FLORIDA POLYTECHNIC UNIVERSITY

Syllabus: Structure and Property of Materials

Semester: Spring 2026

Course Information

- **Course Number and Title**: EGN 3365: Structure and Property of Materials
- **Credit Hours:** 3
- **Academic Term:** Spring 2026 Semester

Instructor Information

- **Instructor**: Dr. Mary Vollaro
- **Office**: WEB 1027 *[Wendt Engineering Building]*
- **Office Hours**: Mon., Wed. 2:00 – 3:00 pm, Fri., 8:50 -9:50 am
- **Office Phone**: (863) 874-8604
- **E-mail:** mvollaro@floridapoly.edu All course-related e-mails should be sent to the instructor in Florida Poly email.

Course Delivery and Course Description

- **Class Meeting Day, Time & Location**:
  - Section 01- MWF: 10:00AM-10:50AM, IST 1014
  - Section 02- MWF: 12:00PM-12:50PM, IST 1065
  - Section 03- MWF: 1:00PM -1:50PM, IST 1062
- Course Modality: In-Person
- **Semester Dates**: Jan. 12, 2026 – Apr. 28, 2026 (plus final exam week)
- **Course Website**: Will be posted to the Canvas Course Site for Structure and Properties of Materials and WileyPlus for Homework
  - **Official Catalog Course Description**: The course introduces the fundamental concepts of materials science and engineering focusing the interrelationship between the microstructure of a material, its properties and its processing. The topics highlighted in this course are material selection, crystallographic structure, diffusion, solidification, phase diagrams, phase transformation, microstructure, and mechanical properties of different classifications of materials, which include metals, polymers, ceramics, and composites. The analysis of mechanical properties, the manufacturing process, the material specifications for a selected application or component, and the advantages and limitations of selected material are presented.
- **Course Prerequisites:** CHM 2045 Chemistry 1; PHY 2048 Physics
- **Course Co-Requisite:** MAC 2312 Analytics Geometry and Calculus 2
- Communication/Computation Skills Requirement (6A-10.030): No
  - **Required Texts**: Wiley Plus V6 Student Package for Fundamentals of Materials Science and Engineering: An Integrated Approach 6e, Callister, © 2021, ISBN: 9781119688945
  - *Optional Printed Text*: Fundamentals of Materials Science and Engineering: An Integrated Approach, 5th or 6th Edition William D Callister, David G. Rethwisch
- Equipment and Materials: WileyPlus, Canvas.
  - **Note**: Only use of the following calculator models as used on the Fundamentals of Engineering (FE) Exam will be allowed:
    - "**Casio:** All fx-115 and fx-991 models (Any Casio calculator must have "fx-115" or "fx-991" in its model name.)
    - **Hewlett Packard:** The HP 33s and HP 35s models, but no others
    - **Texas Instruments:** All TI-30X and TI-36X models (Any Texas Instruments calculator must have "TI-30X" or "TI-36X" in its model name.)"
- **Resources and Reference Materials**: Will be provided on Canvas, WileyPlus as needed

Syllabus can be modified at any time at the discretion of Dr. Vollaro

Course Objectives and Outcomes

- **Course Objectives**: Describe and recognize the fundamental concepts of materials science and generalize the structure-property-processing relationships. Interpretation of structure-property-processing relationships and how they can be used to optimize systems and design attributes. Describe how experimental design can be used to determine material properties.
- **Course Learning Outcomes**:
    - Students will learn the fundamental concepts of materials science
    - Students will learn how structure, processing, and property of materials are inter-related to one another
    - Students will learn how application of the knowledge of structure-property-processing relationships can be used to optimize systems and design attributes
    - Students will learn how basics experiments can be applied to characterize the structure of materials, determine material properties, and develop manufacturing processes.

