

ENGR 223-3 Principals of Engineering III

Department: Mathematics, Physics and Engineering

Credit Hours: 3

Required or Elective (circle one)

Current Catalog Description:

Description of properties of materials using a unified approach; discussion of the chemical structure, crystalline structure, microstructure, interface structure, and phase diagrams for materials; develop bulk properties and characteristics of metals, polymers and ceramics; mechanical, electrical, magnetic and optical properties for these materials. Prerequisites: ENGR 2213, 2223: CHEM 1084 and Math 3063 or concurrent registration. Lab fee \$10

Course Schedule:

3 lecture hr/ wk, 2 lab hr/week

Prerequisites by Topic:

ENGR 112 – Foundations of Engineering II

PHYS 122 – Physics 1 (calculus-based)

MATH 209 – Calculus II

Program Outcome and Course Learning Goals Map:

The Program Outcomes for Engineering Physics are:

* A-L omitted here to meet 2-page requirement, but included on syllabus distributed to students *

Course Learning Goals:

Upon completion of this course with a C or better, students will:

1. have been introduced to the difference between materials engineering and materials science and know the impact each has on the design and manufacturing process
2. know the fundamental principles of atomic structure and bonding and their effects on mechanical properties and strengthening mechanisms
3. know the concepts of ductile and brittle behavior and testing methods
4. Be able to interpret stress/strain curves and be able to determine modulus, fatigue life and strength, ultimate and yield strength
5. have been introduced to failure mechanisms, failure analysis including, investigation and solving process and risk analysis
6. be able to interpret phase diagrams and demonstrate knowledge on how thermal processing of metal alloys alter microstructure and mechanical properties
7. be able to explain the different characteristics, applications and processing of polymers, Ceramics including composites
8. know the concepts of the corrosion process, degradation of materials, and the potential economic and safety ramification
9. Know the concepts of the electrical properties of materials, conductivity and energy bands structures in solids
10. have been introduced to the economic, environmental and social issues in material science and engineering
11. be able to do a material selection and cost analysis (given the manufacturing and structural requirements
12. through industry tours have been exposed to real life factory and manufacturing environments

Topics Covered:

Topic	Course Goal	Program Outcomes	# Lec/Lab (approx.)
What is the Difference Between Engineering and Science	1,	a,h	1.5
Basic Material Types, Properties and Applications Metals, Polymers, Composites, Ceramics	2-11	a,b,c,e,f,h,j,k	4

Engineering Ethics, Environmental and Social Responsibility	1,10-11	f,h,j	2.5
Tailoring Materials Properties and Testing	2-4,6,8	a,b,c,k	3
Failure Analysis Corrosion & Problem Solving	5,7,8,10	a,b,c,e,f,h,j,k	3
Engineering Design	1,3-5,10-11	a,b,c,e,f,h,j,k	9
Basic Atomic Structure, Crystalline Structures and Bonding of Engineering Mat'l's	1,2	a,b,c	2.5
Data Representation; Tables and graphs	3-6,11	a,b,c,e,f,j,k	5
Stress-Strain-Strength, Ductility-Temperature, Fatigue, Phase Diagrams and Property & Cost Data			
Engineering Fundamentals	4-6,9	a,b,c,e,f,g,h	7
kinematics, thermo and electrical properties			
Manufacturing Engineering and Fabrication Processes	1-11	a-k	8.5
Materials selection, manufacturing, testing, cost			
Industry Site Visits - Fibergrate / Lockheed	1,3-5,7,10-11	a-k	4
On-Hands Activities - Material Accelerator and SEM		a,b,j,k	2
Exams	1-11	a-k	4

Academic Honesty:

Cheating, plagiarism (submitting another person's materials or ideas as one's own), or doing work for another person who will receive academic credit are all-impermissible. This includes the use of unauthorized books, notebooks, or other sources in order to secure or give help during an examination, the unauthorized copying of examinations, assignments, reports, or term papers, or the presentation of unacknowledged material as if it were the student's own work. Disciplinary action may be taken beyond the academic discipline administered by the faculty member who teaches the course in which the cheating took place.

Students with Disabilities Policy:

It is the policy of Tarleton State University to comply with the Americans with Disabilities Act (ADA) and other federal, state, and local laws relative to the provision of disability services. Students with disabilities attending Tarleton State University may contact the Office of Disability Services at (254) 968-9478 to request appropriate accommodation. Furthermore, formal accommodation requests cannot be made until the student has been officially admitted to Tarleton State University.

Contribution of Course to Meeting the Professional Requirement:

Engineering Topics: 100%

Status of Continuous Improvement Review of this Course:

Prepared by: Michael Hibbs

Date: December 21, 2005

Reviewed by: Denise Martinez

Date: May 9, 2005

Review Notes:

05/09/05 – updated the syllabus to include A-L; course review based on outline of FE material and needs for Solid State Physics (ENPH 436) -- DMM