

Processing of non metals - Video course

COURSE OUTLINE

The main objective of the course is to impart an understanding of the manufacturing science and engineering of non-metals which is usually not covered at the UG level. The course deals with the study of the basic nature of different non-metals and the manufacturing processes associated thereof. The various non-metals covered in the course include glasses, ceramics, plastics and different types of composite materials.

Contents: Introduction; classification of engineering materials and processing techniques, various types of non-metals, basic nature of non-metals, properties of various non-metals, challenges in processing of non-metals, glass forming, heat treating glass; classification of ceramics, structure and properties, synthesis of ceramic powders, processing of ceramic products, ceramic coatings.

Classification of plastics, processing – injection/rotational/blow molding, extrusion, thermoforming, rapid prototyping; classification of composite materials, polymer matrix composites, processing – hand layup, filament winding, pultrusion etc., processing of ceramic matrix composites, Secondary processing of composite materials.

COURSE DETAIL

Sl. No	Topic	Hours
1.	Introduction: Classification of engineering materials and processing techniques, structure and properties of non-metals.	2
2.	Glass structure and properties, glass melting and forming, glass annealing.	3
3.	Classification of ceramics: crystal structures and properties, ceramic	7



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Mechanical Engineering

Pre-requisites:

- Understanding of the basic concepts of science and engineering of materials and basic manufacturing techniques
- UG course on Basic Manufacturing Processes

Additional Reading:

- Handbook of Composites: S.T. Peters

Coordinators:

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	powder preparation, Synthesis of ceramic powders, fabrication of ceramic products from powders: pressing, casting, vapour phase techniques, sintering, finishing, machining. ceramic coatings..	
4.	Structure and mechanical properties of plastics, thermoplastics and thermosets, Processing of Plastics: Extrusion. Injection moulding. Thermoforming. Compression moulding. Transfer moulding. General behavior of polymer melts, Machining of plastics.	7
5.	Classification of composite materials, properties of composites, processing methods of polymeric matrix composites: hand lay-up, autoclaving, filament winding, pultrusion, compression molding, pre-pegging, sheet molding compounds etc., process capability and application areas of various techniques.	10
6.	Ceramic matrix composites, mechanical properties of ceramic matrix composites, different processing techniques for ceramic matrix composites, process capability and applications of various techniques.	6
7.	Secondary processing of composite materials, Need of secondary operations, different type of secondary operations, machining and drilling of non-metals, machining induced damage, different methods of reducing the damage on account of secondary processing.	5

References:

1. Manufacturing Processes for Engineering Materials : S. Kalpakjian, 3rd edition Addison - Wesley, 1997
2. Plastic Materials and Processing :A. Brent Strong, Prentice Hall, ISBN 0-13-021626-7
3. Composite Materials: Engineering and Science: F.L. Mathews and R.D. Rawlings, CRC press, 084930251X