- **Alignment with Program Outcomes**:

Course Learning Outcome	Learning Level (Bloom's / ABET Assessment Example)	Program Learning Outcome (ABET, GenEd, Other)
• Students will demonstrate knowledge the fundamental concepts of materials science.	**Knowledge**- Ability to recall previously learned material. **ABET Assessment** – quizzes and exam questions	ABET 1 – an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and math.
• Students will explain the interrelationship between processing, properties microstructure in a variety of applications.	**Comprehension**- Ability to grasp meaning, explain, and restate ideas. **ABET Assessment** – Exam questions	ABET 1 – an ability to identify formulate and solve complex engineering problems by applying principles of engineering, science, and math.
• Students will show how structure, processing, and properties of materials are interrelated to one another in real-world applications.	**Application** – Ability to use learned material in new situations. **ABET Assessment** – Literature search applied to the project (e.g., poster and paper).	ABET 7 - an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
• Students will be able to illustrate and communicate their knowledge of structure-property-processing relationships as related to real-world applications.	**Application** – Ability to use learned material in new situations. **ABET Assessment** – Illustrated in poster with oral communication in poster session, and in written communication in paper.	ABET 3- an ability to communicate effectively with a range of audiences.
• Students will be able to model basic experiments in material science, which have applications in the lab and manufacturing environments.	**Analysis**- Ability to separate material into component parts and show relationship between parts. **ABET Assessment-** Selected exam, tensile tests, carburization, cold work and heat treatment. tensile tests, carburization, cold work, and heat treatment.	ABET 1 – an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science, and math.

Assignment/Evaluation Methods

Activity	Percentage
Exams (5 x 13 % each) *(20 pt. 'plus up' on single exam of your choice)	65%
Homework –-keep 80% of total WileyPlus points	15%
Project (Guided Investigation with AI learning 5% & Poster 5%)	10%
Attendance – Lose all 5 points with more than 5 absences	**5%**
Sustainability Activities	**5%**
Total	**100%**

- *Exams* - (5 @ 13% each; 20 points 'plus up' on exam of your choice)
  - **Chapter tests' / exams only, no final exam.**
  - **Exams will be administered during class time**. Exams will be closed book and closed notes.
  - A reference sheet of formulas/constants will be provided for exams. Make-up examinations will only be administered if there is a documented approved excused absence (as based upon university policy).
  - Only use of calculator models as used on the Fundamentals of Engineering (FE) Exam allowed.

- *Homework*- (15% of the total grade; keep 80% of total points from WileyPlus assignments to earn full HW %)
  - *Each lecture will have a WileyPLus assignment released after the class lecture and all assignments must be turned in by 9:00 am on the day of each exam.*
  - ***Late/make-up homework assignments will not be accepted.***

  - **WileyPLUS assignments**: Homework is assigned, and completion is required through use of WileyPLUS! course software, unless otherwise noted by the instructor. The homework, which includes problems/reading/vocabulary, is assigned through WileyPLUS! **after each lecture** (unless otherwise noted) and is to be completed by the due date specified in WileyPLUS! (or by 9:00 am on the day of the exam.) The grades are automatically tabulated in the WileyPLUS! course software and recorded in Canvas. The homework grade will be based on the recorded score, then at the end of the course, will be calculated with 80% of the total possible WileyPlus points contributing to the 15% of the final grade. The max contribution is 15% of the final grade, as engagement is *strongly encouraged* in this out-of-class activity *(that is the homework*) using the software as an *effective learning tool.* **Note:** One of the primary benefits of WileyPLUS! is the instantaneous availability of solutions to the homework problems.

- *Project*- Guided Investigation with AI Learning and Poster Presentation (10% of the total grade; 5% for Guided Investigation with AI Learning and 5% for poster presentation) – To encourage a project-based learning environment, students will be assigned a final project), to assess proficiency in applying concepts taught throughout the semester. A topic of interest will be selected by the student and agreed to by the instructor. A brief statement of the project with a detailed outline contributing to a guided investigation with AI learning are required. The guided investigation with focus on the interrelationship of processing, properties, and microstructure applied to an application of the student's choice. This investigation is designed to connect the student's 'foundational body of knowledge' gained from this course and advance it with experiential activities using AI tools for next level learning. A poster presentation on the selected topic is also required and must be prepared in professional manner. Details regarding project submission and grading, specific to the project, will be provided to students at the time of project assignment.

