<table>
<tr><td colspan="7">Department of Metallurgical & 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>MMS751</td><td>Manufacturing Processes Lab - II</td><td>PCR</td><td>0</td><td>0</td><td>1</td><td>4</td><td>1.5</td></tr>
<tr><td colspan="2">Pre-requisites</td><td colspan="5">Course Assessment methods (Continuous (CT) and end assessment (EA))</td></tr>
<tr><td colspan="2">MMC403 and MMC501</td><td colspan="5">CT+EA</td></tr>
<tr><td colspan="2">Developer</td><td colspan="5">Dr. Manab Mallik</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">CO1: Learn science and technological aspects of the Powder production by Chemical reduction and Ball milling
CO2: Evaluate structure and physical properties of the synthesized powder
CO3: Demonstrate the effect of compaction pressure, particle geometry, binders and lubricant on the green strength
CO4: To study the effect of compaction pressure on densification
CO5: Learn various sintering techniques to produce net shape product
CO6: Examine microstructural, physical and mechanical properties of sintered products
CO7: Explore powder-processing-property relationship through laboratory assignment.</td></tr>
<tr><td>Topics Covered</td><td colspan="6">Exp 1: Demonstration of ball milling, compaction unit, dynamic light scattering technique and tube furnace [3 hours]
Exp 2: Synthesis of nano powders by Chemical reduction [3 hours]
Exp 3: Particle reduction by Ball milling [3 hours]
Exp 4: Characterization of nano and milled powders [3 hours]
Exp 5: Particle size analysis by different techniques [3 hours]
Exp 6: Conventional die compaction of powders [3 hours]
Exp 7: Solid state sintering [3 hours]
Exp 8: Liquid phase sintering [3 hours]
Exp 9: Microstructural characterization and phase analysis of sintered products [3 hours]
Exp 10: Hardness measurement of sintered products [3 hours]</td></tr>
<tr><td>Text Books, and/or reference material</td><td colspan="6">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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