

AMAE18 HIGH TEMPERATURE MATERIALS

UNIT-1 CREEP

- 1.1 Factors influencing functional life of components at elevated temperatures,
- 1.2 Definition of creep curve, various stages of creep,
- 1.3 Metallurgical factors influencing various stages, effect of stress, temperatures and strain rate.

UNIT-2 DESIGN FOR CREEP RESISTANCE

- 2.1 Design of transient creep time, hardening, strain hardening,
- 2.2 Expressions of rupture life of creep, ductile and brittle materials,
- 2.3 Monkman-Grant relationship.

UNIT-3 FRACTURE

- 3.1 Various types of fracture, brittle to ductile from low temperature to high temperature,
- 3.2 Cleavage fracture due to micro void coalescence
- 3.3 Diffusion controlled void growth; fracture maps for different alloys and oxides.

UNIT-4 OXIDATION AND HOT CORROSION

- 4.1 Oxidation, Pilling, Bedworth ratio, kinetic laws of oxidation
- 4.2 Defect structure and control of Oxidation by alloy additions, hot gas corrosion deposit,
- 4.3 Modified hot gas corrosion, fluxing mechanisms, effect of alloying elements on hot corrosion,
- 4.4 Interaction of hot corrosion and creep, methods of combat hot corrosion.

UNIT-5 SUPER ALLOYS AND OTHER MATERIALS

- 5.1 Iron base, Nickel base and Cobalt base super alloys, composition control,
- 5.2 Solid solution strengthening, precipitation hardening by gamma prime,
- 5.3 Grain boundary strengthening, TCP phase, embrittlement,
- 5.4 Solidification of single crystals, Intermetallics, high temperature ceramics.

References Books:

1. Boyle J.T, Spencer J, "Stress Analysis for Creep" ,Butterworths, UK, 1983.
2. Bressers.J., "Creep and Fatigue in High Temperature Alloys", Applied Science, 1981.
3. McLean D., "Directionally Solidified Materials for High Temperature Service", The Metals Society, USA, 1985.