

Fall 2021

## MTSE 301-003: Principles of Material Science and Engineering

N. M. Ravindra

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[Principles of Material Science and Engineering - MTSE 301 003](#)

Instructor:

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Course Facilitator:

Mr. Haizheng Zhuang

PhD Candidate, Materials Science & Engineering

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Class meeting schedule:

	<u>Face-to-Face</u>	
<u>Book</u> 003 94780	M	02:30 PM - 03:50 PM <a href="#">KUPF 117</a>
	R	02:30 PM - 03:50 PM <a href="#">CKB 204</a>

Office Hours:

Ravi: Fridays 2 to 3 PM; Tiernan Building - 414

Haizheng: Thursdays – 1 to 3 PM; Tiernan Building – 323 D

Online Meetings

Webex platform will be used for online meetings. Conference invitation messages for the class meetings will be sent to your NJIT email addresses. WebEx meetings will take place at:

<https://njit.webex.com/meet/ravindra>

**PREREQUISITE:** Phys 111 and Phys 121, Chem 125 and Chem 126, Math 111 and Math 112 or equivalent.

**TEXTBOOK:** “[FOUNDATIONS OF MATERIAL SCIENCE AND ENGINEERING](#)” *William F. Smith, Javad Hashemi, Sixth Edition (or Fifth Edition), McGraw-Hill, Inc.*

**YOUR FINAL LETTER GRADE** in MTSE 301 will be based on a composite score for term’s work that includes one midterm exams, final exam, lecture quizzes and homework. Here are the approximate weights to be used for calculating the composite score:

**Exam 1 = 25% Exam 2 = 25% Final Exam = 30% Homework = 10% Lecture Quizzes = 10%**

**The conversion of numerical to letter grades is as follows:**

> 80% A; >75% to 80% B+; >66 %to 75% B; >58%-66% C+; >50%-58% C; <50% D and <40% F.

## COURSE POLICIES

In order to insure consistency and fairness in application of the NJIT policy on withdrawals, student requests for withdrawals after the deadline (*end of the 10th week of classes*) will not be permitted unless extenuating circumstances are documented **through the Office of the Dean of Students**. The course instructor and the Dean of Students are the principal points of contact for students considering withdrawing from a course. When a student invokes extenuating circumstances for any reason (late withdrawal from a course, request for a make-up exam, request for an Incomplete grade) the student should contact the Dean of Students Office.

**Missed lecture quizzes:** There are no make-ups for in-class activities. If you miss a lecture quiz, you will receive a grade of zero.

## HONOR CODE

*“Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.*

*Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at [dos@njit.edu](mailto:dos@njit.edu) ”*

## **LEARNING OUTCOMES**

For this course, you can expect to be assessed on the following learning outcomes:

1. Comprehend the interrelations among structure, properties and performance of engineering materials.
2. Apply the principles of crystallography to understand the structure of materials.
3. Understand the effect of solid-state imperfections on diffusion and mechanical properties of materials.
4. Analyze phase diagrams of binary alloy systems.
5. Understand the mechanical, electrical and optical properties of metals, semiconductors, ceramics and polymers
6. Apply the equations governing different processes in solid materials. Calculate unknown quantities based on physical relationships, boundary conditions, and known quantities.

**COUNSELING AND ACADEMIC SUPPORT:** The Center for Counseling and Psychological Services is committed to assisting students experiencing high levels of personal challenge and stress. If you need accommodations due to a disability, please contact Ms. Chantonette Lyles, Associate Director of Disability Support Services, Fenster Hall Room 260 to discuss your specific needs.

