<table>
<tr><td colspan="8">Department of Metallurgical and Materials Engineering</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Title of the course</td><td rowspan="2">Program Core (PCR) / Electives (PEL)</td><td colspan="4">Total Number of contact hours</td><td rowspan="2">Credit</td></tr>
<tr><td>Lecture (L)</td><td>Tutorial (T)</td><td>Practical (P)</td><td>Total Hours</td></tr>
<tr><td>MME714</td><td>Powder Metallurgy</td><td>PEL</td><td>3</td><td>0</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td colspan="2">Pre-requisites</td><td colspan="6">Course Assessment methods (Continuous (CT) and end assessment (EA))</td></tr>
<tr><td colspan="2">MMC302</td><td colspan="6">CT+EA</td></tr>
<tr><td colspan="2">Developer</td><td colspan="6">Dr. Manab Mallik</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">CO1: Learn science and technological aspects of the Powder Metallurgy Techniques.
CO2: Describes generic approaches to powder production and the basic principle associated with appropriate fabrication techniques.
CO3: Emphasis is put on methods for those types of metal powders which are commercially important.
CO4: The contemporary need can be met by the ability to analyze the industrial processes.
CO5: Learn various techno-economic aspects of powder metallurgy processing.
CO6: Solve problems of near net shape fabrication of powder metallurgy parts
CO7: Explore powder-processing-property relationship through assignment/ group task.</td></tr>
<tr><td>Topics Covered</td><td colspan="7">Introduction: Historical perspective of Powder Metallurgy; The Future of Powder Metallurgy. [4 hours]
Fabrication of Powders: Basics methods, Mechanical fabrication techniques; Electrolytic fabrication techniques, Chemical fabrication techniques, Atomization techniques. Production of Ferrous powders [8 hours]
Powder Characterization: Experimental methods for measuring particle size, shape, distribution, surface area; Significance of true, apparent and tap densities of powders;Flow rate; compressibility and green strength; Characteristics of common ferrous powders [6 hours]
Mixing and Blending: Dry Mixing, wet mixing; Powder Lubrication [4 hours]
Compaction: Injection Molding; Fundamentals of Compaction; Influence of Material and Powder Characteristics on compaction. [6 hours]
Sintering Behavior: Sintering fundamentals; Sintering Theory; Mixed Powder Sintering; Liquid Phase Sintering; Sintering Atmosphere, Sintering Furnaces; Full Density Processing. [8 hours]
Finishing Operations: Machining; Heat Treatments; Surface Treatments [4 hours]
Applications: Competitive Processes; Examples of Powder Metallurgy Applications and Properties. [4 hours]</td></tr>
<tr><td>Text Books, and/or reference material</td><td colspan="7">TEXT BOOKS:
1. Powder Metallurgy – A Upadhyaya and G S Upadhyaya.
2. Powder Metallurgy Science – R. M. German, 2nd Edition, MPIF, 1994
REFERENCE BOOKS:
1. Powder metallurgy: principles and applications, Fritz V. Lenel, Metal Powder Industries Federation, 1980
2. Powder Metallurgy Technology, Cambridge International Science Publishing, 2002</td></tr>
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