MT225 Jan 3:0

Elevated Temperature Deformation and Fracture

Instructor

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Department: Materials Engg

Course Time:

Lecture venue:

Detailed Course Page:

Announcements

Brief description of the course

The course deals broadly with high temperature deformation in a wide range of materials. An approach combining experiments and theories is developed as a basis to examine several different topics involving deformation at high temperatures, including creep, creep fracture, superplasticity and sintering.

Prerequisites

No prerequisites, although exposure to a course on mechanical behaviour is desirable.

Syllabus

Phenomenology of creep, Microstructural considerations in metals, alloys, ceramics and composites, Creep mechanisms, Deformation mechanism maps, Superplasticity in metallic alloys, ceramics and nanophase materials, Commercial applications and considerations, Cavitation failure at elevated temperatures by the nucleation, growth and interlinkage of cavities. Sintering mechanisms. The course will also include some laboratory demonstrations of the phenomena discussed in class together with an appropriate analysis of the data.

Course outcomes

Encouraging a healthy skeptical approach to examining existing theories, models and experiments. Develop skills in evaluating critically experimental data and different potential mechanisms. Utilize fundamental understanding to assess results on new materials.

Grading policy

Homework 15

Midterm 10

Maps 20

Term paper 40

Finals 15

Assignments

Resources

Zhang, J.-S., High temperature deformation and fracture of Materials, Elsevier, 2010

Polreer, J.P., Creep of crystals, Cambridge University Press, Cambridge, 1984

Riedel, H., Fracture at high temperatures, Springer Verlag, Berlin, 1987