Shape and Property Control of Metals I & II

This course is part of **Materials Science for Technological Application Specialization**

Instructor: Terry Alford

1,683 already enrolled

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5 modules
Gain insight into a topic and learn the fundamentals.

4.8 ★
(19 reviews)

Beginner level
Recommended experience

2 weeks to complete
at 10 hours a week

Flexible schedule
Learn at your own pace

What you'll learn

- Explore Shape and Property Control of Metals.

Skills you'll gain

Reliability | Mechanical Engineering | Engineering Calculations | Semiconductors | Materials science | Thermal Management | Manufacturing Processes | Failure Analysis

Details to know

Shareable certificate
Add to your LinkedIn profile

Taught in English

Assessments
2 assignments[1]
AI Graded see disclaimer

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Build your subject-matter expertise

This course is part of the Materials Science for Technological Application Specialization
When you enroll in this course, you'll also be enrolled in this Specialization.

- Learn new concepts from industry experts
- Gain a foundational understanding of a subject or tool
- Develop job-relevant skills with hands-on projects
- Earn a shareable career certificate

There are 5 modules in this course

This course introduces students to the basic concepts of shaping materials and their impacts on properties and structure. An introduction to the fundamentals of diffusion in a solid follows. We present different types of diffusion mechanisms and their dependence on temperature. The role of dislocation on mechanical properties and how it can be used to strengthen materials will be shown.

Read less

Shape and Property Control of Metals I & II

Module 1 • 5 minutes to complete

Module details

This course introduces students to the basic concepts of shaping materials and their impacts on properties and structure. An introduction to the fundamentals of diffusion in a solid follows. We present different types of diffusion mechanisms and their dependence on temperature. The role of dislocation on mechanical properties and how it can be used to strengthen materials will be shown.

What's included

1 video 1 reading

Hide info about module content

1 video • Total 2 minutes

Mini Course #3 Introduction Video • 2 minutes

1 reading • Total 3 minutes

Specialization Overview • 3 minutes

Module 1: Diffusion and Its Mechanisms

Module 2 • 5 hours to complete

Module details

In this module, we explore shape and property control of materials and diffusion of atoms into different materials.

What's included

6 videos 8 readings 2 discussion prompts

Hide info about module content

6 videos • Total 32 minutes

Shape and Property Control, Part 1 • 3 minutes

Shape and Property Control, Part 2 • 6 minutes

Shape and Property Control, Part 3 • 5 minutes

Diffusion, Part 1 • 4 minutes

Diffusion, Part 2 • 8 minutes

Diffusion, Part 3 • 3 minutes

8 readings • Total 244 minutes

Lesson 1 Overview • 1 minute

Intro to Materials Science, Chapter 9, Mechanical Properties II - Environment & Failure • 60 minutes

Lesson 2 Overview • 1 minute

Introduction to Materials Science, Chapter 9, Mechanical Properties II - Environment & Failure • 60 minutes

Lesson 3 Overview • 1 minute

Introduction to Materials Science, Chapter 10, Single-Phase Alloys I – Diffusion • 60 minutes

Lesson 4 Overview • 1 minute

Introduction to Materials Science, Chapter 10, Single-Phase Alloys I -- Diffusion • 60 minutes

2 discussion prompts • Total 60 minutes

Property of Materials • 30 minutes

Diffusion • 30 minutes

Module 2: Diffusion

Module 3 • 4 hours to complete

Module details

In this module, we explain how physical (e.g. atom size; host atom bond strength) factors affect diffusivity and activation energy.

What's included

3 videos 6 readings 1 assignment 2 discussion prompts

Hide info about module content

3 videos • Total 15 minutes

Diffusion, Part 4 • 6 minutes

Diffusion, Part 5 • 1 minute

Diffusion, Part 6 • 7 minutes

6 readings • Total 138 minutes

Lesson 1 Overview • 1 minute

Introduction to Materials Science, Chapter 10, Single-Phase Alloys I -- Diffusion • 60 minutes

Lesson 2 Overview • 1 minute

Introduction to Materials Science, Chapter 10, Single-Phase Alloys I -- Diffusion • 15 minutes

Lesson 3 Overview • 1 minute

Intro to Materials Science, Chapter 10, Single-Phase Alloys I -- Diffusion • 60 minutes

1 assignment • Total 30 minutes

Single-Phase Alloys – Diffusion Quiz • 30 minutes

2 discussion prompts • Total 60 minutes

Interstitial Diffusion • 30 minutes

Substitutional Diffusion • 30 minutes

Module 3: Shape and Property Control of Materials

Module 4 • 5 hours to complete

Module details

Semiconductor devices require very precise control of the properties of the materials that are used for the devices. In this module, we learn about shape and property control of materials, dislocations, and strengthening mechanisms.

What's included

4 videos 8 readings 1 discussion prompt

Hide info about module content

4 videos • Total 27 minutes

Dislocations, Part 1 • 5 minutes

Dislocations, Part 2 • 6 minutes

Dislocations, Part 3 • 10 minutes

Dislocations, Part 4 • 5 minutes

8 readings • Total 244 minutes

Lesson 1 Overview • 1 minute

Introduction to Materials Science, Chapter 11, Single-Phase Alloys II -- Deformation & Strengthening • 60 minutes

Lesson 2 Overview • 1 minute

Introduction to Materials Science, Chapter 11, Single-Phase Alloys II -- Deformation & Strengthening • 60 minutes

Lesson 3 Overview • 1 minute

Introduction to Materials Science, Chapter 11, Single-Phase Alloys II -- Deformation & Strengthening • 60 minutes

Lesson 4 Overview • 1 minute

Introduction to Materials Science, Chapter 11, Single-Phase Alloys II -- Deformation & Strengthening • 60 minutes

1 discussion prompt • Total 30 minutes

Dislocations • 30 minutes

Module 4: Strengthening Mechanisms

Module 5 • 5 hours to complete

Module details

Metal alloys are used for interconnections (and for chip-substrate joins) in semiconductor technology. Strengthening mechanisms are used to enhance the strength and reliability of such interconnects. In this module, we discuss the different kinds of strengthening mechanisms for metals and their alloys.

