COURSE TITLE : MANUFATURING PROCESS
COURSE CODE : 3023
COURSE CATEGORY : B
PERIODS/ WEEK : 5
PERIODS/ SEMESTER : 75
CREDIT : 5

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Measuring instruments, gauges & comparators	16
2	Welding soldering and brazing.	21
3	Structure of materials , mechanical working of metals	18
4	Foundry and Casting	20
TOTAL		75

Course Distribution:

Module	Name of Module	Course Outcome no.	Total periods per semester		
			Instructional	Test	Total
1	Measuring instruments, gauges & comparators	1	Theory : 15 Practical :	1	16
2	Welding, soldering and brazing.	2	Theory : 20 Practical :	1	21
3	Structure of materials , mechanical working of metals	3,4,5	Theory : 17 Practical :	1	18
4	Foundry and Casting	6,7	Theory : 19 Practical :	1	20
Total periods per semester					75

Remarks based on feedback from students, faculty, industry (revision 2010)

Course Outcome :

sl.no.	sub	student will be able to:
1	1	Understand the basic measuring instruments, gauges & comparators.
	2	Comprehend the welding, soldering and brazing.
	3	Appreciate the Structure of materials

	4	Understand the mechanical working of metals - cold working and hot working.
	5	Appreciate the forging processes
	6	Comprehend the foundry and casting processes.
	7	Understand the various Plastics & their Moulding processes.

SPECIFIC OUTCOME

MODULE I

1.1.0 Understand the basic measuring instruments, gauges & comparators.

1.1.1 Classify the different measuring instruments
1.1.2 Explain the working of different measuring instruments
1.1.3 Classify the different types of gauges
1.1.4 Explain the use of different gauges
1.1.5 Classify the Comparators
1.1.6 Describe the working of different comparators

MODULE II

2.1.0 Comprehend the welding, soldering and brazing.

2.1.1 Define welding and types of welding ,advantages and limitations of welding.

2.2.0 Illustrate the principle of arc welding and various joints and its defects

2.2.1 Discriminate D C generators and A C transformer
2.2.2 Identify the electrodes for a particular weld and the specification of electrodes
2.2.3 Define gas welding, Identify oxy -acetylene welding and the types of flame
2.2.4 State the functions of pressure regulators, welding torch and nozzles, filler rod and flux
2.2.5 Explain submerged arc welding, tungsten inert gas (TIG) welding,Metal inert gas (MIG) welding.
2.2.6 Classify soldering and brazing
2.2.7 Compare welding, soldering and brazing

MODULE III

3.1.0 Appreciate the Structure of materials

3.1.1 Explain the atomic structure
3.1.2 Describe bonding and its properties
3.1.3 Illustrate the structure of solids
3.1.4 Distinguish the Metallic Crystal structure-bcc, fcc, hcp.
3.1.5 Identify the Changes in Crystal Structure w.r.t. temperature.

3.2.0 Understand the mechanical working of metals - cold working and hot working

3.2.1 Explain the cold working and hot working and its advantages and disadvantages
3.2.2 List the cold working operations

3.2.3 Explain the cold working operations and hot working operations
3.2.4 State the effects of hot working on metals
3.3.0 Appreciate the forging processes
3.3.1 Define forging
3.3.2 Explain the different forging processes and forging tools

MODULE IV

4.1.0 **Comprehend the foundry and casting processes**
4.1.1 Explain the necessity of making different types of pattern
4.1.2 List the various pattern material and state the advantages and disadvantages
4.1.3 List and explain various pattern allowances and scales
4.1.4 List and explain properties of moulding sand
4.1.5 List the types of moulding sand
4.1.6 List the ingredients of sand
4.1.7 Mention the uses of chaplets
4.1.8 Explain the different methods of moulding
4.1.9 Identify the different moulding operations
4.1.10 Explain the pouring techniques of molten metal
4.1.11 Mention the function of runner and risers
4.1.12 State the importance of permanent mould casting and mention its limitation
4.1.13 List the cleaning methods of casting and explain it
4.1.14 List the special types of casting
4.1.15 List the steps of die casting processes
4.1.16 State the processes of gravity die casting and pressure die casting
4.1.17 Explain the process of slush casting, vacuum casting, plaster moulding and centrifugal casting and investment casting.
4.2.0 **Understand the various Plastics & their Moulding processes.**
4.2.1 Explain the different methods of processing of plastics-extrusion injection moulding, blow-moulding, thermoforming, casting etc

