

**Mechanical Engineering**  
**New Jersey Institute of Technology**

**ME438**

**Spring 2025**

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*It is the responsibility of the student to read and understand this course syllabus. This syllabus is subject to change and may be updated throughout the semester.*

**ME-438**

**INTRODUCTION TO PHYSICAL METALLURGY**

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**(1) TEXT:** Herman W. Pollack E, Paul, Materials Science and Metallurgy, 4<sup>th</sup> Ed. A Reston Book, A Pearson Education Company, 1988

**(2) Reference Text:** William D. Callister, Jr., Materials Science and Engineering Metallurgy: An Introduction. John Wiley and Sons, Inc., NY, 8<sup>th</sup> Edition, 2008.

**(3) Reference Text:** S. H. Avner, Introduction to Physical Metallurgy, 2<sup>nd</sup> Edition, McGraw Hill, 1974

WK	TOPIC	PAGES	HW PROBLEMS
1	Production of Ferrous and Non-Ferrous Metals. Problems.	1-39	Ch.1; Q-S:3,5,6,7,43,50,54,62,63,69
2	The Structure of Metals. Problems.	39-69	Ch.2; Q-S: 7,14,5,19,21,26,32-35

3	Inspection and Testing of Materials. Problems.	70-116	Ch.3; Q-S: 10,13,16,22,33,37,63
4	Material Transport in Engineering Solids. Mechanism of Diffusion. Problems.	Notebook	Special Assignment #1
5	Equilibrium Diagrams. Problems.	117-135	Ch.4; Q-S: 3,4,6,20,23,24,30,34
6	The Iron-Iron Carbide Equilibrium Diagram Steels. Problems.	136-157	Ch.5; Q-S: 3,6,7,8,9,11,18,22,28,38 Library
7	The Iron-Iron Carbide Equilibrium Diagram, Cast Irons. Problems. <b>Midterm exam.</b>	158-174	Ch.1; Q-S: 1,20,27 Ch.6; Q-S: 1,3,7,8,10,11,24,25
8	Classification of Steels. Problems.	118-136	Ch.7; Q-S: 1,2,3,4,5,6,12,20,21,24,27,38
9	Heat Treatment Processes. Non-Equilibrium Diagrams. Problems.	194-246	Ch.8; Q-S: 1,3,4,5,6,7,18,19,21,22,23,24,38,43
10	Practice of Heat Treatment Processes. Problems.	Notebook	Special Assignment #2
11	Tool Steels. Problems	247-275	Ch.9; Q-S: 1,9,10,11,20,27,31,32,33,34,52
12	Non-Ferrous Metals. Problems.	276-349	Ch.10; Q-S: 1,9,10,11,21,23,40,42,51,68,69,72 Ch.11:Q-S: 2,4,10,18,28,32

13	Structure and Properties of Engineering Materials. Principles of Metallography. Visit to Materials Processing Laboratory.	Notebook Report
14	Powder Metallurgy. Composite Materials. Ceramics. Problems.	350-356 Ch-12;Q-S:1,2,8,15 411-440 Ch.16;Q-S:75,76, 505-512 Ch.19;Q-S:1,2,3,8,10,11,13,15

### Review and Final Exam

- 15 Term Project, Component Design and Material Selection

### Office Hours

The office hours will be given on Tuesdays 4:30 PM to 5:30 PM.

Office hours for individual instructors are posted in the ME Department office.

**Repeat Students:** Students repeating the course are required to repeat the entire course. Assignments, project reports cannot be transferred from previous semesters.

**Exams:** Two exams will be given. A midterm exam during week 8 of the semester and a final exam. Exams will be conducted in person using the Respondus LockDown browser on a **student supplied laptop**. For conflicts, we follow the NJIT policy for final exams provided online. The policy generally indicates that the course with the higher numerical value takes place during the regularly scheduled period.

The NJIT honor code will be upheld and any violations will be brought to the attention of the dean of students. All exams will be closed book closed notes. Only calculators are allowed during exams. Mobile phones, smart watches, headphones and similar electronic devices are expected to remain out of sight — the sight of a mobile phone, smart watch, or any other unpermitted resource during an exam results in a grade of F for the class. In addition, students are not allowed to wear hats during the exam. Failure to show for an exam results in a grade of zero and employment is not considered a valid reason for missing an exam. The NJIT best practices related to academic integrity, indicates that makeup exams “should not be administered unless an unforeseen extraordinary circumstance . . . prevents a student from taking an exam at the designated time.” We adhere to that practice, and NO MAKEUP EXAMS WILL BE GIVEN, and only one

appropriately excused exam absence accommodation is possible per semester per student. In case of an appropriately excused absence from the exam the student should write an email to the professor indicating that he/she is going to contact the dean of students office about their absence from the exam. The dean of students office may be contacted at [dos@njit.edu](mailto:dos@njit.edu). Those expecting official travel (i.e., athletes, academic conferences, etc.) must notify the professor and the dean of students office at least 2 weeks prior to the exam. In extreme cases (i.e., unforeseen sickness, death, etc.) the student must notify the professor and dean of students office within 48 hours after the originally scheduled. In the email sent to the dean of students office, students should at a minimum include the following: (i) name; (ii) ID number; (iii) course and section; (iv) professor's name and email; (v) regularly scheduled exam time; (vi) valid evidence for the unforeseen extraordinary circumstance that caused absence. Upon receiving notice from the dean of students office, the professor will make a decision.

