

SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Defence Science)
Semester: IV
Syllabus with Effect from: June - 2014

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| Paper Code: PT04CDSC03 | Total Credit: 4 |
| Title Of Paper: Composite Materials & Its Applications to Defense Needs | |

| Unit | Description in Detail | Weightage (%) |
|------|---|---------------|
| I | Introduction: Composite Materials definition and classification - Dispersion Strengthen Composites, Particulate Composites, Concretes, Laminar Composites and Introduction to Fiber Reinforced Composites. Reinforcements: Types of reinforcements-whiskers and fibers, preparation, structure and properties of different reinforcing fibers, carbon fibers, glass fibers, polymer fibers (Aramid, PU fibers etc.) and alumina fibers. Matrix systems: Ceramics and Carbon matrix system, polymer matrix systems - Fluoro Polymers, Epoxy Resins etc. | 25% |
| II | Types of Composites: Fiber reinforced composites with different matrix systems, polymer matrix (thermoset and thermoplastic) composites e.g. Polyester glass fiber reinforced Laminates for Aircrafts With glass cloths, Chopped strand Mat, Needle Mat, Preforms etc., PEEK - C/graphite Thermoplastic Composites for Aircrafts and Missiles, High Temperature Ablative Composites - Specialty Polymers: Polyamide-imides and their composites with E-glass, S-glass, and C-fibers with PF and MF Resins, C-Fiber with epoxy resins, High Heat Resistant Thermoplastics Composites for Aircrafts and Helicopters, metal matrix composites and ceramic matrix composites, C-C Composites, types of nanocomposites | 25% |
| III | Fabrication Techniques and Test Procedures: Interfaces in composites and micromechanics of composites, molding processes for reinforced composites - Hand layup technique, contact molding, transfer molding, pultrusion, filament winding, Fabrication of metal and ceramic matrix composites. Coating Techniques: Electrostatic Powder gun coating, Dipping Method, Electrochemical Deposition, Room Temp Curing with initiator catalysts, Test procedures for mechanical testing, physical properties, void content for fiber reinforced composites. | 25% |
| IV | Properties and applications of composites: Mechanical properties of composite, effect of fiber volume content, orientation of fibers & void contents on mechanical properties of composites, fracture behavior of composites, thermal properties of composites, Applications of composites in Defense and Aerospace applications. Materials for LCAs, Rocket and Missile Structures, Nanocomposites for military and air warfare applications. Conducting Polymer Microwave Absorbing & ESD Protection Materials, Polymers for Electronic Applications, Photo resists, Polymers for Prosthetic Devices: Plsiloxanes, PVA, PET, Polycarbonates | 25% |

Basic Text & Reference Books:-

- Composite Materials, K. K. Chawla, Springer
- Handbook of composites, G. Lubin, Springer
- Science and Engineering of Materials, Donald R. Askeland
- An Introduction to Composites Materials by D. Hull, Cambridge
- Engineering Materials, 1980, MF Ashby, Pergamon