- *Attendance* – (5% of total grade) - Attendance is one of the primary activities for success in this course**. Lose all 5 points with more than 5 absences.**

- *Sustainability Assignment* – (5% of total grade) - Variety of short activities to increase awareness of sustainability issues in material selection for recyclability, reuse and disposal.

Late Work/Make-up work

- Make-up examinations will only be administered if there is a documented approved excused absence (as based upon university policy). Late/make-up homework/project assignments/in-class assessments will not be accepted. Exceptions to any late work/make-up work requirements due to extenuating circumstances may be made on a case-by-case basis.

Grading Scale

Grade	Percentage
A	93-100
A-	90-92
B+	86-89
B	83-85
B-	80-82
C+	76-79
C	70-75
D	60-69
F	0-59

- Percentages that fall between grades will be rounded up. Grades for each assignment will be posted to Canvas, and students should make sure they are recorded correctly. It is your responsibility to report any errors to instructor and keep track of your 'in-progress, day-to-day grade' per Assessment/ Evaluation Methods stated in this syllabus. Note that Canvas will only record grades per activity and will not reflect an in-progress, day-to-day' total grade. If you require assistance with your grade status at any time during the semester, please feel free to contact the instructor for assistance. The instructor will calculate final percentages and letter grades based on recorded Canvas grades.

Spring 2026 Course Schedule *(Tentative, Subject to Change)*

Week #	Day, Date	Class #	Topic	Reading / Homework
1	Mon., Jan. 12	**1**	Introduction to Materials (Ch.1)	All work is posted with each lecture. Includes reading, review notes, and assignment**.**
	Wed., Jan. 14	**2**	Atomic Bonding in Solids (Ch. 2)	
	Fri., Jan. 16	**3**	Crystal Structures & unit cells (Ch. 3)	
2	Mon., Jan. 19	**--**	**No class - Martin Luther King Day**	
	Wed., Jan. 21	**4**	More Crystal Structures (Ch. 3)	
	Fri., Jan. 23	**5**	Crystallographic Planes and Directions (Ch. 3)	
3	Mon., Jan. 26	**6**	Linear and Planar Density (Ch. 3)	
	Wed., Jan. 28	**7**	X-ray Diffraction – Bragg's Law (Ch. 3)	
	Fri., Jan. 30	**8**	X-ray Diffraction – Experiment & Spectra (Ch. 3)	
4	Mon., Feb. 2	**9**	Ceramic Crystal Structures (Ch. 4)	
	Wed., Feb. 4	**10**	Calcs with Ceramics (Ch. 4)	
	Fri., Feb. 6	**11**	**Review of crystal structure for metals & ceramics**	
5	Mon., Feb. 9	**Exam #1**	**Exam #1 – Chapter 1, 2 & 3**	Sustainability Activity #1
	Wed. Feb. 11	**12**	Polymer Structures (Ch. 4)	
	Fri., Feb. 13	**13**	Phase transformations in Polymers: The Glass Transition Temperature (Ch.11)	
6	Mon., Feb. 16	**14**	Materials structures / Atomic arrangement/ Physical Properties	
	Wed., Feb. 18	**15**	Imperfections in Solids / Point Defects (Ch. 5)	
	Fri., Feb. 20	**16**	Imperfections in Solids / Dislocations & bulk (Ch. 5)	
7	Mon., Feb. 23	**17**	Imperfections in Solids/ Grains and Grain Size Determination (Ch. 5)	
	Wed., Feb. 25	**18**	**Review of polymer structure and defects in metals**	
	Fri., Feb. 27	**Exam #2**	**Exam #2 – Chapter 4 & 5**	Sustainability Activity #2

