the drill press.	Prepare material for drilling. Drill blind holes. Drill pilot holes. Drill through holes. Change drilling speeds Clamp work piece to drill table.	Identify types of drills. Identify pulley arrangements . List safety precautions. List procedure for laying holes.	Drilling means cutting a circular hole with a tool called a drill. The cutting tool i.e the drill must be harder than the material to be cut.	Listen attentively and respond appropriately. Complete assigned task.	- Safety precautions associated with drilling machines and operations - Parts of the drill press with special emphasis on the pulley arrangement and chuck adjustment. - Laying out holes for drilling.	Discuss and demonstrate safety precautions in drilling operations. Pulley arrangement on chalk board showing the driver and driven. Also labelled diagrams or pictures of drill press. Demonstrate laying out of holes on materials	1. Asses layout holes for accuracy. 2. Assess the drilled hole for accuracy. 3. Observe and correct unsafe work habits of students.	Woods Building Technology Electricity/ Electronic Technology

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Laying out holes for drilling pilot blind and through holes.	Select remove, replace drill bits	List the steps of procedure in preparing work piece for drilling List types of holding devices	Plan is a necessity in Mechanical Engineering Technology. Holding devices ▪ Reduce injuries ▪ Reduce damage to tools.	Students must display safe working habits. Develop personal responsibility. Cultivate the habit of making sure that all the safety guards are in place before starting any machine.	- Layout hole for accurate drilling - Drilling blind holes - Drilling through and through holes. - Holding devices: - T-slot bolts - C – clamp -Jack screw, etc.	Have students use prick punch and ball pen hammer to layout holes. Demonstrate and discuss pilot holes, blind holes, and through holes. Sketch diagrams of blind holes, pilot holes, and through holes. Sketch diagrams of holding devices. Demonstrate uses of holding devices.	Test the work done on calculation of speeds and feds. Oral questioning. Give written assignments.	

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Measuring the size of Drills. Sharpening of Drills.	Using gauges and micrometer to measure drills (size). Sharpen drill with the aid of drill gauge correct angles.	State uses of drill gauges and micrometer. Identify clearance and angles of a drill.	Drill gauges have standard diameters of drills and cannot be changed. The micrometer has to be set/adjusted before its size could be determined. A drill will not produce a hole without lid, clearance drill angles must be equal.	Appreciate that gauges and the micrometer are to be well cared for. Recognize & appreciate the importance of each part of the drill bit.	Measure drills with gauges. Measure drills using a micrometer. Sharpen drill showing the clearance angle or lip clearance, length and angle of lip, rake angle.	Have students measure the size of a drill using drill gauges and micrometer. Demonstration and discussion sharpening of drills with emphasis placed on clearance and angles sketching and labeling diagrams of holes before layout. Have students drill holes and leave evidence of the layout lines (positions) to be observed.	Students will be given specific sizes of drills to determine their size using:- ▪ drill gauge ▪ micrometer	Mathematics

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Drills Breakage. Drilling Speed and Feed. Drilling and Lubricants.	Use drill effectively. Calculate cutting speed for drill and feed. Apply a specific lubricant to the drilling operation.	State ways of preventing breakage. State difference between speed and feed. Describe the calculation for cutting speed and feed. List types of Lubricants.	Drill bits can be broken easily Speeds & feeds change depending on ▪ diameter of drill ▪ type of material being drilled the importance for calculating speeds and feeds. Lubricant reduces friction		Causes for drill breakage. Definition of drilling speed and feed. Calculation of speeds and feed. Types of lubricants used on various metals.	Discussion on reasons for drill breakage. Discussion on drill speeds and feeds. Calculate cutting speeds and feeds. Discussions on types of lubricants Students will research topic prior the commencement.	Oral 1. Question and answer. 2. Assignments 3. Paper and pencil test.	Mathematics Integrated Science.

