# The University of Texas Rio Grande valley
# College of Science and Engineering
# Department of Mechanical Engineering
# Fall 2018
# August 3, 2018
# Rev D

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| **Course Number** | MECE 4361 |
| **Course Title** | Senior Design I |
| **Course Time** | **Theory: F** 10:00 AM– 12:00 Noon<br>**Lab: F** 1:00-6:00 PM |
| **Place** | Engr. 1.300 |
| **Instructor** | Dr. Kamal Sarkar |
| **Office/Phone** | 3.243 Engineering Building / (956) 665-2682 |
| **Meeting Hours** | Monday thru' Thursday 10:00AM-5:00 PM<br>30 Minutes for each group on scheduled slot |
| **Email** | kamal.sarkar@utrgv.edu |

**Important Websites**

Senior Design:
**http://utrgv.edu/mece/academics/undergraduate/senior-design/index.htm**

NUBE (Network for UTRGV Bachelors of Engineering)
**https://www.utrgv.edu/mece/academics/undergraduate/**

**(Pl. note that NUBE is controlled website for UTRGV students & staff only. As an Administrator, I can let you in. Contact me for details. Thanks.)**

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| **Pre-requisites** | Approval from the Chair and completing all pre-requisites<br>(Pl. check with Dr. Fuentes for any doubt!) |

**Please note that it is the responsibility of each and every member of the team to ensure that everyone in the team has fulfilled all the Pre-requisite requirements of the Department AND College to continue the course. *No exception!* IF any violation is discovered at any time the student may be required to drop the course at his/her cost and the team may suffer!**

**Catalog Description** This course is designed to provide a real life experience of solving complex engineering problems that need resources, team work, and application of scientific and engineering principles. Since the projects must be finished in a timely manner and presented to a professional audience, professional attitude and behavior are required during the course. At the end of the course you are expected to develop problem solving skills to define a real life problem in engineering terms and develop a realistic solution within the constraints of given resources. You are also expected to develop multiple solutions for a problem and identify the best for given resources and time constraints. In the final presentation, participants must professionally present their findings in a multi-media environment. Equally important professional trait is required from you by listening and questioning your fellow participants showing your depth of your engineering knowledge.

**Text** None

**References:** Faculty Advisor will identify appropriate references.

**Equipment:** Permanently bound lab notebook for individuals, three ring binder for the team, and a flash drive,

**Course Requirements:** Even if there is a lot of emphasis on team work, individual work will be recognized and rewarded. Grade has three major components, namely, Faculty Advisor (FA), Course Advisor (CA), and Final Presentation (FP). Your immediate task is to form your team that has a common interest to complete a specific project that interests you the most. Once you have the team, identify the project and corresponding Faculty Advisor (FA). Remember that it is a commitment for two semesters. It is your responsibility to identify the team and faculty advisor to complete the project. If you have issues, you are encouraged to discuss your problem with your instructor ASAP.

Here are some guidelines for three components (FA, CA, and final Presentation) of your grade

**Faculty Advisor:** Meet your FA ASAP to discuss the resources and time that will be necessary to complete the project in an effective manner. Develop a realistic Gantt Chart to solve the problem. You must follow the Gantt Chart as closely as possible. At the end of this course you are expected to develop multiple solutions for a realistic problem, develop tools to rank them, and finally identify the most optimum solution that will be pursued in the following Semester. Meet with your FA at least half an hour a week that is convenient for everybody. Here are some guidelines:

**a.** Individual attendance.
**b.** Develop appropriate Gantt chart .
**c.** A logbook in which you document your progress - signed and dated.

**d.** Group member evaluation of self and other group members.
e. All the parts and resources need be ordered before Thanksgiving Day (November 24) to ensure completion of the project, data collection, and analysis by next semester.

**Weekly Meeting with Course Advisor:** Meet your CA at least 30 minutes a week to monitor progress, identify issues, and resolve old issues. While you will be guided to solve general engineering problems, it is your responsibility to make sure that you have taken advantage of the resources to solve your individual team problem. You are responsible for

**a.** Individual attendance.
**b.** Following the Gantt Chart as closely as possible.
**c.** Recording all issues and achievements in team binder.
**d.** Documenting all ideas related to the problem
**e.** Maintaining your team binder for future references.
**f.** Your own development as a professional

**Final Presentation:** All presentations will be judged based on technical content, visual effectiveness, communication skill, Q&A effectiveness, professional attire, among others. Note that there will be five zero credit "technical update / progress report" presentations and one zero credit "dress rehearsal" during the term at times to be announced.