What's included

4 videos 6 readings 1 assignment 1 peer review 1 discussion prompt

Hide info about module content

4 videos • Total 17 minutes

Strengthening Mechanisms, Part 1 • 5 minutes

Strengthening Mechanisms, Part 2 • 4 minutes

Strengthening Mechanisms, Part 3 • 7 minutes

Course Review • 0 minutes

6 readings • Total 183 minutes

Lesson 1 Overview • 1 minute

Introduction to Materials Science, Chapter 11, Single-Phase Alloys II -- Deformation & Strengthening • 60 minutes

Lesson 2 Overview • 1 minute

Introduction to Materials Science, Chapter 11, Single-Phase Alloys II -- Deformation & Strengthening • 60 minutes

Lesson 3 Overview • 1 minute

Introduction to Materials Science, Chapter 11, Single-Phase Alloys II -- Deformation & Strengthening • 60 minutes

1 assignment • **Total 30 minutes**

Single-Phase Alloys II – Strength Quiz • 30 minutes

1 peer review • **Total 60 minutes**

Shape and property controls • 60 minutes

1 discussion prompt • **Total 30 minutes**

Strengthening Mechanisms • 30 minutes

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Instructor

Terry Alford
Arizona State University
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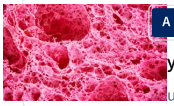
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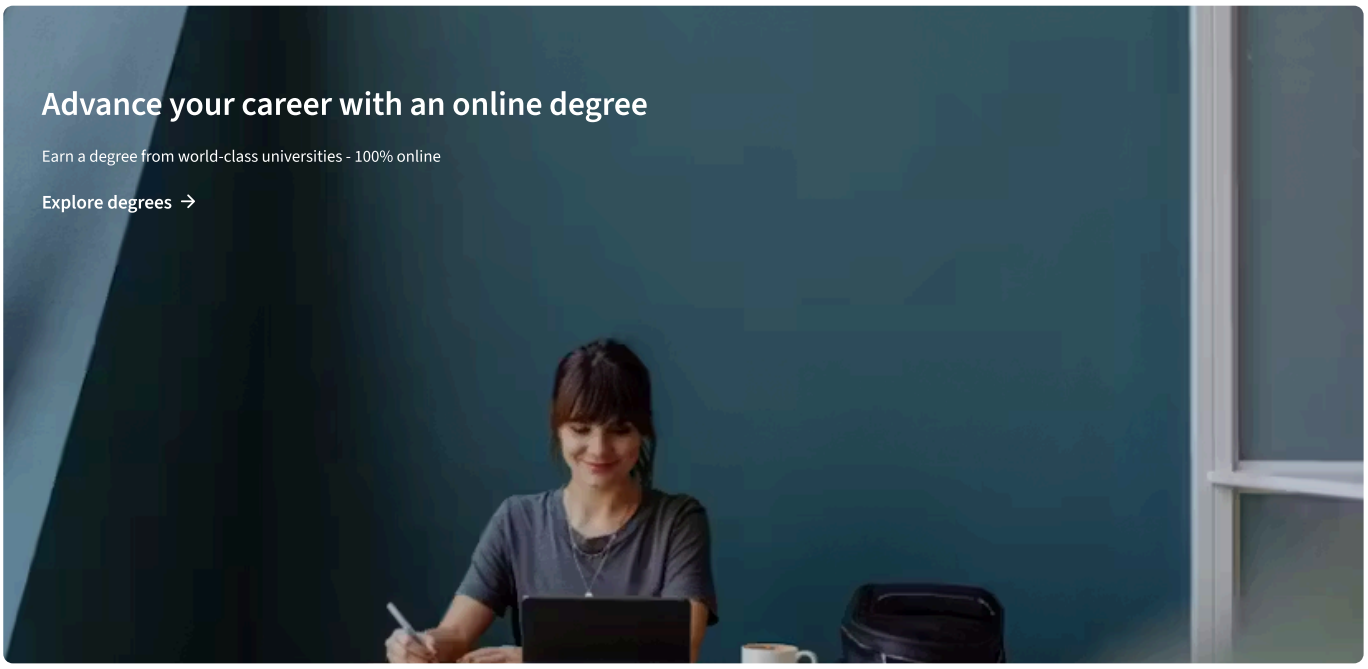

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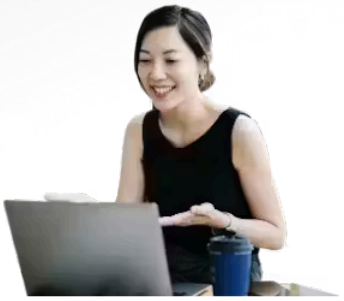

Frequently asked questions

When will I have access to the lectures and assignments?

To access the course materials, assignments and to earn a Certificate, you will need to purchase the Certificate experience when you enroll in a course. You can try a Free Trial instead, or apply for Financial Aid. The course may offer 'Full Course, No Certificate' instead. This option lets you see all course materials, submit required assessments, and get a final grade. This also means that you will not be able to purchase a Certificate experience.

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More questions

Visit the learner help center

Financial aid available, learn more

[1] Some assignments in this course are AI-graded. For these assignments, your data will be used in accordance with Coursera's Privacy Notice.