

B.E Semester: 5 Mechanical Engineering
Subject Name: Manufacturing Technology (ME503-N)

A. Course Objective:

- To develop a problem oriented in depth knowledge of Manufacturing Technology.
- To address the underlying concepts, methods and application of casting, welding, forming.

B. Teaching / Examination Scheme:

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
4	0	2	6	5	3	70	30	20	30	150

C. Detailed Syllabus:

Unit No.	Details
1	Manufacturing Processes: Basic Introduction, Importance of Manufacturing, Economics and Technological Definition, Classification and Selection of Manufacturing Processes
2	Metal Casting Processes: Patterns, Types of patterns, allowances and material used for patterns, moulding materials, moulding sands, Moulding sands; properties and sand testing: Grain fineness, moisture content, clay content and permeability test. Core materials and core making. Moulding practices: Green, dry and loam sand moulding, pit and floor moulding; shell moulding; permanent moulding; carbon dioxide moulding. Metal casting: Melting furnaces: Rotary, Pit electric, Tilting and cupola. Review of casting processes, casting design considerations, capabilities and applications of casting processes; Gating and Rising design fundamentals, (Gating System) Types of Gates and Risers, Gating Ratios and chills, Riser location & design in actual casting, Directional Solidification in Casting, Physical Behavior of Metals during Solidification, Yield calculation, various fettling and finishing operations of casting Design and simulation, Fluid and Heat flow analysis casting defects.
3	Soldering, brazing, adhesive bonding processes :(To be covered in Practical) Introduction, Principle, Advantages, Disadvantages and application of Soldering, brazing, adhesive bonding processes. Gas Welding Processes :(To be Covered in Practical) Introduction, oxy-acetylene welding, oxy-hydrogen, air-acetylene welding. Principle of operation, types of welding flames, Lighting the torch, flame adjustment, gas welding techniques, Welding techniques- leftward & rightward. Filler metals and fluxes, Gas welding equipments, applications, Gas Cutting: Introduction, Principle and application of Gas, Plasma and Laser cutting, Kerf Width measurement Welding Processes:(Partially to be covered in practical) Arc Welding Processes: Introduction, Principle, Welding Arc and Arc Physics, Working, Specifications, Equipments, Merits and demerits, applications of Carbon arc welding, Flux Shielded Metal Arc Welding, Gravity Welding, Sub Merged Arc Welding, Gas Tungsten Arc Welding, Gas Metal Arc Welding, CO ₂ Welding, Flux Cored Arc, welding(FCAW), Electro Slag welding, Electro Gas welding, Plasma Arc Welding. Source of Power Supply: AC/DC & their

	<p>characteristics. Arc Welding Electrodes:(To be Covered in Practical) Types, Details, Categories of welding electrodes, Ingredients of coating and their functions, Selection of Electrodes, Classification and Coding of mild steel and low alloy steel electrodes as per Indian and American System</p> <p>Resistance Welding Processes:(Partially to be Covered in Practical) Introduction, Principle, Heat balance, Specifications, Equipments, Merits and demerits, Applications of Spot welding, Seam Welding, Projection Welding, Upset welding, Flash Butt Welding and Percussion Welding. Solid State and Thermo Chemical Processes: (Partially to be Covered in Practical) Introduction, Principle, Working, Specifications, Equipments, Merits and demerits, applications of Solid State welding Processes like Cold (or pressure welding), Diffusion (Bonding), Explosive welding, Friction Stir Welding, Inertia and forged welding. Thermo chemical welding processes like Thermit Welding, Atomic hydrogen welding.</p> <p>Inspection and Testing of Casting and Welding: (To be Covered in Practical) Casting and Welding Defects, Introduction, type of defects in, causes and remedies of defects, Repair of defective casting and welded products, Inspection and nondestructive testing for casting and welding parts. Current trends in Casting and Welding technology: Hybrid Welding, Robotic Welding</p>
4	<p>Metal Shaping and Forming: Metal working, Elastic and plastic deformation, Concept of strain hardening, Hot and cold working, Rolling, Principle and operations, Roll pass sequence, Forging, Forging operations, extrusion, Wire and tube drawing processes. Forging: Method of forging, Forging hammers and presses, Principle of forging tool design, Cold working processes: Shearing, Drawing Squeezing, Blanking, Piercing, deep drawing, Coining and embossing, Metal working defects, cold heading, Riveting, Thread rolling bending and forming operation. Numerical Calculation of Different process parameters of metal shaping and forming.</p>
5	<p>Plastic, Ceramic and Glass Processing: Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, Transfer moulding, Injection moulding, Extrusion moulding, Blow moulding, Calendaring, Thermoforming, slush moulding, laminating. Ceramic Structure, Properties, and Applications, Shaping Ceramics, Glasses Structure, Properties, and Applications, Forming and shaping of glass, Composite materials, Processing of metal matrix and ceramic matrix composites, Processing semiconductors.</p>

