



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3162103

Semester – VI

Subject Name: Powder Metallurgy

Type of course: Engineering and Science

Prerequisite: Knowledge of Elements of Metallurgy and Materials Engineering and basic science skills

Rationale: This course introduces the particulate technology to create components from powder route.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content: Suggested Specification table with Marks (Theory):

Sr. No.	Content	Total Hrs
1	Powder production	5
2	Powder characterisation	4
3	Powder treatment	3
4	Powder compaction, Pressure less powder shaping	4
5	Sintering theory, sintering kinetics, sintering technology, consolidation	6
6	Defects in P/M route and their control, treatment of powder metallurgy components	3
7	Testing and quality control, metallic and ceramic P/M components, application of P/M products	3
	Total	28

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	45	5	0	0



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Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Powder metallurgy: science, technology and materials – Anish Upadhyaya, G.S. Upadhyaya, Universities Press (2011)
2. Power metallurgy : science, technology and materials – P.C. Angelo, R. Subramanian, Prentice Hall India Learning Pvt. Ltd., (2008)
3. Volume 7: Powder Metallurgy, ASM Handbook – P.K. Samal and J.W. Newkird, ASM (2015)
4. Powder Metallurgy Science – R.M. German, Metal Powder Industry (1994)
5. Introduction to Powder Metallurgy, A. K. Sinha, Dhanpatrai Publication

Course Outcomes:

Sr. No.	CO statement	Marks % Weightage
CO-1	Understand the basic steps for powder metallurgy and metal powder production.	45
CO-2	Select/Judge different compaction methods depending upon powder characterization.	35
CO-3	Identify the consolidation process during P/M route and the defects that arise in the P/M component	20

List of Experiments:

1. To compare powder metallurgy with other manufacturing processes.
2. To perform sieved analysis of Powder Metallurgy.
3. To measure the particle size and shape of metal powder by Optical Microscopy.
4. To measure tap density and apparent density of given powder sample.
5. To measure flow rate of given powder sample.
6. To measure friction Index of given powder sample.
7. To manufacture Copper powder by electrolysis method
8. To perform powder compaction of different metal powder by hydraulic press.
9. To study the mechanism of sintering.
10. To study different application of powder metallurgical component.



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Major Equipment:

1. Planetary ball mill
2. Hydraulic press
3. Sintering furnace
4. Hall flow meter
5. DC Power Source of 5 to 10 amp for Electrolysis.
6. Objective lens of square grid and horizontal grid for measuring particle size of powder.
7. Sieve Shaker.

List of Open Source Software/learning website:

1. <http://nptel.ac.in/>
2. <http://www.ipmd.net/>