

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	Metal Forming and Particulate Processing Lab		
Course Code	MTLR35	No. of Credits	2
Department	MME	Faculty	Prof. S. Kumaran & Dr. D. Nagarajan
Pre-requisites Course Code	MTPC21		
Course Coordinator(s)	Not applicable		
Other Course Teacher(s)/Tutor(s)	----	Telephone No.	0431-250 3712
Course Type	ELR		

**COURSE OVERVIEW**

This lab course demonstrates the different types of manufacturing/forming processes that are employed in engineering and different equipments/ dies that are used for shaping the metals into useful components. It also demonstrates the powder metallurgical characteristics of the forming process.

**COURSE OBJECTIVES**

- To familiarize the calibration of load cells and LVDT
- To perform simple metal forming and powder metallurgy experiments

**COURSE OUTCOMES (CO)**

Upon completing the course, the student will be able to :

<u>Course outcomes (Cos)</u>	<u>Aligned POs</u>
➤ Calibrate the load cells and LVDT	[1, 2, 4, 5]
➤ Perform forging, rolling, extrusion, bending and cupping test	[1, 2, 4]
➤ Predict surface strain and determine forming limit curve	[1, 2, 3, 4]
➤ Understand the powder characteristics by using standard procedure	[1, 2, 4]
➤ Learn the density measurements and sintering procedures of various powder preforms	[1, 2]

**COURSE SYLLABUS:**

- 1) Calibration of load cells
- 2) Calibration of LVDT
- 3) Upsetting / Forging of a cylinder
- 4) Rolling, extrusion
- 5) Cupping test
- 6) V- and U-Bending
- 7) Surface Strain prediction and Estimation of Forming Limit Curve
- 8) Powder characteristics such as metal powder size and shape, Apparent density and tap density, Flow rate
- 9) Compressibility of different powders and Green density of powder preform
- 10) Sintering (Conventional and Micro-wave) of powder preforms
- 11) Demonstration on Atomization

12) Demonstration of hot pressing (Vacuum hot pressing & Spark Plasma Sintering)

**COURSE TEACHING AND LEARNING ACTIVITIES:**

The class will be divided into 2 batches. One batch of students will be undergoing metal forming experiments (Exp. Nos: 1-7) first and the other batch will be demonstrated particulate processing lab in parallel, and the batches will be swapped later.

S.No.	Week	Topic	Mode of Delivery
1.	1 <sup>st</sup> week	Calibration of load cells (Batch 1)/ Powder characteristics such as metal powder size and shape (Batch 2)	Chalk & Talk and PowerPoint presentation
2.	2 <sup>nd</sup> week	Calibration of LVDT (Batch 1)/ Apparent density and tap density, Flow rate (Batch 2)	
3.	3 <sup>rd</sup> week	Upsetting / Forging of a cylinder (Batch 1)/ Compressibility of different powders, Green density of powder preform (Batch 2)	
4.	4 <sup>th</sup> week	Rolling, extrusion (Batch 1)/ Sintering (Conventional and Micro-wave) of powder preforms (Batch 2)	
5.	5 <sup>th</sup> week	Cupping test (Batch 1)/ Demonstration on Atomization (Batch 2)	
6.	6 <sup>th</sup> week	V- and U-Bending (Batch 1)/ Demonstration of hot pressing (Vacuum hot pressing & Spark Plasma Sintering) (Batch 2)	
7.	7 <sup>th</sup> week	Surface Strain prediction and Estimation of Forming Limit Curve (Batch 1)/ Evaluation for the particulate processing lab portion (Batch 2).	
8.	8 <sup>th</sup> week	Calibration of load cells (Batch 2)/ Powder characteristics such as metal powder size and shape (Batch 1)	
9.	9 <sup>th</sup> week	Calibration of LVDT (Batch 2)/ Apparent density and tap density, Flow rate (Batch 1)	
10.	10 <sup>th</sup> week	Upsetting / Forging of a cylinder (Batch 2)/ Compressibility of different powders, Green density of powder preform (Batch 1)	
11.	11 <sup>th</sup> week	Rolling, extrusion (Batch 2)/ Sintering (Conventional and Micro-wave) of powder preforms (Batch 1)	
12.	12 <sup>th</sup> week	Cupping test (Batch 2)/ Demonstration on Atomization (Batch 1)	
13.	13 <sup>th</sup> week	V- and U-Bending (Batch 2)/ Demonstration of hot pressing (Vacuum hot pressing & Spark Plasma Sintering) (Batch 1)	
14.	14 <sup>th</sup> week	Surface Strain prediction and Estimation of Forming Limit Curve (Batch 2)/ Evaluation for the particulate processing lab portion (Batch 1).	
15.	15 <sup>th</sup> week	Evaluation for the metal forming lab portion	

**COURSE ASSESSMENT METHODS**

Sl. No.	Mode of Assessment	% Weightage
1.	Continuous Assessment	50%
2.	Record	10%



3.	Viva-voce	10%
4.	Final Assessment	30%

**COURSE EXIT SURVEY**

With a questionnaire covering the following aspects: (1 to 10; 1 is poor and 10 is excellent) –  
 Either with the faculty through the questionnaire or through MIS.

1. Whether class was conducted as per schedule and in regular manner.
2. Whether prescribed syllabus was completed
3. Whether sufficient/suitable study material was given to the students on-time.
4. Whether assessment of the students was carried out properly and is satisfactory.

*NOTE: No make-up examination is conducted, unless prior approval is obtained from the Course Faculty and HoD. For genuine medical reasons, a letter from a Medical Officer is required.*

**COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)**

Copying in examination, plagiarism in assignment are highly penalized.

**ADDITIONAL COURSE INFORMATION**

No minimum attendance is required.

**FOR SENATE'S CONSIDERATION**

*[Handwritten signature]*  
 Faculty

*[Handwritten signature]*  
 17.08.23  
 Class Committee Chairman

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 HoD  
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 Professor & Head  
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