**Note: Your FA (technical content), CA (effort) and Dr. Freeman (communication) will collaborate to determine your grade.**

## Grading Scheme:

Course Advisor …. ……..40%
Faculty Advisor ……..40%
Department Faculty …… 20%

**Homework and Exams**

**There is no Home Work or Exam in this course.**

## Mechanical Engineering Department Classroom Policies

**ATTENDANCE:**

1. Attendance will be noted every time the class meets. Any student arriving to class **5 minutes** after the class has started may not be allowed in class. Students will be allowed a **maximum** of 5 absences for the whole semester for classes meeting three times a week, 3 absences for classes meeting twice a week, and 2 absences for classes meeting once a week. A **point** will be deducted from the total (100%) for each **unexcused** absence exceeding the maximum allowable.
2. Students **will not** be permitted to leave the classroom during lectures and exams except for **extreme emergencies**.

**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.

**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.

**AMERICAN DISABILITIES ACT STATEMENT** If you have a documented disability which will make it difficult for you to carry out the work as I have outlined and/or if you need special accommodations/assistance due to the disability, please contact Disability Services, University Center 305A, (956) 665-2659. Appropriate arrangements/accommodations can be arranged.

**MANDATORY COURSE EVALUATION PERIOD**: Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (http://my.utrgv.edu/home); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades

**DROP POLICY:** 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 can withdraw from a course through the *Office of the Registrar* on or prior to:

- September 12th, 2018, 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).
- November 14th, 2018, Wednesday: 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.

Following are important dates for the course as notified through the *Office of Records and Registration*:

- August 31, Friday, 2018, First day of class
- September 12, Wednesday, 2018, Census day
- November 17, Wednesday, 2018, last day to drop a course or withdraw.
- December 6 & 7, Thursday & Friday, 2018 Senior Design Presentation Days

**Other important days for this course to remember**:

- September 3, Monday, 2018, Labor day (School is closed)
- October 1-7, Monday-Sunday, 2018 HESTEC Conference
- October 17-21, 2018, HENAAC Conference at Pasadena, CA
- November 7-11, 2018, SHPE Conference at Cleveland, OH

# Tentative Course Schedule

| Wk | *Day* | *Date/Time* | *Topics* | *Speaker* |
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| 1 | Friday | August 31<br>10:00 AM | Organizational Meeting & Grading Rubrics<br>Design Methodology Overview: Four Phases of Design Problem Formulation: Elevator Speech, Competitive Products & Solution Strategy<br>Joining NUBE & Senior Design Website | Sarkar |

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| | Friday | August 31<br>1:00 PM | **Presentations on "Elevator Speech"<br>(Total 10 minutes for each team including 3 minutes for Q&A)** | **All Groups** |
| 2 | Friday | Sept 7<br>10:00 AM | Problem Formulations: Background Research<br>Customer Discovery Process<br>Needs, Wants, Constraints: Goals & Objectives | Sarkar |
| | Friday | Sept 7<br>1:00 PM | Safety Training including Nanomaterials<br>BoM & Purchase Orders through iShop<br>Training on Intellectual Property, Legal Liability, & Professional Responsibility<br>Business Model Canvas by Dr. Rhi-Perez | Dr. Castillo<br>Ms. Ocanas<br><br>Mr. Gonzalez |
| 3 | Friday | Sept 14<br>10:00 AM | Quality Function Deployment (QFD) | Sarkar |
| | Friday | Sept 14<br>1:00 PM | Workshop on QFD<br>Business Model Canvas (Contd.) Dr. Rhi-Prez | Sarkar |
| 4 | Friday | Sept 21<br>10:00 AM | Concept Generation:<br>Functional Decomposition<br>Design Criteria & Concept Variants<br>Dr. Rhi-Perez | Sarkar |
| | Friday | Sept 21<br>1:00 PM | Workshop on Concept Generation<br>(What is Brain Storming?!) | Sarkar |
| 5 | Friday | Sept 28<br>10:00 AM | Concept Selection Methods:<br>Functional Decomposition & Pairing Technique | Sarkar |
| | Friday | Sept 28<br>1:10 PM | Workshop on Concept Selection Tools & Techniques | Sarkar |
| 6 | Friday | Oct 5<br>10:00 AM | **HESTEC Week (2-8 Oct) No Class!<br>(HENAAC Conference @ Anaheim, CA** | |
| 7 | Friday | Oct 12<br>9:00 AM | **Showcasing Concept Model: All Groups<br>(20 minutes for Presentation & additional 10 Minutes for Q&A totaling 30 minutes)** | **Sarkar & Faculty Advisors** |
| | Saturday | October 13<br>10 AM | **Showcasing Concept Model: All Groups<br>(20 minutes for Presentation & additional 10 Minutes for Q&A totaling 30 minutes)** | **Sarkar & Faculty Advisors** |
| 8 | **Friday** | **Oct 19<br>1:00 PM** | Lessons Learned from Concept Model Presentations<br>**(HENAAC Conference @Pasadena, CA** | **Sarkar** |
| 9 | | Oct 26<br>10:00 AM | Design Embodiment<br>Engineering Calculations | Sarkar |