CONTENT DETAILS

MODULE I

Measuring instruments, gauges & comparators
measuring instruments- precision and non precision instruments(definition and name only)- direct reading and indirect measuring instruments(definition and name only)- linear measuring instruments- angular measuring instruments and plane surface measuring instruments (name and description only)- line measuring and end measuring devices(name and description only) Vernier calliper- micrometer (inside, outside, depth and vernier)- vernier height gauge- vernier depth gauge- vernier bevel protractor
Classifications of gauges- Plug- ring- snap- screw pitch gauge- feeler gauge- standard wire gauge - indicating gauges.
Comparators – Mechanical comparators- Electrical comparators- Optical comparators- Pneumatic comparators

MODULE II

Welding soldering and brazing

Welding – introduction- classification of welding- advantages and limitation of welding. Arc welding – Principle of arc welding- arc welding machines – D.C. generators- A.C. transformers. Advantages and limitations of each. Welding positions —- flat- horizontal - vertical and overhead welding- welded joints - butt- lap –corner-- tee--edge - V- joints- U-joint- symbols as per BI S code.

welding electrodes-selection- Electrode coatings – functions of Electrode coating. Gas welding – Oxy – Acetylene welding- Major advantages and limitations – type of flames –functions and operation of oxy – acetylene cylinders- pressure regulators- welding torch- nozzle. Gas welding procedure – selection of filler rod and flux. Brief explanation of submerged arc welding- tungsten inert gas (TIG) welding- metal inert gas (MIG) welding- Atomic hydrogen welding.

Thermit welding – brief description only. Defects in welding – causes and remedies of the defects- porosity- poor penetration- warping- under cut- distortion crack- poor appearances.Testing and inspection of welding joints (Name only): Soldering and brazing – brief description only. Comparison between welding- soldering and brazing

MODULE III

Structure of materials- mechanical working of metals

Structure of materials-Atomic structure -Bonding and properties- structure of solids - Metallic Crystal structure-bcc- fcc- hcp.- Changes in Crystal Structure w.r.t. temperature.- Crystal Defects- crystal imperfections-crystal growth and grain formation- Deformations of metal- rate of cooling- grain size on properties- Property changes by deformation- work hardening- solid solution hardening- strain hardening age hardening.

Cold working– Operations – Drawing- Squeezing Rolling- Bending- Shearing & Extruding – Hot Working – Operations – Rolling- Piercing- Drawing- Spinning & Extruding - Effects of Hot Working - Types – Advantages & Disadvantages

Forging processes- classification of forging processes-flat die forging and closed dye forging Forging tools- anvil- swage block- hammers (hand hammer and sledge hammer- ball peen- straight peen and cross peen hammer)- tongs- chisels- swages- fullers- flatters- set hammer- punch and drift

MODULE IV

Foundry and Casting-Types of patterns- single piece pattern- split pattern- match plate pattern- gated pattern- loose piece pattern- sweep pattern etc Pattern materials- wood- metal- plastics- plaster Advantages & Disadvantages of Pattern materials Pattern allowances- shrinkage allowance- draft allowance- machining allowance- distortion or camber allowance- rapping allowance Properties of molding sand- porosity- plasticity- adhesiveness- cohesiveness- refractoriness moulding sand: - Types- Green sand- dry sand- parting sand- loom sand- facing sand- core sand- Composition of moulding sands- – their ingredient and use - uses of chaplets - Moulding processes: - Bench moulding- pit moulding- floor moulding and sweep moulding.

Pouring and feeding – proper pouring techniques – functions of risers – importance of chiller - Castings – Types – Ferrous- Non ferrous-special castings-die casting – gravity die casting – pressure casting – goose neck type – direct injection type and cold chamber machine - Slush castings – vacuum casting – cleaning of casting – cut-off-trimming-shot and sand blastering.

Types of plastics – thermo- thermosetting- reinforced plastics. Methods of processing plastics-extrusion moulding- injection moulding -blow moulding- thermoforming- casting

TEXT BOOKS

Angelo & Subramanian	Powder Metallurgy: Science, Technology and Applications
Chakrabarti	Casting Technology and Cast Alloys
Datta	Powder Metallurgy—An Advanced Technique of Processing Engineering Materials, 2nd ed.

REFERENCE

John	Metal Casting and Joining
Kaushish	Manufacturing Processes, 2nd ed.
Khan and Haq	Manufacturing Sciences
Kibbe, et al.	Machine Tool Practices, 9th ed.
Kumar & Gupta	Manufacturing Processes
Lindberg	Processes and Materials of Manufacture, 4th ed.
Mukherjee	Metal Fabrication Technology
Parashar	Cellular Manufacturing Systems: An Integrated Approach
Parashar & Mittal	Elements of Manufacturing Processes
Rajan, et al.	Heat Treatment: Principles and Techniques, 2nd ed.
Ravi	Metal Casting: Computer-Aided Design and Analysis
Surender Kumar	Technology of Metal Forming Processes