

1. Basic Engineering Processes; Material Removal

1	Sawing 	Fine toothed - power saw, hacksaw, junior hacksaw, circular abrasive disc.
2	Filing 	Hardened steel in the form of a bar or rod with many small cutting edges raised on its surfaces; used for smoothing or shaping objects.
3	Threading 	Tapping (internal thread) uses a tap & wrench & threading (external thread) uses a die & die holder.

2. Basic Engineering Processes; Hand Forming

1	Forging 	Make or shape a metal object by heating it in a fire or furnace and hammering it.
2	Casting 	An object made by pouring molten metal or other material into a mould.
3	Bending 	Shape or force something straight into a curve or angle using a vice., folding bars or a forming jig.



3. Basic Engineering Processes; Joining Methods,

1	Soldering 	Soldering is a process in which two or more metal items are joined together by melting and then flowing a filler metal into the joint— the filler metal having a relatively low melting point. Soldering is used to form a permanent connection between electronic components.
2	Brazing 	A metal-joining process in which two or more metal items are joined together by melting and flowing a filler metal (alloy of copper & zinc) into the joint, the filler metal having a lower melting point than the adjoining metal.
3	Welding 	Join together metal parts by heating the surfaces to the point of melting with electric arc, or other means, and forcing them together. (MIG welding & TIG welding use a third metal to bond the surfaces together).
4	Riveting	A metal bolt that is hammered to secure pieces together.
5	Adhesives	Epoxy resin or contact adhesive.
6	Self-tapping Screws	A screw that can tap its own hole as it is driven / screwed into the material.

4. Basic Engineering Processes; Heat Treatment

1	Hardening	Hardening is the process of increasing the hardness of the material by heating and then quickly cooling.
2	Tempering	Tempering is the heating process to a temperature below is critical range, holding and then cooling slowly.
3	Case Hardening	The mild steel is subjected to heating till it is bright red. It is immersed into a carbon compound that covers the outer surface
4	Annealing	Heat metal and allow it to cool very slowly, in order to remove internal stresses and toughen it.
5	Normalising	Normalising is a heat treatment process that is used to make a metal more ductile and tough after it has been subjected to thermal or mechanical hardening processes.
6	Nitriding	Nitriding is a heat treating process that diffuses nitrogen into the surface of a metal to create a case-hardened surface.

SAFETY RULES FOR YOUR PROTECTION			
KEEP CLEAN WORK AREAS	1	KEEP MACHINE GUARDS IN THEIR INTENDED PLACE	7
DO NOT OPERATE MACHINERY UNLESS AUTHORIZED	2	WEAR EYE PROTECTION WHERE NECESSARY	8
WEAR PROPER CLOTHING FOR THE JOB	3	BE SURE EVERYONE IS IN CLEAR BEFORE STARTING EQUIPMENT	9
LIFT PROPERLY-USE LEGS, NOT BACK	4	REPORT ALL UNSAFE CONDITIONS	10
DO NOT CLEAN, OIL OR ADJUST MOVING MACHINERY	5	CHECK ELECTRICAL EQUIPMENT FOR DEFECTS BEFORE USING	11
KEEP HAND TOOLS IN GOOD CONDITION	6	REPORT ALL INJURIES AND OBTAIN FIRST AID	12



5. Basic Engineering Processes; Surface Finishing

1	Linishing	The process of using grinding or belt sanding techniques to improve the flatness of a surface
2	Polishing	Make the surface of something smooth and shiny by rubbing it
3	Plastic/Powder Coating	A dry finishing process that uses finely ground particles of pigment and resin that are electrostatically charged and sprayed onto electrically grounded parts. The charged powder particles adhere to the part and are held there until melted into a uniform coating in an oven.
4	Painting	Use a brush or roller, or use a spray for application on metal. May require a primer before final coat is applied.
5	Electroplating	The metal is immersed in an electrolytic bath that is composed of a solution of the metal to be plated. A direct current (DC) of electricity is passed through the solution, effecting the transfer of metal onto the surface of the item.
6	Galvanising	The process of applying a protective zinc coating to steel or iron, to prevent rusting.



6. Machine Processes: Material Removal

1	Drilling	A cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The bit is pressed against the work-piece and rotated. This forces the cutting edge against the workpiece, cutting off chips (swarf) from the hole as it is drilled.
2	Turning	A material removal process, which is used to create rotational parts by cutting away unwanted material
3	Milling	The process of machining using rotary cutters to remove material by advancing a cutter into a work piece.
4	Grinding	An abrasive machining process that uses a grinding wheel as the cutting tool.

8. Machine Processes: Moulding

1	Vacuum forming	A sheet of plastic is heated to a forming temperature, stretched onto a single-surface mould, and forced against the mould by a vacuum.
2	Injection Moulding	The process of melting plastic pellets (thermosetting/thermoplastic polymers) that once malleable enough, are injected at pressure into a mould cavity, which fills and solidifies to produce the final product
3	Blow Moulding	Blow moulding is a specific manufacturing process by which hollow plastic parts are formed such as bottles or other containers.

7. Machine Processes: Forming

1	Die Casting	A metal casting process that is characterised by forcing molten metal into a mould
2	Investment Casting	Process in which a wax pattern is coated with a ceramic material. Once the ceramic material is hardened the wax is melted out and molten metal is poured into the cavity where the wax was.
3	Shell Moulding	Shell mold casting is a metal casting process similar to sand casting, in that molten metal is poured into an expendable mould. The moulding is a thin-walled shell created from applying a sand-resin mixture around a metal mould.
4	Extrusion	Used to create objects of a fixed cross-sectional profile. A material is pushed through a die of the desired cross-section.
5	Press Forming	The process of placing flat sheet metal into a stamping press where two surfaces form the metal into the desired shape.

8. Machine Processes: Moulding

4	Rotational Moulding	A heated hollow mould which is filled with granules / powdered polymer. It is then heated and slowly rotated, causing the softened material to disperse and stick to the walls of the mould
5	Compression Moulding	A process in which a plastic sheet is placed between two matching moulds then is softened by the heat and forced to take the shape of the mould as the mould closes.