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Wrenches Types of Wrenches. Safety precautions associated with Wrenches.	Adjust Screws. Fasten and remove bolts and nuts. Dismantle parts of machine.	Identify wrenches. Difference between adjustable and non-adjustable wrenches. - State uses of various types of wrenches. - List safety precautions associated with wrenches.	Safety precautions could be learnt in the workshop. Adjustable means that wrenches could be opened and closed to fit different sizes of bolts and nuts.	The worker should always select a wrench which fits the nut or bolt properly.	Types and uses of adjustable wrenches: - Monkey wrench - Adjustable end wrench. - Vise grip etc. Types of non-adjustable wrenches: - Open end wrench. - Socket wrench. - Spanner wrench etc. Safety precautions associated with wrenches.	Demonstrate the proper uses of wrenches: Have discussion on the uses of wrenches Make sketches of wrenches on the chalkboard. Let students make sketches of wrenches. Allow students to use wrenches in the manner shown/ demonstrated. Discuss safety precautions associated with wrenches. Demonstrate safety using wrenches.	Test student's use of wrenches, by allowing them to loosen or tighten screws/bolts on old machines. Oral questioning explaining specific use of wrenches and safety precautions in using wrenches.	Woods Electricity Technical Drawing Agricultural Science.

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Permanent Fastener, Rivets and Riveting	Prepare materials for riveting. Sketching rivets. Sketching for riveting.	Identify types of rivets. e.g. Countersink flet, snap fan heed. Identify rivet set and block, know the function and purpose of riveting. List safety precautions associated with riveting.	Riveting and fastening pieces of metals together with rivets. Rivets are used to hold pieces together permanently.	Listening attentively and responding appropriately to questions.	Definition of riveting. Definition of rivet. Types of rivets. - Countersink - Snap head, - Flat etc. - Uses of rivets - Choosing a rivet - Description and uses of a rivet set. - - Rivet operation - Removing rivets from materials.	Have discussions on types of rivets and riveting. Demonstrate the operation of riveting using riveting set. Make sketches of rivets on the chalk board. Demonstrate the removal of rivets from work. Discuss the methods of choosing rivets, drill holes in metals and rivet. Allow students to plan and design simple projects to incorporate drilling and riveting.	Give written questions to test understanding of concepts. Test for the application of skills by allowing students to demonstrate the process of riveting.	Electricity Electrical Technology

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Joining Metals Soft Soldering.	1.Carryout the pro-cedures for tinning a soldering - bit iron - work piece. 2. Select and use suitable solder and flux 3. solder a seam/joint	1. List the four conditions to be fulfilled for soft soldering to be possible. 2. identify soldering device used for soft soldering 3. Name the different types of soft solders. 4. Name the various types of fluxes. 5.List steps for for tinning a soldering bit.	1.Give the use of soldering devices. 2. Fluxes are essential materials in soldering operations. 3. There are different grades/types of soft solders. 4. A tinned soldering bit holds the solder to spread it on the work. 5. Sweat soldering requires a layer of solder on each piece before they are assembled. Sweat, soldering	Observe good safety practices when using soldering devices. Pay attention to explanations and demonstrations given by teacher. Derive satisfaction from performing work neatly and safely.	Definition of soldering. Conditions for soldering. Soldering Soft fluxes (Types of fluxes). Tinning a soldering bit/ copper. Cleaning the area to be soldered e.g seam/joint. Sweat soldering. Process.	Discussing the conditions for soldering. Discussing the use of soldering devices. Let students make simple notes sketching, soldering bits. Show students soldering bits. Demonstrating – “tinning a soldering bit”. Let students carry out soldering process. Demonstrating how to solder a seam/joint. Discussing what is sweat soldering. Suggested projects. Dustpan, match box stand, soap dish and funnel.	Questioning and oral written test, understanding and evaluate practical work.	Electricity Science

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Abrasives and Finishes.	1.Sketch and use suitable abrasives. 2. Apply finishes to metal projects. 3. Select suitable finish for a project.	1.Name the various types of abrasives. 2. Name metal finishes. 3. Identify different types of finishes used on metal products.	1. Explain how abrasives and finishes are used. 2. A good finish is always required on a project. 3. Only certain finishes are used on metal products.	Develop an appreciation for good and suitable finishes.	What is abrasive. Types of abrasives. How to use abrasives. Types and uses of finishes. How various finishes are applied to metal products.	Discussing the use of abrasives and how to select an abrasive. Demonstrating the use of abrasives. Discussing and demonstrating the application of various finishes. Let students identify various finishes and abrasives.	Oral or written questions to test knowledge and understanding. Let students list the names, different finishes (say what type of finishes) with different finishes.	Woods Electricity Science Home Economics