

DMEI 4309 Materials Engineering for Defense Innovation

Instructor: Dr. M. Jasim Uddin

Office: ESCNE 3.348

Phone: 956 665 7462

E-mail: jasim.uddin@utrgv.edu

Course Objectives

The objective of this course is to provide an introduction (principle and practice) to the experimental and theoretical aspects of advanced materials engineering with specialized in surface and interfacial interaction of materials for defense industrial application to solve scientific and engineering problems in a cost and quality efficient approach.

Student learning outcomes

Students will gain a hands-on knowledge in experimental issues and approach and theoretical aspects of surface and interface science for high-tech application to solve scientific problems related to our defense team in a cost and quality efficient approach. The chemists/ physicists/ manufacturing/ /industrial/ material/mechanical engineers need to practice this issue every day in research and in industries, especially in materials and high-tech industries.

The interdisciplinary students will learn and involve in

1. advanced education of the topic in materials engineering , research, and development in nanostructured materials, energy materials, ultrastrong materials, light and strong materials including the approach of new materials discovery and/or processing.
2. utilization of the knowledge of nanostructured materials approach in their industrial/academic careers including the use of: (a) critical thinking / perceptive to identify fundamental concerns of the process and find out the approach of an appropriate solution; (b) creative thinking to develop/analyze the smart and new functional and or high-tech materials or materials surface/interface.
3. designing and conduct new experiments to create advanced materials, interpret and analyze the unknown data/outcomes.
4. develop a high level of intellectual curiosity through lifelong learning.

Course Description

Part I (Theory)

This is the first of a two-parts course sequence. The purpose of the course is to explain the students materials science and engineering with the static and dynamic behavior of clean and adsorbate-covered solid surfaces and interfaces, from both theoretical and experimental points of view. Topics will include geometrical structure, surface morphology, electronic structure, surface composition, kinetics and dynamics (adsorption, scattering, vibrations, diffusion, desorption), structure and reactivity of surface molecules, non-thermal excitations of surfaces, and surface reactions/stability. Surfaces of composite, metals, alloys, oxides and semiconductors will be considered, as well as solid-solid and solid-liquid interfaces. Modern ultrahigh vacuum experimental methods will be discussed: theoretical basis, experimental aspects, and data interpretation. The surface science of materials systems will be discussed.

In preparation.....

DMEI 4309 Materials Engineering for Defense Innovation

Part 2 (Project-Practice)

In the second part, students are to work in individual/groups of no more than three (3) to develop a new applied system of advanced materials related field from conceptualization and design, to manufacturing.

This course will primarily be conducted in the form of discussions, lectures and presentations.

Two well-written project reports by each group/individual are required. The project will be assigned to the team/students during the theoretical classes.

The projects of the advanced materials science course consist of two to three integrated problem related projects. (1) Define project problems: This step determines the project objectives and scope. (2) Project design: Collect qualitative and experimental information and objectively categorize and rank.

Define Project/Problem

- Project charter: Establish project and team. Set direction and objectives
- Understand project goals, illustrate direction and alternatives, and define objectives
- Reports should convey an in-depth comprehensive understanding of the projects' goals in addition to proposing methods for approaching and solving the issue(s).

Project Design

- Scientific data/literature review
- Collect, measure, and interpret data to support all alternatives and prioritize solutions supported by scientific reasoning
- Process capability and validation
- Reports should content an in-depth comprehensive understanding of the projects's goals in addition to proposing methods for approaching and solving the issue(s).

In preparation ,,,, TBD.

Grading Policy

Three Exam- 75% (3*25%); Project - 25% (Report: 15% and Prseantation 10%). Total: 100%

Student work on Homework Sets and Motivation Exercises will be graded on efforts/practice only, whereas Exams will be graded on both quality and mastery learning. Each Exam will be "close-book". University academic honor system is in effect. This honor system is based on the premise that each student has the responsibility to uphold the highest standards of academic integrity in the student's own work.

