



SECOND SEMESTER 2019-2020

Course Handout Part II

Date: 06-01-2020

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
Instructor : Prof. Ramesh Adusumalli

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, carbon materials, plastics and composites (FRP) and Metal matrix composites. Brief overview of 3-D printing of polymers and polymer composites for various applications will conclude the course.

Textbooks:

1. E. Paul De Garmo, J. T. Black, Ronald A. Kohser. Materials and Processes in Manufacturing, 8th Edition, Prentice Hall, New Jersey 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. MN Rahman, Ceramic Processing and Sintering, 2nd Edition, 2003.
3. R. Abbaschian, L. Abbaschian, R. E. Reed-Hill, Physical metallurgy principles, Fourth edition, Cengage learning. 2010.

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	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, Cast Iron and aluminium alloys	TB 1-5 RB4 -14 &15, RB3-9 and lecture notes
11-	Processing	Synthesis of powders, powder characterization, powder	TB1-16, RB-2



17	techniques in ceramics	compaction, Sintering of ceramics, Theory of solid state sintering, Liquid phase sintering	
18-25	Processing of Porous & 2D materials	Porous Materials: Bubbling of gas in molten metal, TiH_2 decomposition, replication techniques, hollow sphere synthesis and sintering, Leaching. 2D Materials: Mechanical Exfoliation, Liquid phase exfoliation, Epitaxial growth, CVD, Etching and electrochemical transfer.	Class notes
26-30	Processing of Carbon Based Materials	Manufacturing of Carbon fibers (PAN & Pitch based), Controlled pyrolysis to make nanofibers, Graphene & CNT.	TB2-2/Notes
31-36	Processing of Polymer Composites (FRP)	Processing and properties of Glass fibers, Aramid fibers and Viscose fibers. Sizing and Preforming. Overview of Polymer & their Composites. Processing of FRP: Filament Winding, Pultrusion, Resin transfer moulding, Autoclave (prepreg-layup), Injection moulding, Compression moulding. Case study: Glass-PP, Nylon-Carbon, Carbon-Phenolic composites	TB 2-5/ TB1-20 / Notes
37-40	Processing of Ceramic and Metal matrix Composites	Overview of ceramics composites, metal composites. Hot pressing, Liquid infiltration, Sol-gel process, CVD, etc. ex: Al-SiC composites, Carbon-Carbon composites	TB 2-7 & 8
41	Processing of thin films*	Materials used in thin films (Organic / inorganic). Introduction to thin film deposition processes: PVD, CVD. Special techniques & applications.	Class notes

- NOTE: * Invited talk from Industrial experts

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-Semester Exam	90 min	30 %	5/3 3.30 - 5.00 PM	Closed book
Projects	-----	20 %	---	Open book
Class Quizzes	-----	10%		Open book
Compre Exam	3 hours	40 %	11/05 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.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Dr. Sujith R
INSTRUCTOR-IN-CHARGE