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| 10 | Friday | Nov 2<br>10:00 AM | Engineering Calculations **(Continued)** | Sarkar |
| | | Nov 2<br>1:00 PM | Design Embodiment<br>BoM, Economic Analysis, & More | Faculty |
| | | | **SHPE Conference Nov 7-11 @Cleveland,OH** | |
| 10 | Friday | Nov 9<br>10:00 AM | Design Validation<br>DMFA, Test Protocols, & More<br>DHF (Design History File) | |
| | Friday | Nov 9<br>1:00 PM | Workshop on FMEA<br>(What is FMEA? Why it is Critical?!) | |
| 11 | Friday | Nov 16<br>10:00 AM | Overview of Final Presentation & Final Report | |
| | Friday | Nov 16<br>1:00 PM | **Selected Group Presentations**<br>**(30 Minutes)** | **All Groups** |
| 12 | **Friday** | **Nov 16**<br>**1:00 PM** | **Selective Dry Runs for Final Presentation**<br>**(30 Minutes Presentation Plus 20 Minutes Q&A)** | **All Groups** |
| | **Saturday** | **Nov 17**<br>**10:00 AM to 4:0 PM** | **Dry Run for Other Final Presentations**<br>**(30 Minutes Presentation Plus 20 Minutes Q&A)** | **All Groups** |
| | **Monday** | **Nov 19**<br>**12:00 Noon** | **All POs Must Be Turned In!** | **All Groups** |
| **13** | **Monday** | **Nov 22-25** | **Thanksgiving Weekend: No Class!** | |
| | **Thursday** | **Nov 29**<br>**Noon** | **Final Report Due** | **All Groups** |
| **14** | **Thursday & Friday** | **Dec 8 & 9**<br>**9:00 AM to 5:00 PM** | **Final Group Presentations**<br>**(30 Minutes Presentations Plus 20Minutes Q&A)** | **All Groups** |
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**Notes:** ***<u>There might be slight adjustment to Course Lectures IF needed.</u>***

*Materials on web for each learning module.*

*You are to provide flash drive of your presentations & reports to both Dr. Sarkar & your Faculty Advisor(s).*

*This schedule does not include your separate meetings with your Faculty Advisor(s) for 30 minutes & Dr. Sarkar for 30 minutes each week.*

***It is your responsibility to set up meeting times with your Faculty Advisor(s) & Dr. Sarkar.***

# Mechanical Engineering Program Educational Objectives

The Educational Objectives of the Mechanical Engineering Program at The University of Texas - Pan American are to produce graduates who:

1. have the knowledge and technical skills required to be and to remain productive in the field of mechanical engineering.
2. have an understanding of the importance of professionalism, ethics, safety and socioeconomics concerns in resolving technical problems.
3. are capable of functioning in diverse environments.

# Senior Design I Course Outcomes

At the end of the course the students will be able to:

1. have a basic understanding problem solving skills using scientific and engineering principles
2. be able to apply the fundamental principles of engineering to the analysis and solution of real life problems
3. understand that real life engineering solutions need multi-disciplinary knowledge and have multiple solutions based realistic business constraints
4. identify appropriate solution that specifically addresses economic, social, ethical, environmental, and safety concerns, among others
5. be able to identify issues and opportunities while resolving an engineering problem
6. understand the need for using modern engineering tools and techniques that demands an urge for life-long learning
7. communicate effectively in engineers, professionals, and general public, alike.

## Course outcomes and assessment

The course is structured according to ABET definitions and requirements. Evaluation rubrics have been developed based on these requirements. Every faculty will use these rubrics to evaluate the performances of each team and individuals alike. They are available to all the students to ensure that they prepare themselves accordingly.

In SDI we specifically address following ABET outcomes marked **bold blue font**.

**ABET Outcomes (Seven plus One from us) to match Student Learning Outcomes for Various Courses are given below. In SDI we will emphasize on the Outcomes in blue and the others in red will be emphasized in SDII. Purple ones are emphasized in both SDI and SDII. Remember, this is just a guideline and you are expected to use these tenets in every step of your way as a professional.**

**1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.**

**2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.**

**3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.**

**4. An ability to communicate effectively with a range of audiences.**

**5. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.**

**6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.**

**7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.**

**8. An ability to use state of the art computational hardware and software for analysis, design and documentation**