Course Number: MECE 6399-01-Summer II 2017
Course Title: Topics in Engineering
Course Time/Place: MTW 2:40 pm-5:10 pm, ENGR 1.242
Instructor: Dr. Mataz Alcoutlabi
Office/Phone: Eng. 3.262/(956) 665-8945
Office Hours: MTW 1:00 pm-2:00 pm
Email: mataz.alcoutlabi@utrgv.edu
Website: http://http://faculty.utrgv.edu/mataz.alcoutlabi/

Textbook: None
Lecture notes will be available on Blackboard

Resource Material and reference book:
1. Smart Materials by Mel Schwartz (Ed), ISBN 9781420043723 - CAT# 43722

Prerequisites:
MECE 2340 Materials Engineering

Course Description:
The course introduces advanced topics in Materials Science & Engineering to graduate students in mechanical engineering with an emphasis on the relationships between the structure, processing, properties and performance of nanomaterials. The course will begin with some background on topics related to Materials Science and Engineering including metals, ceramics, polymers and composites, their bulk properties and applications. A special emphasis will be given on the processing, characterization and properties of thermosetting resins used in high performance composites and nanocomposites. The course will then cover background material related to the processing, synthesis, properties and applications of smart and advanced materials.

Topics to be covered in this course:
- Nanomaterials
- Auxetic materials with negative poison’s ratio and negative thermal expansion coefficient
- Shape memory alloys
- Residual stresses in composite materials
- Smart battery materials
- Piezoelectric materials
- Polymers/ceramics
- Smart polymer hydrogels
- Nanofibers
- Ferroelectric materials
- Food packaging
- Metamaterials
- Ultrathin films
- Fundamentals of Fiber Science
- Composite and nanocomposites
- Their potential applications in energy storage, sensors, actuators and Aerospace
- Physical aging of polymers, glasses and metallic glasses
- Rheology and Nanorheology of Non-Newtonian fluids
- Smart materials for food packaging, Magnetorheological fluids
- Electrorheological materials
- Graphene, carbon nanotubes and graphene nanocomposites

Course Outcomes
1. To understand and be able to demonstrate an understanding of the properties of matter at the macro and nano scale. Topics to be covered include mechanical, dielectric, thermodynamics, viscoelastic and rheological properties at nanoscale.
2. To develop logical thinking processes which are essential in Science and Engineering.
3. To understand and develop cognitive understanding of nanoscience and nanotechnology concepts.
4. To prepare the student for research experience in advanced and smart materials.
5. Students will discuss in pier groups to develop their cooperative skills and reinforce understanding of concepts.
Grading Policies

Midterm exam I 20%
Midterm exam II 20%
Final exam 25%
Homework and quizzes 20%
Project presentation 15%

Final grades are assigned according to the following grading policy:

90 and above A
80-89.9 B
70-79.9 C
60-69.9 D
59.9 and below F

Topics and Course Schedule

Week 1
2. From bulk to nano properties of Materials: viscoelastic, rheological and thermodynamic properties.

Week 2
4. Relaxation mechanism in glass-forming liquids, physical aging, time-aging time superposition, time-pressure, time-temperature and time-strain superpositions.
5. Processing and characterization of thermosets and rubber, chemorheology, residual stresses in composite materials

Exam I

Week 3
7. Processing and properties of nanocomposites,
8. Confinement effects on material behavior at the nanoscale.
9. Polymer and ceramic nanofibers, graphene, carbon nanotubes, nanoparticles, nanowires, ultra-thin films and nanocomposites.

Week 4
Smart and advanced materials:
10. Smart battery Materials
11. Magnetorheological fluids, Shape memory alloys, piezoelectric materials,
12. Hydro and solvothermal processing of composite nanofibers

Exam II

Week 5:
13. Auxetic materials, Smart Hydrogels, food packaging materials
14. Project Presentations
15. Project Presentations

Final Exam: Aug. 18 (Fri.)
**Attendance:**
1. Attendance will be taken every time the class meets. Any student arriving to class 5 minutes after the class has started will not be allowed in class. Students will be allowed a maximum of **two absences for the whole semester**. Five points will be deducted from the total (100%) for each absence exceeding the maximum allowable unless documentation justifying that absence is provided.
2. Students will not be permitted to leave the classroom during lectures and exams except for extreme emergencies.

**Homework and Exams:**
1. Absolutely no late assignments will be accepted.
2. Absolutely no cell phones, laptops, iPads, iPods, or any other smart technology devices are allowed in exams.
3. Make-ups for in-class exams for documented emergencies will be scheduled during the last week of class.

**Scholastic Integrity:**
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, 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.

**Drop Policy:**
Students can withdraw from a course through the Office of the Registrar on or prior to:
- July 12th, 2017, Wednesday: Last day to drop a class before it appears on the transcript and counts toward the “6-drop” limit. Last day to receive a 100% refund for dropped classes (other policies apply when a student is withdrawing from all classes).
- August 8th, 2017, Tuesday: Drop/Withdrawal Deadline; last day for students to drop the course and receive a “DR” grade. After this date, students will be assigned a letter grade for the course that will count on the GPA.

**Course Drops:**
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.

**Students with Disabilities:**
If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodations, please inform your instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodations can be provided at any time. Brownsville Campus: Student Accessibility Service is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at accessibility@utrgv.edu. Edinburg Campus: Student Accessibility Service is located in 108 University Center and can be contacted.
Sexual Harassment, Discrimination, and Violence:
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 in an environment free from sexual misconduct and discrimination.

Course Evaluation:
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. Online evaluations will be available August 9th – August 18th, 2017. Students who complete their evaluations will have priority access to their grades.
ACKNOWLEDGEMENT OF RECEIPT OF SYLLABUS

By signing below, I hereby affirm that I have received a copy of the syllabus for MECE 6399 Topics in Engineering and have been informed by the Instructor that it is my responsibility to carefully read and understand this document and abide by all its content. I also agree to prepare and submit to the Instructor, at the end of the semester, a folder that contains all my homework assignments, quizzes, exams, projects, reports and/or literature review (if applicable).

__________________________________________
Student ID Number

__________________________________________
Printed Name

__________________________________________
Signature

__________________________________________
Date