Category: **Professional Core Course** Subject Code**: 19ME2203**

**Manufacturing Process**

**Internals: 40 Marks L - T - P - C**

**Externals: 60 Marks 3 - 1 - 0 - 4**

**COURSE OBJECTIVES:**

* To know the various manufacturing processes
* To understand the basic concepts of casting and welding
* To understand the manufacturing of plastics and composites
* To familiarize the forming processes and forming load estimation.
* To understand the principle of high energy rate forming processes

**COURSE OUTCOMES:**

* Able to understand the elements of casting, construction of patterns and gating systems, moulds, methods of moulding, moulding machines and solidification of castings of various metals.
* Able to understand the different types of welding processes, welds and weld joints, their characteristics, cutting of ferrous and non-ferrous metals by various methods.
* Able to understand the basic concept on one, two and three dimensional stress analysis, theory of plasticity; strain hardening, hot and cold working process.
* Able to understand the principles of Extrusion, rolling, forging processes, wire drawing and sheet metal processes, their applications and defects.
* Able to understand the basic concepts of the philosophy of metal cutting and the mechanism of chip formation. Student will understand the effect of various cutting parameters on cutting forces
* Able to know the various concepts about tool wear, tool life, cutting fluid etc.,

**UNIT – I**

**Casting:** Introduction, Pattern allowances and their Construction. Principles of Gating, Gating ratio and design of Gating systems, time of filling the cavity. Moulds: definition, mould materials, types of moulds, moulding methods, moulding machines, tests. Solidification of casting – Concept – Solidification of pure metal and alloys, short & long freezing range alloys.

**Risers**  – Types, function and design, casting design considerations, Design of feeding systems i.e., sprue, runner, gate and riser, moulding flasks. Problems, Casting inspection and defects

**UNIT – II**

**Welding :** Classification of welding process, power characteristics, types of welds and welded joints and their characteristics, design of welded joints, Thermit welding and Plasma (Air and water) welding. Defects, causes and remedies. Problems

**UNIT – III**

**Forming:** Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of Cold and Hot worked parts, **Rolling:** Theory of rolling, Mechanics of rolling. **Extrusion:** Basic extrusion process and its characteristics, Analysis of wire drawing and extrusion. **Forging:** Principles of forging – Tools and dies, Analysis of Forging, **Deep Drawing:** Analysis of deep drawing, tests for measuring of formability.

**UNIT-IV**

**Mechanics of Machining:** Single point cutting tool-types of reference systems–ASA,ORS and NRS systems and their Inter-relationships. Mechanism of chip formation, shear plane model. types of chips, effect of cutting parameters Forces in chip formation-Cutting force analysis- Ernst and Merchant analysis-theory of Lee and Shaffer. Effect of various cutting parameters on cutting forces, Theory of strain and strain rate in metal cutting and Energy considerations.

**UNIT-V**

**Tool Wear Life and Machinability:** Different causes-various forms of tool wear-measurement of tool wear. Tool life. Machinability-criterion for machinability-influence of variables affecting machinability. Measurement of Cutting Forces and Temperatures Tool Materials: Various tool materials, their properties and general guidelines for selection. Cutting Fluids: Functions, properties, types and selection. Economics of Metal Cutting: Various types of costs and their estimation. Determination of cutting speed for maximum production rate and minimum cost criteria.

**Video links for UNIT-V**

1. <https://www.youtube.com/watch?v=_OnGXJA7oX8&list=PL9ssGyHa3fnz9_rVCIzGdba9_UZj-ssz9&index=10>
2. <https://www.youtube.com/watch?v=TtVrqgso9RA&list=PL9ssGyHa3fnz9_rVCIzGdba9_UZj-ssz9&index=11>
3. <https://www.youtube.com/watch?v=hgHa8UlF-d4&list=PL9ssGyHa3fnz9_rVCIzGdba9_UZj-ssz9&index=12>
4. <https://www.youtube.com/watch?v=qLwpLbHdS1s&list=PL9ssGyHa3fnz9_rVCIzGdba9_UZj-ssz9&index=13>
5. <https://www.youtube.com/watch?v=-R-fySRLa9Q&list=PL82E9A8429ED7BB27&index=14>
6. <https://www.youtube.com/watch?v=v-4RsUQRFCE&list=PL82E9A8429ED7BB27&index=15>
7. <https://www.youtube.com/watch?v=7MkX-sW97rI&list=PL82E9A8429ED7BB27&index=16>
8. <https://www.youtube.com/watch?v=Ws8RA1jxsIw>
9. <https://www.youtube.com/watch?v=t3XNDPDEj4Q>
10. <https://www.youtube.com/watch?v=dje_JXy-CDo&list=PL9ssGyHa3fnz9_rVCIzGdba9_UZj-ssz9&index=26>
11. <https://www.youtube.com/watch?v=VeS1Yxl7_sQ&list=PLurb1PKes7bkI0NmhEVwvj4kbbE19D2fm&index=1>
12. <https://www.youtube.com/watch?v=bR-QfjFLAd8&list=PLurb1PKes7bkI0NmhEVwvj4kbbE19D2fm&index=2>
13. <https://www.youtube.com/watch?v=Jv3msJ8P26g&list=PLurb1PKes7bkI0NmhEVwvj4kbbE19D2fm&index=5>
14. <https://www.youtube.com/watch?v=l1p7nmSLeOQ&list=PLurb1PKes7bkI0NmhEVwvj4kbbE19D2fm&index=6>
15. <https://www.youtube.com/watch?v=y4wEQU1obX4>
16. <https://www.youtube.com/watch?v=InuVLdxbRlI>
17. <https://www.youtube.com/watch?v=D_Ef69DW_7c>