Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2015-2016

Course Handout Part II

Date: 07-01-2019

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **MST F332**
Course Title : Materials Processing
Instructor-in-Charge : Dr. Sujith R

Scope and Objective of the Course: This course is aimed at providing insight into various materials processing techniques that are commonly employed in industrial manufacturing. The course is intended to cover aspects of processing techniques of metals, ceramics, thin films, carbon materials, plastics and composites.

Textbooks:

1. E. Paul DeGarmo, J. T. Black, Ronald A. Kohser. Materials and Processes in Manufacturing, 8th Edition, Prentice Hall, Newjersy 2002.
2. Krishan K. Chawla. Composite Materials: Science and Engineering, Second edition. Springer-Verlag, New York, 1998.

Reference books

1. HS Ray and A Ghosh. Principles of Extractive Metallurgy. New Age International Publishers. 1991
2. BK Datta. Powder Metallurgy. PHI Learning Private Limited. 2012.
3. V. Raghavan, Materials Science & Engineering, Sixth edition, PHI Learning Private Limited. 2015
4. R. Abbaschian, L. Abbaschian, R. E. Reed-Hill, Physical metallurgy principles, Fourth edition, Cengage learning. 2010.
5. J. F. Lancaster, Metallurgy of welding, Sixth edition, Woodhead Publishing Limited, 1999.

Course Plan:

Lect. No.	Learning objectives	Topics to be covered	Chap. in the Text Book
1	Introduction	Course overview. Introduction to materials processing.	TB1- 1
2-10	Appraise the various processing techniques in metals	Solidification: Homogeneous and Heterogeneous, Nucleation and Growth, Zone refining, Nanostructured materials, Bulk metallic glasses, Cold working and Hot working, Strengthening mechanisms, Dynamic Recovery and recrystallization, Weldability of steel, CI and aluminium alloys	TB 1-5 RB4 -14 &15, RB3-9, RB5-2 and lecture notes
11-18	Demonstrate the processing techniques in	Introduction to powder processing, powder characterization, powder compaction, Hot-isostatic pressing, Sintering, Curvature effect, Spark plasma	TB1-16, RB-2

	ceramics	sintering	
19-26	Processing of thin films & 2D materials	Materials used in thin films (Organic / inorganic). Introduction to thin film deposition processes: PVD, CVD. Special techniques & applications. 2D Materials: Mechanical Exfoliation, Liquid phase exfoliation, Epitaxial growth, CVD, Etching and electrochemical transfer	Class notes
27-32	Processing of Carbon Based Materials	Manufacturing of Carbon fibres: Controlled Pyrolysis and Electrospinning.	TB2-2/Notes
33-37	Processing of Polymer Composites (FRP)	Structure,-properties of Glass fibres, Aramid fibres, Alumina and SiC. Sizing and preforming. Overview of Polymer & their Composites, Filament Winding, Pultrusion, Resin transfer moulding, Autoclave (prepreg-layup), Injection moulding, Compression moulding. Case study: Glass-PP, Carbon-Phenolic. Recycling of FRP*	TB 2-5/ TB1-20 / Notes
38-40	Processing of Ceramic Composites	Overview of ceramics composites, Hot pressing, Liquid infiltration, Sol-gel process, CVD, etc.	TB 2-7 & 8

- NOTE: * Invited talk from Industrial experts

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-Semester Exam	90 min	30 %	11/3 9.00 - 10.30AM	Closed book
Seminars/Assignments	-----	25 %	---	Open book
COMPRE	3 hours	45 %	01/05 FN	Closed book

Chamber Consultation Hour: To be announced later
Notices: All notices related to the course will be uploaded in CMS.
Make-up Policy: Make-up will be granted for genuine cases with prior approval from IC

Dr. Sujith R
INSTRUCTOR-IN-CHARGE