

MT 253: Mechanical Behaviour of Materials

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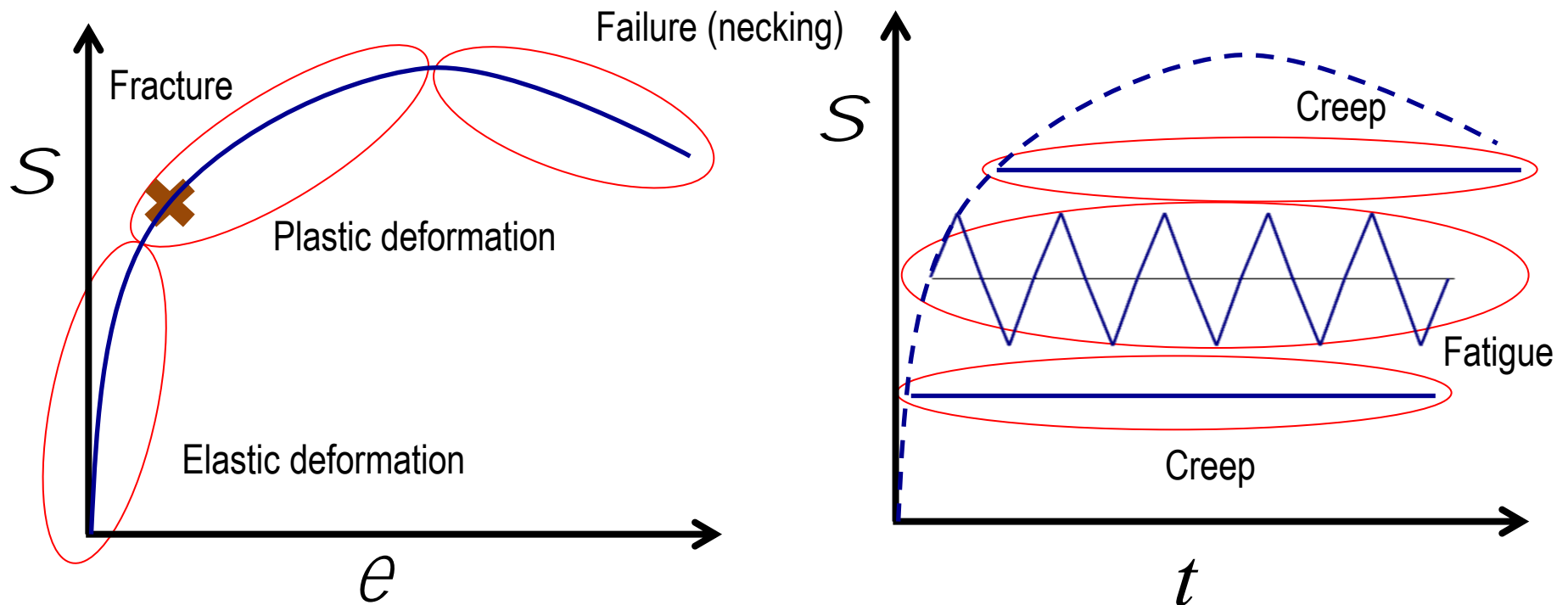
Class Timing:

11:00 AM – 12:00 PM (Monday, Wednesday and Friday)

Lecture Notes @ materials.iisc.ernet.in/praveenk (pk@iisc)

What is a Mechanical Property?

- A mechanical property reflects the *response of a material* subjected to *actions of external forces*; such as: Young's modulus, yield stress, ultimate tensile stress, ductility, hardness, toughness, fracture toughness, creep resistance, etc.



- In this course, we will try to understand the origin of mechanical behavior and then establish easy to use "structure – property relationship"

Tentative Topics

1. Introduction to elastic deformation: Stress-strain tensors, Hooke's law, compliance / stiffness tensor, how to change Young's modulus
2. Phenomenological treatment of plastic deformation: Yield criteria, constitutive equations
3. Microstructural aspects of plasticity: Dislocations, dislocation motion, elastic properties of dislocations, dislocations in FCC, plastic deformation of single and poly-crystals
4. Strengthening mechanisms: Strain hardening, grain boundary, solid solution, second phase
5. Fracture: Fracture mechanisms, linear elastic fracture mechanics, toughening mechanism
6. Fatigue: Microstructural aspects, empirical models
7. Creep: Microstructural aspects, phenomenological models

→ No text book, though you may find **Courtney's** or **Dieter's** book on mechanical behaviour useful. A set of reference books for each chapter shall be provided.

Grading

1. **Mid-Term** (sometime after 3rd or 4th chapter) → 35 %
2. **Final** (last week of November) → 55 %
3. **Miscellaneous** (Assignment, Quiz, etc.) → 10 % (if none taken, then everyone gets 10 %)