7th Semester	RPR7D004	Design for Manufacturing and Assembly	L-T-P 3-0-0	3 Credits

Module-I: **(08hours)**

Introduction to DFMA: History of DFMA, Steps for applying DFMA during product design, Advantages and limitations of applying DFMA during product design, Introduction to Manufacturing Process: Classification of manufacturing process, Basic manufacturing processes, Mechanical properties of material: Tensile properties, Engineering stress-strain, True stress strain, Compression properties, Shear properties, Introduction to materials and material selection: Classification of engineering materials, Material selection for product design.

Module-II: **(10 hours)**

Design for casting: Introduction to sand casting, Typical characteristics of a sand cast part, Design recommendation for sand casting, Investment casting: Introduction, Steps in investment casting, Design consideration of Investment casting, Typical characteristics and applications, Die casting: Introduction to die casting, Advantages, Disadvantages and Applications of the die casting process, Suitable material consideration, General design consideration, Specific design recommendation, Injection moulding: Introduction to injection moulding, Typical characteristics of injection moulded parts, Effect of shrinkage, Suitable materials, Design recommendations.

Module-III: **(12 hours)**

Design for machining and welding: Introduction to machining, Recommended materials for machinability, Design recommendations, Design for tuning operation: Process description, Typical characteristics and applications, Suitable materials, Design recommendations, Design for milling operation: Process description, Characteristics and applications of parts produced on milling machines, Design recommendations for milling, Dimensional factors and tolerances, Parts produced by planning, shaping and slotting: Process description, Design recommendation planning, Design for broached parts: Process description, Typical characteristics of broached parts, Suitable materials for broaching, Design recommendations. Design for welding: Design recommendation for welding processes, Design for solder and brazed assembly: Process, Typical characteristics, Suitable materials, Detail design recommendations, Design for adhesively bonded assemblies: Introduction, Typical characteristics, Suitable materials, Design recommendations for adhesive joint.

Module-IV: **(10 hours)**

Introduction to Assembly: The assembly process, Characteristics and applications, Example of common assembly, Economic significance of assembly, Design for Assembly: Introduction, Design consideration, Design for Fasteners: Introduction, Design recommendation for fasteners. Design for Assembly using CAD: Introduction, Assembly features, Definition of assembly feature attributes, Characterization of assembly feature, Examples of Assembly feature, Examples of assembly feature: Aircraft wing and automotive chassis assembly

Books:

[1] Product Design for Manufacture and Assembly by Geoffrey Boothroyd, Peter Dewhurst and Winston Knight, CRC press, Taylor & Francis, Florida, USA.
[2] Design for Manufacturing and Assembly by O. Molloy, S. Tilley and E.A. Warman, Chapman &Hall, London, UK.

[3] Engineering Design - a materials and processing approach by G Dieter, McGraw Hill.
[4] Materials and Processes in Manufacturing by E. P. DeGarmo, J. T. Black, R. A. Kohser, Wiley.
[5] Design for Manufacturability Handbook by James G. Bralla, McGraw-Hill companies, New York, USA.
[6] Fundamentals of modern manufacturing: materials, processes and systems by M. P. Groover, John Wiley & Sons.

Digital Learning Resources:

Course Name:	Design for Manufacturing and Assembly
Course Link:	https://nptel.ac.in/courses/112101005/12
Course Instructor:	Prof. Amitava De, IIT Bombay