

## POWDER METALLURGY

Course Type	Course code	Name of Course	L	T	P	Credits
DE	FMD 401	Powder Metallurgy	3	0	0	9

**Course Objective**

To acquaint with a broad overview of powder metallurgy processes, and understand the recent concepts in powder metallurgy and product design parameters

**Learning Outcomes**

- Conceptualize the powerful tool of powder metallurgy and directly apply to contemporary products.
- Acquainted with various powder production techniques
- Processing parameters related to various fabrication techniques
- Methods of characterization needed for evaluating the powder metallurgical products.

Unit No.	Topics to be covered	Lecture Hours	Learning Outcome
1	Introduction to Powder Metallurgy, Definition.	2	Students will learn the need to study the subject of powder metallurgy for the current technological needs
2	Powder fabrication methods: Mechanical fabrication, electrolytic fabrication, chemical fabrication, atomization, Numerical Problems.	6	Students will learn the different fabrication methods for powder production, advantages and disadvantages and their applications.
3	Microstructure control: Thermodynamics and kinetics of solidification, effect of fabrication process parameters on microstructure, Numerical Problems.	6	Students will learn ways in which the microstructure of a material fabricated via powder metallurgical routes vary with different processing parameters.
4	Powder Handling and Treatment: Classification, Screening, Mixing, Coating	3	Students will learn ways in which powder conditioning is done
5	Powder Characterization: basis for particle size measurement, particle size and distribution, dynamic light scattering, other methods of particle size measurement, surface area analysis, Case studies.	6	Students will learn the tools used to characterize particles size, shape, porosity etc.
6	Powder packing, Powder shaping, Consolidation, Compaction, sintering, characterization of powder compacts.	8	Students will learn different stages of material processing via powder metallurgical route.
7	Cold Isostatic pressing, powder injection molding, slurry techniques, tape casting, sintering, Full density processing, Finishing operations, Properties and Applications	6	Students will learn the different powder compaction and sintering operations.
8	Powder Metallurgy Products and their quality control: Porous components, Sintered carbides, Friction parts, Cermets, Magnetic materials and products etc.	5	Students will learn about the fabrication of P/M products for specific applications and from specific alloy systems.
	Total	42	

**Textbooks:**

- P.C. Angelo, and R. Subramanian, 2008. *Powder metallurgy: science, technology and applications*. PHI Learning Pvt. Ltd.
- A. Upadhyaya, and G.S. Upadhyaya, 2011. *Powder metallurgy: science, technology and materials*. Universities Press.
- G.S. Upadhyaya, A Upadhyaya Powder Metallurgy: Science, Technology and Materials, Universities Press (India) Pvt. Ltd.

**Reference textbooks**

- German, R.M., 1984. Powder metallurgy science. *Metal Powder Industries Federation, 105 College Rd. E, Princeton, N. J. 08540, U. S. A, 1984. 279.*