

COURSE SYLLABUS

1. General Information:

Alpha-numeric codification: INGE 4001
Course Title: Engineering Materials
Number of credits: 3
Contact Period: 3 hours of lecture per week

2. Course Description:

English: A study of the basic principles that govern the properties and behavior of engineering materials, atomic structures, interatomic forces, amorphous and crystalline structures, phase transformations; mechanical properties; the study of the capabilities and limitations of different materials; metals, polymers, ceramics and composites; introduction of corrosion.

Spanish: Un estudio de los principios básicos que rigen las propiedades y el comportamiento de los materiales. Incluye entre otros los siguientes tópicos: fuerzas interatómicas; estructuras amorfas y cristalinas; diagramas de fase y sus transformaciones, propiedades mecánicas, estudio de las capacidades y limitaciones de los diferentes materiales: metales, polímeros, cerámicas y compuestos; introducción a la corrosión.

3. Pre/Co-requisites and other requirements:

(QUIM 3002 or QUIM 3042) or (QUIM 3132 and QUIM 3134) and (FISI 3161 or FISI 3171)

4. Course Objectives:

After completing the course, the student should be able to:

- characterize the structure-property-performance relationship of materials
- distinguish the structure of different types of materials
- specify the microstructure of an alloy from its phase diagram
- analyze mechanical and electrical properties of materials
- select materials for various engineering applications
- establish how failures occur in materials and how to prevent them
- describe corrosion of materials and how to prevent it.

5. Instructional Strategies:

- | | | | |
|---|---|--|-------------------------------------|
| <input checked="" type="checkbox"/> Conference | <input type="checkbox"/> Discussion | <input type="checkbox"/> Computation | <input type="checkbox"/> Laboratory |
| <input type="checkbox"/> Seminar with formal presentation | | <input type="checkbox"/> Seminar without formal presentation | |
| <input type="checkbox"/> Workshop | <input type="checkbox"/> Art workshop | <input type="checkbox"/> Practice | <input type="checkbox"/> Trip |
| <input type="checkbox"/> Thesis | <input type="checkbox"/> Special problems | <input type="checkbox"/> Tutoring | <input type="checkbox"/> Research |
| <input type="checkbox"/> Other, please specify: | | | |

6. Minimum or Required Resources Available:

Textbook. For online lectures a laptop with camera and access to High Speed Internet are needed.

7. Course time frame and thematic outline:

Outline of Topics	Contact Hours
<ul style="list-style-type: none"> • Introduction, Classification of Engineering of Materials, Structure • Property-Performance relationship 	2
<ul style="list-style-type: none"> • Atomic Structure, Interatomic Bonds and their Effect on Properties • Crystal Structure, X-ray Diffraction, Imperfections in Crystals, Grain Structure, Microstructure 	8
<ul style="list-style-type: none"> • Atomic Diffusion, Fick's Laws • Industrial Applications 	3
<ul style="list-style-type: none"> • Phase Diagrams, Phase Rule, Lever Rule, and Microstructures of Alloys 	7
<ul style="list-style-type: none"> • Strengthening Mechanisms, Strain-hardening, Solid-Solution Strengthening, Dispersion Strengthening, and Precipitation Hardening; Heat treatments • Mechanical and Physical Properties 	13
<ul style="list-style-type: none"> • Specific Engineering Materials Ferrous and Non-ferrous Alloys, Polymers, Ceramics, Composite Materials 	5
<ul style="list-style-type: none"> • Corrosion, Protection, and Prevention 	2
<ul style="list-style-type: none"> • Electrical Properties of Materials 	2
Examinations	3
Total hours: (equivalent to contact period)	45

8. Grading System:
 Quantifiable (letters)

 Not Quantifiable
9. Evaluation Strategies:

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	2	60 - 70
<input checked="" type="checkbox"/> Final Exam	1	30
<input checked="" type="checkbox"/> Short Quizzes	0 - 5	0 - 10
<input type="checkbox"/> Oral Reports (Business Proposal)		
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio (Company Assessment)		
<input type="checkbox"/> Projects (Group Online Activities)		
Other, specify:		
TOTAL:		100%

10. Bibliography:

Textbook:

- The Science and Engineering of Materials, Donald R. Askeland and Wendelin J. Wright, 7th Edition, Cengage Learning (2016).

Reference Books:

- Materials Science and Engineering: An Introduction, William D. Callister and David G. Rethwisch, 9th Edition, John Wiley & Sons, Inc. (2014)
- Introduction to Materials Science for Engineers, James F. Shackelford, 8th Edition, Pearson Higher Education, Inc. (2015)

11. Reasonable Accommodation (Law 51):

The University of Puerto Rico at Mayagüez (RUM) recognizes that each student has an inherited right to request reasonable accommodation according to Law 51: Law for Integral Educational Services for People with Disabilities. Every student has the right to receive reasonable accommodation if he/she presents the necessary evidence to be evaluated by the Office of Services to Students with Disabilities (OSEI-RUM), and the related information can be found at the following link: <https://www.uprm.edu/cms/index.php/page/85>. If your case is approved by OSEI-RUM, you will receive reasonable accommodation in your courses and evaluation, and you must contact each professor for course registered. For additional information contact OSEI-RUM at Sánchez Hidalgo 410 or via telephone 787-832-4040 extension 3107.

12. Academic Integrity:

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws.—

13. Policy Against Discrimination Based on Sex, Sexual Orientation, and Gender Identity:

The University of Puerto Rico prohibits discrimination based on sex, sexual orientation, and gender identity in any of its forms, including that of sexual harassment. According to the Institutional Policy Against Sexual Harassment at the University of Puerto Rico, Certification Num. 130, 2014-2015 from the Board of Governors, any student subjected to acts constituting sexual harassment, may turn to the Office of the Student Ombudsperson, the Office of the Dean of Students, and/or the Coordinator of the Office of Compliance with Title IX for an orientation and/or formal complaint.

14. Sexual Harassment: Certification 130-2014-2015 states:

Sexual harassment in the workplace and in the study environment is an illegal and discriminatory act and is against the best interests of the University of Puerto Rico. All persons who understand they have been subject to acts of sexual harassment at the University of Puerto Rico may file a complaint and request that the institution investigate, where necessary, and assume the corresponding action by the university authorities. If the complainant is a student, he or she must refer his or her complaint to the Office of the Student Ombudsperson or that of the Dean of Students.

15. Certification 06-43 of the Academic Senate states, "The academic guidelines for offering online courses," defines:

Traditional face-to-face courses are those that have less than 25% of the course's regular contact hours via the Internet. Therefore, a three-credit course will be considered "face to face" if, of the 45 hours of regular contact, 11 or less are taught via the Internet. According to certification 16-43 of the Academic Senate, a course may include up to 25% of its total contact hours via the Internet. The objective of this is so that all professors have this alternative in the case of any unscheduled eventuality.

Revised by:

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Approved by:



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