8	Mon., Mar. 2	**19**	Diffusion – Diffusivity, Do and Effect of Crystal Structure	
	Wed., Mar. 4	**20**	Diffusion – Concepts and steady state condition (Ch. 6)	
	Fri., Mar. 6	**21**	Diffusion – Non steady state condition (Ch. 6)	
9	Mon., Mar. 9	**22**	Application of Diffusion Concepts: Carburizing and nitriding (Ch.6)	
	Wed., Mar. 11	**23**	Application of Diffusion Concepts: Carburizing and nitriding (Ch.6)	
	Fri., Mar. 13	**Exam #3**	**Exam #3 Chapter 6**	Sustainability Activity #3
	Week of Mar. 16-20	-------	**Happy Spring Break 2026!**	
10	Mon., Mar. 23	**24**	Phase Diagrams – *"The Road Map to Materials!"* (Ch. 10)	
	Wed., Mar. 25	**25**	Phase Diagrams – Binary Equilibrium Phase Diagrams with focus on isomorphous phase diagrams & '3-steps' (Ch. 10)	
	Fri., Mar. 27	**26**	Eutectic Phase Diagrams Related Eutectic Microstructures (Ch. 10)	
11	Mon., Mar. 30	**27**	The Iron-Carbon System (Ch. 10)	
	Wed., Apr. 1	**28**	Phase Diagrams and Microstructure & Microconstituent Development (Ch. 10)	
	Fri., Apr. 3	**29**	*More Phase Diagrams* (Ch. 10)	
	TBD		**Materials Project Assigned**	
12	Mon., Apr. 6	**30**	Phase transformations- Precipitation Strengthening Heat Treatment (Ch.11)	
	Wed., Apr. 8	**Exam #4**	**Exam # 4 Chapter 10 & selected parts of Ch. 11**	Sustainability Activity #4
	Fri., Apr. 10	**31**	Mechanical Properties – Stress/strain diagrams & testing and design (Ch.7)	
13	Mon., Apr. 13	**32**	Mechanical Properties – Mechanisms in Metals, Polymers & Ceramics (Ch. 7)	
	Wed., Apr. 15	**33**	Methods of Strengthening in Metals (Ch. 8)	
	Fri., Apr. 17	**34**	Focus on Cold Work and Recrystallization (Ch. 8)	
14	Mon., Apr. 20	**35**	Intro. to Fracture & Fatigue (Ch. 9)	
	Wed., Apr. 22	**36**	**Review of mechanical properties, strengthening mechanisms, etc.**	
	Fri., Apr. 24	**Exam #5**	**Exam # 5 Chapters 7, 8, & 9**	
15	Mon., Apr. 27	**37**	**Project Preparation** - Review & Feedback	
	TBD		**Poster Session - 'Final Exam' Day/Time Block**	

University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations. If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal, and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive. If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible: DisabilityServices@floridapoly.edu; (863) 874-8770; www.floridapoly.edy/disability.

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. Any faculty or staff member you speak to is required to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discuss resources and options available.

Academic Integrity

Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in sanctions up to and including expulsion from the university.

Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action). *Recording class activities including, but not limited to, lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is* ***prohibited****.*

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Tutoring and Learning Center**: The Tutoring and Learning Center (The TLC) provides tutoring to all Florida Poly students who may need additional academic support. The TLC is staffed by students who have excelled in the courses they tutor. They offer support by reviewing concepts and materials from class, clarifying points of confusion and providing assistance with learning strategies. While the focus of TLC is to provide support to students in freshman-level courses, upper-level courses are also tutored at the Center. The TLC is located in the IST Commons (second floor).
    - **Knack Tutoring**: Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Florida Polytechnic University has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit floridapoly.joinknack.com and sign in with your student account.
- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center**: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit floridapoly.edu/writing center.