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Detailed syllabus

MANUFACTURING TECHNOLOGY - I

UNIT I - METAL CASTING PROCESSES

The casting process - Introduction, Classification of casting processes, Expendable pattern process.

Sand mould casting - Introduction, Types of sand mould casting process, Classification of sand moulding materials, Making a green sand mould, Major components of a sand mould. **Patterns** - Introduction, Types of patterns, Solid patterns, Split pattern, Match plate pattern, Cope and drag pattern, Gated pattern, Loose - piece pattern, Skeleton pattern, Sweep pattern, Segmental pattern, Shell pattern, Follow board pattern, Colour scheme for patterns, Pattern making, Wood pattern, Metals pattern, Plastic compounds, Waxes, Quick setting compounds, Pattern allowances. **Moulding sand properties** - Introduction, Classification of moulding sands, Types of moulding sands, Properties of moulding sands. **Core making** - Introduction, Essential qualities of a core, Core sands, Core manufacture, Core sand preparation, Core moulding, Core baking, Finishing of core, Types of core, Horizontal and vertical core, Balanced core, Wing core and core prints, Core boxes, Half core and dump core box, Split core box, Gang core and left and right core box, Chaplets. **Sand testing** - Introduction of sand testing, Types of sand testing, Moisture content test, Clay content test, Permeability content test, Grain fineness test, Strength test, Hot hardness test, Refractoriness test, Mould hardness test. **Moulding tools and equipments**- Machine moulding, Jolt machine, Squeezer machine, Jolt-squeeze machine, Jolt-squeeze roll-over draw machine, Mould blowing machine, Sand slinger, Hand moulding tools and equipment, Mould boxes, Types of moulding boxes, Rammers, Cleaners and Riddle, Gate cutters, Swab and Trowels, Bellows, Vent wire and Mould board. **Melting furnaces** - Introduction of melting furnaces, Types of melting furnaces, Blast furnace, Operation of blast furnace, Cupola furnace, Cupola operation, Crucible furnace, Oil fired furnace, Coke fired furnace, Pit furnace, Electric arc furnaces, Direct arc furnace, Indirect arc furnace, Induction furnace. **Principle of Special casting processes** - Need of special casting methods, Shell moulding, Investment casting, Ceramic mould casting, Centrifugal casting, True centrifugal casting, Semi centrifugal casting, Centrifuge casting, Die casting, Hot chamber die casting, Cold chamber die casting, Carbon-di-oxide process, Stir casting. **Defects in sand casting** - Defects in sand casting, Classification of casting defects, Misrun, Cold shut, Hot tear, Flash, Shift or mismatch defect, Shrinkage, Blow defect, Drop defect, Scab defect, Penetration, Warpage, Blow holes, Porosity, Pin hole, Inclusion. **Inspection methods** - Inspection of castings, Visual inspection, Dimensional inspection, Radiographic testing, Magnetic particle inspection, Fluorescent penetrant inspection, Eddy current inspection, Pressure testing, Ultrasonic testing, Metallographic test.

UNIT II – JOINING PROCESSES

Joining processes - Welding process, Types of welding process, Classification of welding process, Position of welding, Welding joints. **Gas welding** - Types of gas welding, Principle of oxy-acetylene welding, Techniques of oxy-acetylene welding, Oxy-acetylene welding process, Air-acetylene welding, Oxy-hydrogen welding, Equipments used in gas welding, Equipments used in gas welding, Procedure of gas welding, Flame characteristics, Types of flames, Filler materials, Flux. **Arc welding** - Arc welding, Carbon arc welding, Arc welding equipments, Electrodes in arc welding, Types of electrodes, Function