Passing Grades

90 - 100	A
80 - 89	B
60 - 79	C

Failing Grades

59-0	F
------	---

***** **There is no "Incomplete" grade in this class** *****

DMEI 4309 Materials Engineering for Defense Innovation

Recommended Texts

- The Science and Engineering of Materials, 6th Edition by Donald R. Askeland (978-1-4613-0443-2)
 Surface Science: An Introduction, (1998) by J. B. Hudson (ISBN: 978-0-471-25239-9), John Wiley & Sons, Inc.
 Physics of Surface and Interface, (2006) by Harald Ibach (ISBN-10: 3540347097 ISBN-13: 978-3540347095, First Edition, Springer

Lecture

Schedule: Fall/Spring ...

Beginning Date:...	Introduction to course: why are materials surfaces and interface interesting to scientist and engineers?
	Surface thermodynamics and materials surface structure
	TBD
	TBD
	TBD
	TBD
TBD	Midterm Exam
	TBD
	TBD
	TBD
TBD	Midterm Exam
	TBD
	TBD
	TBD
	TBD
	Project Report due; Project Review
TBD	Final Exam
No late reports or slides will be accepted.	

UTRGV Policy Statements

The UTRGV disability accommodation, mandatory course evaluation statement and sexual harassment statement are required on all syllabi. Additional policy statements are optional, such as those covering attendance, academic integrity, and course drop policies.

STUDENTS WITH DISABILITIES: *Required on all syllabi.* Do not modify.

Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive academic accommodations should contact **Student Accessibility Services (SAS)** as soon as possible to schedule an appointment to initiate services. Accommodations can be arranged through SAS at any time, but are not retroactive. Students who suffer a broken bone, severe injury or undergo surgery during the semester are eligible for temporary services.

Pregnancy, Pregnancy-related, and Parenting Accommodations

Title IX of the Education Amendments of 1972 prohibits sex discrimination, which includes discrimination based on pregnancy, marital status, or parental status. Students seeking accommodations related to pregnancy, pregnancy-related condition, or parenting (reasonably

DMEI 4309 Materials Engineering for Defense Innovation

immediate postpartum period) are encouraged to contact Student Accessibility Services for additional information and to request accommodations.

Student Accessibility Services:

Brownsville Campus: Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at ability@utrgv.edu. **Edinburg**

Campus: Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at ability@utrgv.edu.

MANDATORY COURSE EVALUATION PERIOD: *Required on all syllabi. Do not modify.*

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (<http://my.utrgv.edu>); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available on or about:

Module 1	TBD
Module 2	TBD
Full Fall Semester	TBD

ATTENDANCE: Recommended on all syllabi; may be modified by the instructor as long as it is not inconsistent with UTRGV policy.

Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV's attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

SCHOLASTIC INTEGRITY: Recommended on all syllabi.

As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism (including self-plagiarism), and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE: *Required on all syllabi. Do not modify.*

In accordance with UT System regulations, your instructor is a "Responsible Employee" for reporting purposes under Title IX regulations and so must report any instance, occurring during a student's time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect that is free from sexual misconduct and discrimination.

COURSE DROPS: Recommended on all syllabi; may be modified by the instructor as long as it is not inconsistent with UTRGV policy.

DMEI 4309 Materials Engineering for Defense Innovation

According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

STUDENT SERVICES: Recommended on all syllabi.

Students who demonstrate financial need have a variety of options when it comes to paying for college costs, such as scholarships, grants, loans and work-study. Students should visit the Students Services Center (U Central) for additional information. U Central is located in BMAIN 1.100 (Brownsville) or ESSBL 1.145 (Edinburg) or can be reached by email (ucentral@utrgv.edu) or telephone: (888) 882-4026. In addition to financial aid, U Central can assist students with registration and admissions.

Students seeking academic help in their studies can use university resources in addition to an instructor’s office hours. University Resources include the Learning Center, Writing Center, Advising Center and Career Center. The centers provide services such as tutoring, writing help, critical thinking, study skills, degree planning, and student employment. Locations are:

- Learning center: BSTUN 2.10 (Brownsville) or ELCTR 100 (Edinburg)
- Writing center: BLIBR 3.206 (Brownsville) or ESTAC 3.119 (Edinburg)
- Advising center: BMAIN 1.400 (Brownsville) or ESWKH 101 (Edinburg)
- Career center: BCRTZ 129 (Brownsville) or ESSBL 2.101 (Edinburg)