## Course Outline

*Week 1* - Introduction to Nature, Matter & Materials

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*Week 2* - Atomic Structure and Bonds

Chapt. 2 Sect. 2.1 – 2.4 (5<sup>th</sup>)

Chapt. 2 Sect. 2.5 – 2.6 (6<sup>th</sup>)

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*Week 3* - Crystal and Amorphous Structure in Materials

Chapt. 3 Sect. 3.1 – 3.6 (5<sup>th</sup>)

Chapt. 3 Sect. 3.9 – 3.12 (6<sup>th</sup>)

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*Week 4* - Solidification, Crystalline Imperfections, Diffusion in Solids

Chapt. 4 Sect. 4.1 – 4.5 (5<sup>th</sup>)

(6<sup>th</sup>)

Chapt. 5 Sect. 5.1 – 5.4 (5<sup>th</sup>)

(6<sup>th</sup>)

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*Week 5* - Mechanical Properties of Metals I

Chapt. 6 Sect. 6.1 – 6.5 (5<sup>th</sup>)

Chapt. 6 Sect. 6.6 – 6.10 (6<sup>th</sup>)

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### **EXAM 1**

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*Week 6* - Mechanical Properties of Metals II

Chapt. 7 Sect. 7.1 – 7.7 (5<sup>th</sup>)

(6<sup>th</sup>)

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*Week 7* - Phase Diagrams, Engineering Alloys

Chapt. 8 Sect. 8.1 – 8.10 (5<sup>th</sup>)

(6<sup>th</sup>)

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*Week 8* - Engineering Alloys

Chapt. 9 Sect. 9.2 – 9.4, 8 (5<sup>th</sup>)

(6<sup>th</sup>)

Chapt. 9 Sect. 9.5 – 9.7, 9 (6<sup>th</sup>)

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*Week 9* - Polymeric Materials

Chapt. 10 Sect. 10.1 – 10.4 (5<sup>th</sup>)

Chapt. 10 Sect. 10.6, 10.10-10.12 (6<sup>th</sup>)

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*Week 10* - Ceramics

Chapt. 11 Sect. 11.1 – 11.5 (5<sup>th</sup>)

Chapt. 11 Sect. 11.6 – 11.11 (6<sup>th</sup>)

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## EXAM 2

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### *Week 11* - Composite Materials

Chapt. 12 Sect. 12.1 – 12.3 (5<sup>th</sup>)

Chapt. 12 Sect. 12.10 – 12.11 (6<sup>th</sup>)

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### *Week 12* - Corrosion

Chapt. 13 Sect. 13.1 – 13.4 (5<sup>th</sup>)

Chapt. 13 Sect. 13.4 – 13.7 (6<sup>th</sup>)

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### *Week 13* - Electrical Properties of Materials

Chapt. 14 Sect. 14.1 – 14.3 (5<sup>th</sup>)

Chapt. 14 Sect. 14.4 - 14.6

Chapt. 14. Sect. 14.7 – 14.8 (6<sup>th</sup>)

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### *Week 14* - Optical Properties of Materials

Chapt. 15 Sect 15.1 – 15.4 (5<sup>th</sup>)

Chapt. 15 Sect 15.5 – 15.7 (6<sup>th</sup>)

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### *Week 14* - Biological Materials and Biomaterials

Chapt. 17 Sect.17.1- 17.8

Reading only

Review – Q&A Session

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## Final Exams

**Fall 2021 Academic Calendar**

September	1	Wednesday	First Day of Classes
September	4	Saturday	Saturday Classes Begin
September	6	Monday	Labor Day
September	8	Wednesday	Monday Classes Meet
September	8	Wednesday	Last Day to Add/Drop a Class
September	8	Wednesday	Last Day for 100% Refund, Full or Partial Withdrawal
September	9	Thursday	W Grades Posted for Course Withdrawals
September	15	Wednesday	Last Day for 90% Refund, Full or Partial Withdrawal - No Refund for Partial Withdrawal after this date
September	29	Wednesday	Last Day for 50% Refund, Full Withdrawal
October	20	Wednesday	Last Day for 25% Refund, Full Withdrawal
November	10	Wednesday	Last Day to Withdraw from Classes
November	25	Thursday	Thanksgiving Recess Begins
November	28	Sunday	Thanksgiving Recess Ends
December	10	Friday	Last Day of Classes
December	11	Saturday	Saturday Classes Meet
December	12	Sunday	Sunday Classes Meet
December	13	Monday	Reading Day 1
December	14	Tuesday	Reading Day 2
December	15	Wednesday	Final Exams Begin
December	21	Tuesday	Final Exams End
December	23	Thursday	Final Grades Due

