



MEC 101: Freshman Design Innovation

Department of Mechanical Engineering

Fall, 2016

Instructor Information

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Course Description

This course presents an overview of mechanical engineering profession, engineering ethics, basics of computation via correct usage of dimensions, units, and significant digits, and engineering documentation. Furthermore, this course introduces the students to the process of engineering design and provides a project-based design experience wherein the students design, build, and program a microcontroller driven autonomous mechatronic device. In doing so, they are provided an early exposure to the systematic approach to engineering problem solving that brings together fundamentals concepts of forces, motions, energy, materials, manufacturing processes, and machines and mechanisms from Mechanical Engineering and basic electronics, sensing, actuation, and Computer Programming.

Course Purpose

MEC 101 is a required class for all Mechanical Engineering students. The class introduces design concepts and projects early in a student's education, promotes teamwork, and introduces modern engineering tools. A Design Innovation class at any level mandates that students undergo significant hands-on, experiential learning to achieve design education goals. In MEC101, this goal is currently fulfilled by incorporating an autonomous robot/machine design project, wherein the students have to design and build an autonomous robot/machine that either carries out either a functional or interesting motion. The goal is to motivate students to think about designing and prototyping programmable, Electro-mechanical devices at an early stage of their engineering career. In doing so, they apply fundamentals to a fun and exciting design problem of their choice, learn to think critically, communicate ideas, and work in a team.



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Course Learning Outcomes (CLO)

Upon completion of this course, students will be able to:

- CLO 1. Articulate an overview of the Mechanical engineering profession, the design process, and the ethics in Engineering
- CLO 2. Demonstrate familiarity with dimensions, units, conversion, and engineering estimation
- CLO 3. Calculate vectors as physical elements, basic engineering Statics (2D), balance of forces and moments
- CLO 4. Calculate Stress, Strain, and failure for mechanical components loaded in tension, compression or shear, and fundamental material properties for material selection
- CLO 5. Calculate mechanical energy, work, and power.
- CLO 6. Articulate how the motions of common mechanisms are realized.
- CLO 7. Demonstrate an understanding of basic electronics, sensing, actuation, and circuit drawing
- CLO 8. Demonstrate Microcontroller programming
- CLO 9. Work in a team based project to design and fabricate an autonomous, microcontroller driven machine

Course Learning Outcomes Assessment and relationship to ABET Student Outcomes

The relevant ABET Student Outcomes are

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

CLOs	ASSESSMENT TOOLS	STUDENT OUTCOMES
CLO 1	HW, Exam	f,h
CLO 2	HW, Exam	a
CLO 3	HW, Exam	a
CLO 4	HW, Exam	a
CLO 5	HW, Exam	a

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CLO 6	HW, Exam	a
CLO 7	HW, Exam	a,k
CLO8	HW, Exam	k
CLO9	HW, Exam	d

Course Topics

1. Introduction to Mechanical Engineering Profession
2. Engineering Ethics
3. Fundamentals of computation: dimensions, units, significant digits
4. Vectors and Scalars
5. Forces, Moments and static equilibrium analysis
6. Stress, Strain, and fundamental material properties
7. Mechanical Energy, work, and power
8. Mechanisms, Machines and their motions
9. Basic electronics, sensing, and actuation
10. Microcontroller programming using Arduino

Pre- or co-requisites

AMS 151 or MAT 125 or MAT 131 or MAT 141 or MPE level 4 or greater and PHY 125 or PHY 131 or PHY 141

Technology and Tools

Some of the technologies and tools that we would use in this class are:

1. **Blackboard:** Most of the information pertaining to this class can be found at the MEC 101 website at <http://blackboard.stonybrook.edu>
2. **Piazza:** This term we will be using Piazza, an online text-based forum, for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. Please sign up at <http://piazza.com/stonybrook/fall2016/mec101/home>
 In the beginning of the class, I will add you to the Piazza manually. However, you will have to sign up yourself to complete the registration process.
3. **Voicethread:** Using Voicethread, you can comment on VoiceThread slides using one of five powerful commenting options: microphone, webcam, text, phone, and audio-file upload. You do not have to sign up for it; this is integrated in the Blackboard. **Please do not log in from**



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voicethread.com.

4. **MotionGen:** This is a home grown app for mobile platforms (iOS and Android devices) for enabling planar four-bar linkage synthesis and simulation. Download it from <http://www.motiongen.io>
5. **Calculators:** Only an approved NCEES allowed calculator will be permissible to use during quizzes and exams. Please see the *Calculator Policy* section below on details.
6. **Microphone and Webcam:** needed for participating in the Voice Thread discussions and Commenting
7. **Adobe Acrobat Reader (free) and Microsoft Word:** Free to Stony Brook University students, go to <https://it.stonybrook.edu/software/title/microsoft-office>
8. **Device and Internet Connection:** This course requires that you have access to the Internet. You are responsible for having a reliable computer and internet connection throughout the course. At times, you may be able to use your smartphone or a tablet with internet connection in class to take the quizzes or participate in the discussions.

