



Course Outline

MATS6106

Mechanical Properties of Materials

Materials Science and Engineering

Science

T1, 2022

1. Staff

Position Name	Email
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2.1 Course summary

Crystallography revision. Theoretical strength; slip; twinning; deformation of single and polycrystals; dislocation multiplication; cross slip; climb; dislocation interactions. Strain-strain curves of different metal crystals. Theories of the yield point and flow stress. Temperature dependence of flow stress, high-temperature deformation and creep. Advanced theories on strengthening mechanisms of metals. Superalloys and composite materials to be taught illustrating some of the principles involved.

2.2 Course aims

To relate dislocation theory and strengthening mechanisms to the mechanical behaviour of materials. Advanced theories of strengthening will be introduced in the course. These principles will be illustrated with respect to superalloys and composite materials.

2.3 Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

1. Understand the principles underlying the deformation and strengthening of materials
2. Articulate the common strategies used to strengthen materials
3. Understand strengthening mechanisms at different temperature and creep resistance in materials

2.4 Relationship between course and program learning outcomes and assessments

Course Learning Outcome (CLO)	LO Statement	Program Learning Outcome (PLO)	Related Tasks & Assessment
CLO 1	Understandō	5	Assignment 1, Mid-term exam, Assignment 2 & Final exam
CLO 2	Articulateō	1	Assignment 2 & Final exam
CLO 3	Understandō		

4. Course schedule and structure

You are expected to undertake a total of approximately 150 hours of work for this course, including working through the online tutorials, attending live online classes, completing assessments, reading the textbooks and other resources, and revising and preparing for the exam.

Week	Topics	Activity
1	Revision of crystallography Defects in materials Properties of dislocations	Online tutorials
2	Movement of dislocations Dislocation interactions	Online tutorials
3	Sources of dislocations Relating dislocation behaviour to macroscopic effects Dislocations in FCC crystals	Online tutorials Formative online quiz
4	Dislocations in HCP and BCC crystals	Online tutorials
5	Dislocations in covalent and ionic crystals	Online tutorials Assignment 1 due

5. Assessment

5.1 Assessment tasks

Assessment task	Description	
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Online exams will be opened for a limited amount of time; students must complete the exam during the allocated time and only have one attempt.

Unless otherwise specified in the task criteria, all assignments/assessment tasks must be

The *Conduct and Integrity Unit* provides further resources to assist you to