AMCT21 ADVANCED CERAMIC PROCESSING

UNIT-1 POWDER PROCESSING

1.1 Powder preparation by mechanical methods
1.2 Comminution, mechano-chemical synthesis.
1.3 Powder synthesis by chemical methods
1.4 Solid state reaction, liquid solutions, vapour phase reactions.
1.5 Synthesis of nano scale ceramic powder
1.6 Liquid solution technique, vapour phase technique.

UNIT-2 FORMING

2.1 Additives in ceramic forming- solvents, dispersant, binder, plasticizer, other additives.
2.2 Forming of ceramics- dry and semidry pressing - die compaction and isostatic compaction;
2.3 Casting methods- slip casting, pressure casting, gel casting, electrophoretic deposition;
2.4 Plastic forming methods - extrusion, co-extrusion, injection molding,
2.5 Solid freeform fabrication- particle filled polymer methods,
2.6 Powder methods, suspension methods-
2.7 Porous ceramic forming- foaming, intrusion, organic additives.

UNIT-3 SINTERING MECHANISMS

3.1 Solid state sintering- driving force,
3.2 Effect of surface curvature and boundary defects, mechanism, stages of sintering.
3.3 Liquid phase sintering- stages, kinetic and thermodynamic factors,
3.4 Phase diagram in liquid phase sintering.
3.5 Grain growth- different grain growth process, control of grain growth, grain growth and pore evolution in a porous compact, interaction between pore and grain boundary.

UNIT-4 ADVANCED SINTERING

4.1 Pressure assisted sintering
4.2 Hot pressing and hot iso-static pressing.
4.3 Reaction bonded sintering, microwave sintering.

UNIT-5 MACHINING AND SURFACE FINISHING OF CERAMICS

5.1 Mechanism of material removal and its effect on strength,
5.2 Surface grinding and mechanical polishing, non-abrasive finishing,
5.3 Ceramic surface coating, joining of ceramics- metal ceramic joints.

References Books:

1. Paul De Garmo E, Black J.J and Ronald A.Kohser, Materials and Processes in Manufacturing, 8th Edn., Prentice – Hall India Pvt. Ltd., New Delhi, 1997.
2. Reed J.S, Introduction to the Principles of Ceramic Processing, Wiley, New York, 1988.
3. John G.P.Binner (Ed), Advanced Ceramics Processing and Technology, Noyes Publications, New Jersey, 1990.