Stony Brook University | The State University of New York

MEC 101: Freshman Design Innovation
Department of Mechanical Engineering
Fall, 2017

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 goals 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.

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
CLO 6	HW, Exam	a

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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 course 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/fall2017/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. **Respondus LockDown Browser:** You will need to use this browser to take quizzes online; please download it from this link: http://www.respondus.com/lockdown/download.php?id=772113517

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
A more updated version that can simulate N-bar linkages is available at cadcam.eng.sunysb.edu

I will provide username and password to access that site.

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 on-line quizzes and exam proctoring. The web cam should be either swiveling type or if built-in should allow you to rotate the monitor or laptop for showing your 360 degree environment in the beginning of a test.

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. **Computer and Internet Connection**: This course requires that you have a solid internet connection to a reliable and working computer. Cheap wifi connections do not work and in the past students had difficulties taking exams when they were connected to unreliable wifi access points, such as at starbucks, etc We will not be responsible for you not being able to connect to the servers during the quizzes and no extensions on time will be given.
Please install all the updates on your computer well before a quiz. Window operating system has the nasty habit of initiating an update just before a critical event.
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.

9. **Scanner or camera app**: A scanner to scan HW, Quizzes, or Exams, as necessary or you can use a smartphone or tablet camera with an app for creating high quality, cropped pdf documents, such as free version of CamScanner (search for it in Google PlayStore or Apple iTunes store). It is your responsibility to ensure that your scans will be legible without being too large in size. This may be needed for submitting your HWs and cheat sheets, if any.

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

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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: F17
Buy from http://www.elexp.com/mec.aspx (cost $82.95 + shipping and handling)

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.

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

1. 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 formative and summative quizzes to demonstrate understanding of the concepts, while parts related to problem solving and active learning would be conducted in class.
2. Course Attendance is mandatory; we will be taking attendance via a quiz in class randomly. Please always bring an internet connected device to the class.

Preferred Method of Contact with Instructor

My preferred method of contact is via email at anurag.purwar@stonybrook.edu. I will respond to your emails as soon as possible, but please allow between 24-48 hours for a response. Please utilize your Stony Brook University email when getting in touch with me as that is the preferred method of contact from the institution. Include your full name and NetID in all emails to me. For technical questions about HW, quizzes, etc., please post on Piazza. Using Piazza, you can even ask me a personal question by making it visible only to instructors.

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.

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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

  Homeworks 15%
  Quizzes 15%
  One Midterm 20%
  Final Robot Design Project 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.
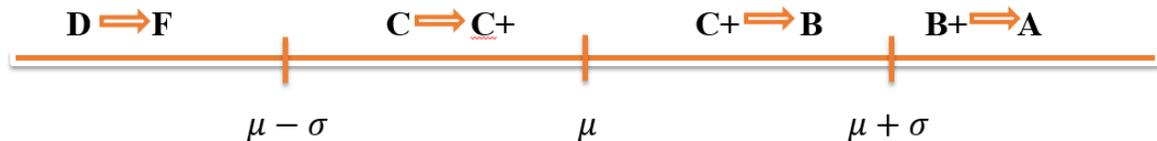
Homework

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.
My instructions to the TA are to come to the class to collect all the HWs a few minutes after the lecture has started, so to have your HW graded, make sure that he has them.

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

Expectations

Communication

Your email addresses in Blackboard is your official University EPO email address (firstname.lastname@stonybrook.edu or firstname.lastname@stonybrookmedicine.edu) and you cannot change your 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 and Quizzes

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

two types of quizzes in this class: 1. Formative quizzes, and 2. Summative quizzes. Formative quizzes are meant for self-assessment and will not be part of overall course grade. These quizzes can be taken as many times as you wish. Summative quizzes can be taken only once and are part of the course grade. The formative quizzes can be taken using a regular browser, while the summative quizzes have to be taken using lockdown browser; see below for details on the lockdown browser.

Midterm: Thursday, Oct 12, 2017 in class
Project Demo: Thursday, December 7, 2017 in class
Final Exam: Monday, December 18, 2017 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.

Mode of Conduct for Quizzes: using LockDown Browser and a Webcam for Online Summative Quizzes

This course requires the use of LockDown Browser and a webcam for online summative quizzes. The webcam can be built into your computer or can be the type that plugs in with a USB cable. Watch this short video to get a basic understanding of LockDown Browser and the webcam feature. A student Quick Start Guide (PDF) is also available.

Then, download and install LockDown Browser from this link:

http://www.respondus.com/lockdown/download.php?id=772113517

Don't Google for a download link — it may be for the wrong school! Our version of the LockDown Browser is tied to Stony Brook University.

If you get a warning message from your anti-virus software, please white-list this download.

To ensure LockDown Browser and the webcam are set up properly, do the following:

- Start LockDown Browser, log into Bb, and select this course.
- Locate and select the **Help Center** button on the LockDown Browser toolbar.
- Run the **Webcam Check** and, if necessary, resolve any issues.
- Run the **System & Network Check**. If a problem is indicated, see if a solution is provided in the Knowledge Base. Troubleshooting information can also be emailed to our institution's help desk.
- Exit the Help Center and locate the Syllabus quiz named SyllabusQuiz, which is part of the *Getting Started* menu.
- Upon completing and submitting the syllabus quiz, exit LockDown Browser.

When taking an online quiz or exam that requires LockDown Browser and a webcam, remember the following guidelines:

- Ensure you're in a location where you won't be interrupted
- Turn off all other devices (e.g. tablets, phones, second computers)
- Clear your desk of all external materials not permitted — books, notes, other devices
- Remain at your computer for the duration of the test
- If the computer or networking environment is different than what was tested above, repeat the Webcam and System checks prior to starting the test
- To produce a good webcam video, do the following:
  - Avoid wearing baseball caps or hats with brims
  - Ensure your computer or tablet is on a firm surface (a desk or table) — not on your lap, a bed, or other surface that might move
  - If using a built-in webcam, avoid tilting the screen after the webcam setup is complete
  - Take the exam in a well-lit room and avoid backlighting, such as sitting with your back to a window
- Remember that LockDown Browser will prevent you from accessing other websites or applications; you will be unable to exit the test until all questions are completed and submitted.

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.
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, room128, (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

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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 ask questions about the Bb LMS along with tutorials are available here: 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.