Typically, for final exams, if appropriately excused, a grade of incomplete is given if appropriate. For those students that will make use of the NJIT Office of Accessibility Resources and Services (OARS), please make note that OARS requires accommodation requests must be submitted no later than 3 business days prior to the exam date. However, if the instructors do not receive at least 2 business days notice, we cannot guarantee any OARS accommodation and the exam should be taken normally. Therefore, we encourage students that makes use of OARS accommodations to do so in a timely manner such that you are well before the deadlines.

**Exam format:** Exams will be conducted in person (in the classroom) using the Respondus LockDown browser on a **student supplied laptop**. To make sure that everyone is well prepared, a mandatory and ungraded practice exam will be administered so that any technical difficulties may be worked out prior to the exam. Note that NJIT requires all undergraduate students have a laptop, and details may be found here (<https://ist.njit.edu/student-computers>). Exam will be **CLOSED BOOK – CLOSED NOTES**.

A few general comments about online exams using the Respondus LockDown browser:

1. If you encounter technical issues, students must work through the IST Service Desk.
2. If you do not have appropriate hardware, students must contact the dean of students office, well before the exam date. Lastly, instructor and TAs have neither the in-depth knowledge nor the admin rights to help resolve any technical issues. If issues arise, students must work through the IST Service Desk. Additionally, if you do not have the appropriate equipment, you must contact the dean of students office. Do not contact instructor or TAs, we will only direct you to either the IST Service Desk or the dean of students office.
3. Scratch paper allowance will be announced prior to the exam.

**Homework:** Homework is assigned on the syllabus. The due dates for the HW will be one week after the delivery of the lecture on particular topic (chapter). Submission of HW will be through the Canvas: <https://canvas.njit.edu/>. Typically, the test date will be the final deadline for the homework problems related to the test material. Late submissions will be subject to deductions. Please, note and follow the deadlines in Canvas. HW is to be uploaded to canvas as a single PDF file.

**Material selection Project and Report:** Project will be conducted in a group setting. One report submission is required per group. Fair participation of each group is required and it has to be documented by “Declaration of Contribution Document” during the semester and in the Project Report. Students who do not contribute fair amount of shared contribution to the project will not receive the grade share for the project. Project report is to be uploaded to canvas as a single PDF file. No late submissions of the Project Report will be accepted. Due dates for all assignments will be posted on Canvas.

**Note:** Plagiarism checks are in place for project reports, when an excessive amount of plagiarism is found, a grade of zero will be given for that project report. In addition, experience has shown that a scan or other image saved as a PDF is not readable for a plagiarism check. Accordingly, such files are also deemed unacceptable and given a grade of zero since they cannot be evaluated consistently with the rest.

No resubmissions will be considered, even if uploaded to Canvas, past the due date, or once graded, whichever comes first. Prior to the due date, or any grading performed, students may resubmit to fix their work. Past experience shows that a resubmission uploaded after the due date will only lower the score previously given. This is due to the automatically computed late policy.

Lastly, past experience has shown a few students will knowingly submit an entirely incorrect document in an attempt to circumvent the policy that the lack of a submission leads to a failure. Professor is the only person responsible to determine if a report was submitted in good faith or not. A report that has been deemed submitted not in good faith will be marked as if it were never submitted.

**Generative AI:** Student use of artificial intelligence (AI) is permitted in this course for certain assignments and activities. AI is not permitted to be used in the abstract, introduction, manufacturing processes, material selection/discussion, and conclusion of the project report. Doing so would undermine student learning and achievement of numerous course outcomes. Additionally, if and when students use AI in this course, the AI must be cited as is shown within the NJIT Library AI citation page for AI that is here. If you have any or concerns about AI technology use in this class, reach out to your instructor prior to submitting any assignments.

**Grading:** Note that late assignments, reports, etc., will not be accepted after the last day of class for the semester (i.e., the university wide last day of class, not the last day of

lecture for your section). The weights shown bellow will be used in determination of the final course grade. Alongside are the letter grades and their corresponding description as written in the university undergraduate academic policy.

Midterm Exam 1: 25%

Final Exam: 35%

Material Selection Project Report: 30%

Homework and class participation: 10%

**NJIT university undergraduate academic policy letter grades:**

A Superior

B+ Excellent

B Very Good

C+ Good

C Acceptable

D Minimum

F Inadequate

Also, note that external factors (such as level of effort, ability in other courses, time management, etc.) are typically not considered in the computation of grades.

Any disagreement over grades must be brought to the attention of the instructor no later than the first two weeks of the following semester, grades will not be altered after that. Further, final grades are typically not discussed via email, an appointment should be made.

**Requirements for students:** Prior to the start of the class period, student is advised to read the topics, which are scheduled for instruction for that class period. This practice raises odds to excel in the course. Employment is not considered a valid reason for missing an exam, or any compulsory portion of the class. If you feel you are not going to pass this course, please reach out to your instructor with adequate time before the drop date.

**Update for remote / converged learning due to the SARS-CoV-2 virus:**

- Instructors – There are no more exam booklets for the online exams.
- Students – Verify that you are able to take the exam in person (in the classroom) using the Respondus LockDown browser on a **student supplied laptop**.