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of coating, Electrode coating ingredients and their function, Electrode materials, Electrode manufacturing, Electrode specification, Selection of electrodes. **Special arc welding process** - Gas metal arc welding, Flux cored arc welding, Submerged arc welding, Electro slag welding, Electro slag gas welding, Gas Tungsten-Arc Welding (TIG-Tungsten inert gas). **Resistance welding** - Principle of resistance welding, Resistance spot welding, Resistance butt welding, Resistance seam welding, Percussion welding. **Special welding process** - Plasma arc welding, Thermit welding, Electron Beam Welding (EBW), Friction welding, Friction stir welding and processing, Diffusion welding. **Welding defects** - Welding defects. **Brazing** - Introduction to brazing, Torch brazing, Procedure for torch brazing, Induction brazing, Resistance brazing, Dip brazing, Furnace brazing. **Soldering** - Introduction to soldering, Equipment of soldering, Soldering procedure, Advantages and applications. **Filler material and fluxes** - Filler materials used in brazing, Fluxes used in brazing, Filler materials used in soldering, Fluxes used in soldering.

UNIT III - METAL FORMING PROCESSES

Introduction - Introduction to bulk deformation. **Hot and cold working of metals** - Classification of metal working process, Hot working, Cold working, Differences between hot working and cold working. **Forging processes** - Forging, Heating furnaces. **Forging classification** - Forging classification, Open die forging, Close die forging, Characteristics of the process. **Types of forging machine** - Types of forging machine, Mechanical hammer, Air lift hammer, Power drop hammer, Fly press, Knuckle joint press, Mechanical press with Eccentric drive, Other Mechanical Hammer, Hydraulic press, Pneumatic hammer. **Typical forging operation** - Typical forging operation, Edging, Bending, Defects in forging. **Rolling processes** - Rolling processes, Terminology of rolling products, Mechanism of rolling. **Types of rolling mill** - Types of rolling mill, Two high rolling mill, Three high rolling mill, Four high rolling mill, Cluster rolling mill, Universal rolling mill, Planetary rolling mill, Tandem rolling mill. **Shape rolling operation** - Shape rolling operation, Other rolling process, Arrangement of stands, Defects in rolled parts, Internal structural defects. **Drawing** - Drawing, Die terminology, Rod drawing, Wire drawing, Tube drawing. **Extrusion processes** - Principle of extrusion, Extrusion mechanism, Types of extrusion, Hot extrusion process, Direct or forward extrusion, Indirect or backward extrusion, Tube extrusion, Cold extrusion process, Hooker's method, Impact extrusion, Hydrostatic extrusion, Extruded metals.

UNIT IV – SHEET METAL PROCESSES

Introduction - Introduction to sheet metal, Introduction to sheet metal processes, Sheet metal characteristics, Spring back effect, Sheet metal materials, Sheet metal specifications. **Typical shearing operations** - Shearing process, Typical shearing operations, Perforating and lancing, Notching and nibbling, Slitting, Shearing terminology, Classification of tools, Presses. **Forming operations** - Forming process, Bending, Bending allowance and Bending force, Spring back compensation, Bending operations, Other bending operations, Drawing, Drawing mechanism, Drawing operations, Stretch forming operations, Formability, Formability tests. **Special forming process** - Special forming process, Hydro-forming, Rubber pad forming, Metal spinning, Explosive forming, Magnetic pulse forming, Peen forming, Super plastic forming, Micro forming processes.

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UNIT V – MANUFACTURE OF PLASTIC COMPONENTS

Plastic - Types of plastics, Thermoplastics, Thermosetting plastics, Elastomer, Polymerisation, Characteristics of shaping and forming process. **Moulding of thermoplastics** - Moulding of thermoplastics, Injection moulding, Screw machine, Plunger machine, Injection moulding applications. **Compression moulding** - Compression moulding, Compression moulding applications. **Transfer moulding** - Transfer moulding, Transfer moulding applications. **Blow moulding** - Blow moulding, Extrusion blow moulding, Injection blow moulding, Stretch blow moulding, Blow moulding applications. **Rotational moulding** - Rotational moulding, Rotational moulding process, Advantages and disadvantages, Rotational moulding applications. **Film blowing** - Film blowing process. **Extrusion** - Extrusion of plastic. **Thermoforming** - Thermoforming, Vacuum thermoforming, Pressure thermoforming, Mechanical thermoforming. **Bonding of thermoplastics** - Introduction to bonding, Methods of bonding, Advantages and limitations.