Communication

You must have an active Stony Brook University e-mail account and access to the Internet. All instructor correspondence will be sent to your SBU e-mail account. Please plan on checking your SBU email account regularly for course related messages. To log in to Stony Brook Google Mail, go to <http://www.stonybrook.edu/mycloud> and sign in with your NetID and password.

This course uses Bb for the facilitation of communications between faculty and students, submission of assignments, and posting of grades. The Bb Course Site can be accessed at <https://blackboard.stonybrook.edu>

Required Course Material

1. Text Book: An Introduction to Mechanical Engineering, 4th edition by Jonathan Wickert, Publisher: CENGAGE L; available at amazon.com <http://tinyurl.com/sbumec101>

2. MEC 101 MECHATRONICS KIT, Publisher: ELEC XPRSS, Edition: F16
Buy from <http://www.elexp.com/mec.aspx> (cost \$80.50 + \$8.17 shipping and handling)

You can see the contents of this kit at <https://sites.google.com/a/stonybrook.edu/mec101-freshman-design-innovation-fall-2016/bookstore-kit>. You will need parts in this kit to carry out HW exercises, in-class exercises, final project, as well as to outfit a Two-wheel drive Mobile Robot called SnapBot that I will provide to you.



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3. Course Fee: \$50

Supplementary Material

Online resources, such as tutorials, on-line videos for Arduino programming, data sheets for electronics as assigned by instructor.

Course Delivery/Modality

I expect that this semester we would follow a hybrid approach, wherein some parts of the class will require you to watch lectures at home and take a quiz in class to demonstrate understanding of the concepts, while some parts related to problem solving and active learning would be conducted in class.

Calculator Policy

Effective Spring, 2009 only the following calculators will be permitted to be used on all midterm and final exams in the Department of Mechanical Engineering. There will be no exceptions. This list of calculators is identical to that allowed for the National Council for Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) exam that many of you will take in your senior year as well as the Professional Engineering (PE) exam that you may take several years from now. The sooner you become comfortable on one of these calculators, the better.

NCEES Allowed calculators as of Nov 2011:

- Casio: All fx-115 models. Any Casio calculator must contain fx-115 in its model name.
- Hewlett Packard: The HP 33s and HP 35s models, but no others.
- Texas Instruments: All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

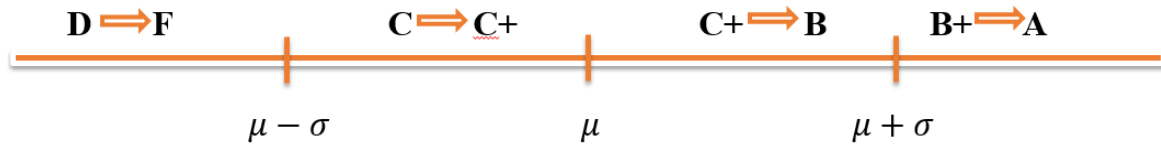
The NCEES policy on calculators can be found here: http://www.ncees.org/Exams/Exam-day_policies/Calculator_policy.php

Grading

- Homework/Quizzes 25% (the lowest HW grade will be dropped)
- Final Robot Design Project 25%
- One Midterm 25%
- Final Exam 25% (Comprehensive)

Your final letter grade will be decided based on the above weights and your relative placement in the class. The following scale shows roughly what your final letter grade range might look like, where μ is the average, and σ is the standard deviation.

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Homework

There will be about 10 homework. Homework will be either assigned in the class or posted at blackboard. You can access Blackboard at: <http://blackboard.stonybrook.edu>. If you have never used Stony Brook's Blackboard system, your initial password is your SOLAR ID# and your username is the same as your Stony Brook username, which is generally your first initial and the first 7 letters of your last name. For help or more information see: <http://it.stonybrook.edu/services/blackboard>. For problems logging in, go to the helpdesk in the Main Library SINC Site or the Union SINC Site, you can also call: 631-632-9602 or e-mail: helpme@ic.sunysb.edu

Homework must be turned in **at the beginning of the class** on the specified due date. **No late homework will be accepted in any case.** However, since emergencies do happen, I will drop the lowest HW grade for each student. Please adhere to the following guidelines for submission (Not following these guidelines will result in deduction of points by the grader)

1. Homework will be accepted only on regular A4/letter sized white or ruled paper – this is basically your most often used paper that you feed to your printer or copying machine. This rules out papers torn apart from your notebook or diary.
2. Staple neatly in top left corner. I don't bring a stapler to the class, so please don't ask for it.
3. Write your name and ID in the top right corner of the first page.
4. Homework will be accepted only in the beginning of the lecture.
5. HW solutions need not be typed, but they have to be done neatly.
6. To save time, the actual submission process will follow a divide and conquer approach for the collection of HWs. In each row, you should pass your HW to the student on your right, and then the last student in each row should pass it to the student ahead of him/her. The last student should put it on the professor's table.

