Course Type	Course Code	Name of Course	L	T	P	Credits
DP	NFMC520	Materials Processing Lab	0	0	3	1.5

Course objectives
The main objective is to introduce students to industrially relevant material processing techniques of metal working, heat treatment, surface treatment, powder processing, coatings, and 3D printing, and the techniques used to judge the efficacy of these treatments on changing the material properties.
Learning outcomes
On successful completion of the course, the students would be equipped with an understanding of different processing techniques, and characterization techniques.

Exp no.	Name of experiment	Lecture hours	Learning outcome
1.	Metal working: Cold rolling of Al alloys under different parametric conditions	3	Student will learn about cold rolling operation of Al alloys and its different parametric conditions
2.	Metal working: Effect of degree of cold rolling by microstructure/properties property analysis of Al alloys	3	Student will learn about structure property relationship in cold rolling of Al alloys
3.	Heat treatment: Effect of heat treatment (Annealing/normalizing/quenching/temperin g) of steels on its microstructure/properties	3	Student will learn about structure property relationship in heat treatment of steels
4.	Heat treatment: Effect of sensitization on the microstructure/properties of steel	3	Students will learn about sensitization on the properties of steel
5.	Powder processing: Metal oxide powder synthesis via sol-gel method	3	Student will learn to synthesize a metal oxide powder via sol-gel synthesis route
6.	Powder processing: Powder particle characterization via optical microscopy and image analysis software (ImageJ)	3	Students will learn to characterize the physical properties of a metal powder.
7.	Surface treatment: Effect of grit blasting parameters on the surface profile of a grit blasted surface	3	Student will learn about structure property relationship in grit blasting of metal surfaces
8.	Powder Sintering: Effect of sintering parameters on the properties of sintered metal powder	3	Student will learn about structure property relationship in sintering of metal powders
9.	Coatings: Cold spray coatings under different parametric conditions	3	Student will learn about cold spray operation and its different parametric conditions
10.	Coatings: Effect of parametric conditions on the properties of coating	3	Students will learn about quantitatively analysis the coating quality and its structure-property-processing relationship

11.	Metal working: Hot rolling of Al alloys under different parametric conditions	3	Student will learn about hot rolling operation of Al alloys and its different parametric conditions
12.	Metal working: Effect of degree of hot rolling by microstructure/properties property analysis of Al alloys	3	Student will learn about structure property relationship in hot rolling of Al alloys
13.	Metal working: Metal extrusion of Al alloys under different parametric conditions	3	Student will learn about metal extrusion operation and its different parametric conditions
14.	Metal working: Effect of extrusion parameters on the microstructure/properties of Al alloys	3	Students will learn about effect of extrusion parameters on the properties of Al alloys
15.	3D printing by fused deposition modelling: Effect of processing parameters on the printed material property	3	Student will learn about structure property relationship in 3D printing via fused deposition modeling
16.	Demonstration of melting of alloy using vacuum induction furnace for alloy development	3	Student will be familiarised practically with alloy development
Total		**48**	

Textbook:

1. Experiments in Materials Technology: A Laboratory Text for Engineers in Physical Metallurgy, Manufacturing Process Metallurgy and Materials Testing, C. A. Higgerson, Affiliated East-West Press, 1973

Reference Books:

1. Respective ASTM standards
2. Solidification and Crystallization Processing in Metals and Alloys, Hasse Fredriksson; Wiley, 2012.
3. Thermo-Mechanical Processing of Metallic Materials, Pergamon Materials Series