4. CERAMIC TECHNOLOGY

Module I (14 hours)

Introduction: Types, nature, conventional & recent applications, refractories, silicates, glasses, super- refractories, cement, whiteware etc.

Structure**:** Types of bonding, bonding characteristics, basic structures, perovskite structure, structure of silicates, polymorphic transformations, ceramic oxides, non-oxide ceramics, crystalline & non-crystalline ceramics

Properties **:** Mechanical, thermal, electrical, optical, magnetic, failure modes, ionic and superionic conductivity

Module II (16 hours)

Phase Equilibria: Phase rule, one component system: silica, binary & ternary systems, miscibility gap in glasses, dilatometric expansion curve, viscosity based transition points in glasses, devitrification in glasses

Processing: Powder pressing, slip casting, tape casting, gelcasting, hydroplastic forming, extrusion, sintering, jiggering, sol-gel processing, anvil technology, ceramic coating, fusion casting, drying & firing, glass forming process

Heat Treatment of Glasses: Influence of processing & heat treatment on microstructure

Module III (10 hours)

Special Types & Applications: Toughened ceramics, cermet, piezoelectric ceramic, ceramic magnets, high temperature superconducting magnets, glass-ceramic composite, chemically bonded ceramics, bioceramics

Ceramics in electrical applications, fuel cells, solar cells, batteries

Text and Reference Books:

1. Fundamentals of Ceramics by M. W. Barsoum, Taylor & Francis
2. Introduction to Ceramics by W. D. Kingery, H. K. Bowen, D. R. Uhlmann, Wiley
3. Ceramic Processing and Sintering by M.N. Rahman, Marcel Dekker, Inc.
4. Principles of Ceramics Processing by J. S. Reed, Wiley Interscience
5. Introduction to Glass Science and Technology by J. E. Shelby, Royal Society of Chemistry
6. Handbook of Advanced Ceramics Vol.II, Processing and Their Applications by Shigeyuki Somiya, Elsevier Academic Press
7. Mechanical Properties of Ceramics by J. B. Watchman, John Wiley New York, 1996