If you come in a few minutes late and I have already started the lecture, wait until the lecture is over to submit the HW. This should be done as an exception only, not as a rule. If I see students abusing my leniency, I reserve the right to not accept a HW submitted later than the beginning of the class.

Again, as a rule, all HWs are due **IN THE BEGINNING OF THE CLASS.**

Expectations

Communication

Effective Monday, January 7, 2013, email addresses in Blackboard will be systematically reset to



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users' official University EPO email address (firstname.lastname@stonybrook.edu or firstname.lastname@stonybrookmedicine.edu) and users will no longer be able to change their email address in Blackboard. This means that you are responsible for all email that go to your University EPO email address as your professors will be communicating with you this way.

Treat your Stony Brook email address as your primary means of communicating with others in the Stony Brook community. Make it a practice to log in at least daily to check for new important items and address them. I use email and blackboard exclusively to communicate with you.

To access Google Apps for Education, go to <http://www.stonybrook.edu/mycloud> and authenticate with your NetID and NetID password.

Fundamentals

From your high school level classes, you should have acquired a working knowledge of basic Trigonometry (sines, cosines, basic trigonometry formula, etc.), Geometry, and basic Physics.

Exams

The exam dates are as follows, while quizzes will be given on a more frequent basis.

Midterm: Thursday, Oct 13, 2016 in class

Project Demo: Thursday, December 8, 2016 in class

Final Exam: Monday, December 19 from 5:30pm to 8:00pm in class

All exams will be scheduled in class, unless otherwise stated. The exams are closed book/notes. If you miss an exam due to unforeseen events, you will have to provide me a proof of the reason, such as doctor's certificate for a medical emergency or death certificate for death in family before I will give you a makeup exam. There will be no make-up exams for reasons that I deem are or were within your control. Thus, this rules out reasons such as pre-arranged vacation, travel, conflict with other exams or other engagements.

Academic Policies

Academic Integrity Statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.



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University Student Conduct Code can be found at (check for most current version)

<http://studentaffairs.stonybrook.edu/ucs/docs/universitystudentconductcode.pdf>

ADA & Disability Support Services (DSS) Statement: The Rehabilitation Act of 1973 – Section 504 applies to all postsecondary educational programs that receive federal assistance. Reasonable accommodations and academic assistance are provided to students with disabilities registered with the Disability Support Services, ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential. For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>

Course Materials and Copyright Statement: Course material accessed from Bb, SB Connect, SB Capture or a Stony Brook Course website is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity and Student Conduct Codes.

Netiquette Guidelines

The following are guidelines for participation on the discussion forums:

- Remember that with the absence of face-to-face communication it's easy to misunderstand.
- Carefully review and read materials that you receive electronically to ensure that you fully understand the message.
- Be sure to carefully re-read and understand what you will be sending in order to ensure that you are not misunderstood by anyone.
- Disagreement in higher education is encouraged, but it is important to be polite, and to clearly communicate why you disagree, support your own ideas with academic sources.
- Avoid cluttering your messages with excessive emphasis (stars, arrows, exclamations).
- If you are responding to a message, either include the relevant part of the original message in your message, or make sure refer to the original's contents so as to avoid confusion.
- Be specific and clear, especially when asking questions.
- If your messages can be typed in UPPER and lower case, please use the two appropriately instead of all UPPERCASE characters. This gives the appearance of shouting and makes the message less readable.
- Remember that not all readers have English as their native language, so make allowance for possible misunderstandings.

Getting Technical Help

Students that need help with Bb can contact the TLT Student Help Desk by calling (631) 632-9602, emailing helpme@stonybrook.edu; more information is available via Stony Brook IT:

<http://it.stonybrook.edu/services/blackboard#section-6706>

Frequently asked questions about the Bb LMS along with tutorials are available here:



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<http://it.stonybrook.edu/services/blackboard/navigate-manage>

Subject to Change Notice

All material, assignments, and deadlines are subject to change with prior notice. It is your responsibility to stay in touch with your instructor, review the course site regularly, or communicate with other students, to adjust as needed if assignments or due dates change.

Syllabus Disclaimer

The instructor views the course syllabus as an educational understanding between the instructor and students. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes via email or in the course site Announcements. Please remember to check your SBU email and the course site Announcements often.