



Shape and Property Control of Metals I & II

This course is part of [Materials Science for Technological Application Specialization](#)



Instructor: [Terry Alford](#)

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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

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Assessments

2 assignments¹

AI Graded [see disclaimer](#)

- ☒ Taught in English

See how employees at top companies are mastering in-demand skills





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 details ^](#)

Module 1 • 5 minutes to complete

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 details ^](#)

Module 2 • 5 hours to complete

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 details ^](#)

Module 3 • 4 hours to complete

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 details ^](#)

Module 4 • 5 hours to complete

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 details ^](#)

Module 5 • 5 hours to complete

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

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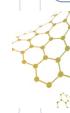
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^ When will I have access to the lectures and assignments?

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.

^ What will I get if I subscribe to this Specialization?

When you enroll in the course, you get access to all of the courses in the Specialization, and you earn a certificate when you complete the work. Your electronic Certificate will be added to your Accomplishments page - from there, you can print your Certificate or add it to your LinkedIn profile.

^ Is financial aid available?

Yes. In select learning programs, you can apply for financial aid or a scholarship if you can't afford the enrollment fee. If fin aid or scholarship is available for your learning program selection, you'll find a link to apply on the description page.

More questions



[Visit the learner help center](#)

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

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Cybersecurity	Google Data Analytics Certificate	Computer Science	Examples of Strengths and Weaknesses for Job Interviews
Data Analytics	Google IT Support Certificate	Data Science	High-Income Skills to Learn
Digital Marketing	Google Project Management Certificate	Education & Teaching	How Does Cryptocurrency Work?
English Speaking	Google UX Design Certificate	Engineering	How to Highlight Duplicates in Google Sheets
Generative AI (GenAI)	IBM Data Analyst Certificate	Finance	How to Learn Artificial Intelligence
Microsoft Excel	IBM Data Science Certificate	Healthcare	Popular Cybersecurity Certifications
Microsoft Power BI	Machine Learning Certificate	Human Resources (HR)	Preparing for the PMP Certification
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