Total hours (Theory):64
Total hours (Practical):32
Total hours:96

D. Lesson Planning:

Sr. No.	Date/Week	Unit	Weight age	Topic No
1	1 st , 2 nd	Unit 1	05 %	1
2	3 rd , 4 th , 5 th	Unit 2	25 %	2
3	6 th , 7 th , 8 th	Unit 3	25%	3
4	9 th , 10 th , 11 th , 12 th	Unit 4	25 %	4
5	13 th , 14 th , 15 th , 16 th	Unit 5	20%	5

E. Instructional Method & Pedagogy

1	At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
---	---

2	Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal Weight age should be given to all topics while teaching and conduction of all examinations.
3	Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4	One/Two internal exams may be conducted and total/average/best of the same may be converted toequivalent of 30 marks as a part of internal theory evaluation.
5	Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6	Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overallinternal evaluation.
7	The course includes a laboratory, where students have an opportunity to build an appreciation for theconcept being taught in lectures. Suggested list of experiment is given below

F. List of Practical:

1	Performance of various flames in oxy acetylene gas welding.
2	To join the given two work pieces as a required type of joint by gas welding process
3	To join the given two work pieces as a butt joint by MIG welding process
4	To join the given two work pieces as a butt joint by TIG welding process
5	Effect of welding parameters on bead characteristic for SAW process
6	To weld given material by spot welding process
7	Analysis of various parameters in rolling process
8	To make rectangular tray from the given sheet metal.
9	Parameter demonstration in Plastic Injection Molding Process.
10	Influence of main parameters of forging process
11	To determine moisture content of given moulding sand
12	Introduction of Sand Rammer and Permeability meter.
13	Introduction of Universal sand strength machine, Sieve and Shaker
14	Hands on Exercise on Pattern Making.

G. Students Learning Outcomes:

After learning the course the students should be able to:

1	The student will demonstrate the ability to think in core concept of manufacturing.
2	To learn various concepts related to casting and its application.
3	To learn various concepts related to welding and have practical perview of various welding process, welding standards.
4	To learn various concepts related to metal forming process and calculation of Different process parameters of metal shaping and forming.
5	To have basic understanding of Plastic, Ceramic and Glass Processing

H. Text Books & Reference Books:

1	Manufacturing Engineering And Technology By S. Kalpakjian, Pearson.
2	Manufacturing Processes, Kalpakjian, Pearson
3	Degarmon's Materials and Processes in Manufacturing, 11th Ed. Black, Ronald A Kohser, Wiley India.
4	Manufacturing Technology Vol-II, By P.N. Rao, Tata McGraw Hill.

5	Manufacturing Processes and Systems, 9th Ed. Phillip F., Ostwald, Jairo Munoz, Wiley India
6	Production technology, by R.K. Jain, Khanna publishers.
7	Production Technology by P.C. Sharma S Chand & Co Ltd.
8	Welding Technology, by O. P. Khanna, Dhanpat Rai publishers.
9	Technology of Metal forming Processes by Surendra, PHI
10	Mechanics of Sheet Metal Forming by Marciniak, Elsevier
11	Mechanical Metallurgy by George Dieter, McGrawhill
12	Welding Processes and Technology by R.S.Parmar, Khanna.
13	Welding and Welding Technology by Little, McGrawhill.
14	Welding Technology for Engineers by Rai, Narosa.
15	WS welding Handbook, Vol 1 to 4 AWS
16	Process and Materials of Manufacture by Lindberg – PHI.
17	Casting Technology by Chakravarty – New Age.
18	Metal Casting by Ravi, PHI.
19	Principle of Metal Casting by Hein.