Course Syllabus

MEC 220: Practical Electronics for Mechanical Engineers

Spring 2026

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Office	165 Light Engineering, Stony Brook University
Office Hours	TuTh 11:00 AM – 12:00 PM (or by appointment)
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* All course-related questions should be asked during lectures, my office hours, and TA's office hours. Email should be used only for strictly personal issues. I will respond to your emails as soon as possible, however, please allow up to 2 business days for a response. Your SBU email must be used for all your communications. Please include the course number in the subject line and your full name and SBU ID# in your emails.

Teaching Assistant	Su Li (Su.Li.3@stonybrook.edu)
Office Hours & Office	Wednesday 10:00 – 11:30 AM, 158 Light Engineering

Course Details

Title	MEC 220: Practical Electronics for Mechanical Engineers
Credit	3
Lecture	TuTh 9:30 – 10:50 AM, Frey Hall 104
Prerequisites	PHY 127, PHY 132, or PHY 142

Course Description

An overview of basic electronics at the practical level. The course provides mechanical engineering students with the fundamentals to perform basic electronics work needed in laboratories, subsequent courses and their professional careers. Topics include both passive and active components, AC and DC circuits, and a focus on operational amplifier and transistor driven circuits needed for instrumentation and control. Hands-on work in each area complements theoretical analysis, and ensures that students can implement these circuits and devices practically; students will analyze and build circuits both from circuit diagrams, as well as from product datasheets.

Course Learning Objectives

1. Ability to analyze resistive, capacitive, and inductive circuits.
2. Ability to analyze circuits with operational amplifiers.
3. Ability to analyze circuits with transistors and diodes.
4. Ability to analyze AC circuits prevalent in MEC field.
5. Ability to read and interpret circuit diagrams.
6. Ability to use information from product datasheets to solve a circuit design problem to meet given specifications in the absence of a prescribed solution.

Required Materials

Students will require one set of electrical components (see section **Required Parts List** on the last page) which must be ordered by the students from an appropriate supplier.

Recommended Textbook

- Charles Alexander and Matthew Sadiku, *Fundamentals of Electric Circuits*, 7th Edition, McGraw Hill Education, 2021 [Publisher, Amazon].
- David G. Alciatore, *Introduction to Mechatronics and Measurement Systems*, 5th Edition, McGraw-Hill Education, 2018 [Publisher, Amazon].
- Paul Horowitz, Winfield Hill, *The Art of Electronics*, 3rd Edition, Cambridge University Press, 2015 [Publisher, Amazon].

Tools

Brightspace: It is required that you use the Brightspace for this course. Brightspace is used for facilitation of communications between faculty and students, posting of the course materials, important announcements, and grades, and submission of assignments. You need to check your SBU email and Brightspace announcements regularly [Android App, iOS App].

Calculator: Only NCEES Allowed Calculators will be permitted to be used on all quizzes, midterm, and final exams. Please see the Calculator Policy on Stony Brook and NCEES websites.

LabVIEW: LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a visual programming language and development environment. It is developed by National Instruments and used for data acquisition, automation, and instrument control.

Arduino IDE: Arduino IDE is an open-source software program designed by Arduino that is used to write, compile, and upload code to Arduino boards.

Homework Assignments

Homework problems for each topic, along with their solutions, will be posted on Brightspace. Homework will not be graded because of the accessibility of solutions on the Internet. They will be mainly posted to provide students with an opportunity to practice the principles discussed during lectures and effectively prepare for examinations.

Lab Responsibilities

- Students will form into lab groups of 4 (or 3) individuals at the beginning of the semester to perform a number of at-home experiments and submit reports as a group.
- All the group members must contribute equally in performing all the experiments and writing the reports. It is each group member's responsibility to ensure that their reports are properly submitted before the deadline. Students found to be making insufficient contributions to their group's work will be removed from the group, and will receive a grade of zero for all lab work, at the sole discretion of the instructor. If any of your group members is not contributing to the lab work, please discuss this with the instructor ASAP to avoid negative impacts on your group. Be careful to select students that you will trust to do work reliably and on time; do not necessarily pick your "friends".
- Lab reports must be submitted through the Brightspace before the deadline. For each day your lab report is late, its grade will be reduced by 30%. The tentative lab report due dates are as follows.

Labs	Due Date/Time
Lab #1: Simple Circuits	Friday 03/06/2026, 11:59 PM
Lab #2: Voltage Regulators	Friday 03/13/2026, 11:59 PM
Lab #3: Operational Amplifiers 1	Friday 03/27/2026, 11:59 PM
Lab #4: Operational Amplifiers 2	Friday 04/03/2026, 11:59 PM
Lab #5: Transistors	Friday 04/17/2026, 11:59 PM
Lab #6: Timer Circuit Design Project	Friday 04/24/2026, 11:59 PM
Lab #7: 7-Segment Display Control Circuit Design Project	Friday 05/01/2026, 11:59 PM

- All lab-related questions must be asked during TA's office hours.
- Since the lab work is entirely group-based, each group can either purchase one kit of parts and share it, provided they can manage the sharing, or purchase individual kits. It is important to note that students in different locations may face challenges in safely swapping kits. If there is any uncertainty, it is recommended that each group member buys their own kit.

Examinations

Midterm Exam #1 Thursday, Feb. 26, 2026 (in class)
Midterm Exam #2 Thursday, Apr. 9, 2026 (in class)
Final Exam Monday, May 18, 2026, 11:15 AM (in class)

(a) Make-up exams are considered only for students who provide official documentation of a compelling reason (e.g., medical emergency) before, or within two days following the missing exam. There will be no make-up exams for reasons that can be within your control (e.g., pre-arranged travel or other engagements). An unexcused exam absence will be scored as a zero.

(b) The exam dates are subject to change. Students will be notified in a timely manner of any changes.

Grading Policy

Lab and Design Work	40%
Midterm Exam #1	20%
Midterm Exam #2	20%
Final Exam	20%

(a) Any disagreement with exam and lab report grading must be settled within one week after posting the grades.
(b) You will have the opportunity to review your midterm exams after grades are posted. However, this opportunity may not be available for the final exam, as the semester concludes once final grades are released.
(c) No individual extra credit work or extra points will be offered to improve grades.
(d) Depending on the class performance, the grades may be curved.

Grading Scale

A	[100, 90]%	**A**$^-$	(90, 85]%		
B$^+$	(85, 80]%	**B**	(80, 75]%	**B**$^-$	(75, 70]%
C$^+$	(70, 65]%	**C**	(65, 60]%	**C**$^-$	(60, 55]%
D$^+$	(55, 50]%	**D**	(50, 45]%	**F**	(45, 0]%

Tentative Course Schedule

Week 1: Chapter 1: Error Analysis in Engineering Measurements
Week 2: Chapter 2: Basic Concepts and Laws
Week 3: Chapter 3: Nodal and Mesh Analyses
Week 4: Chapter 4: Circuit Theorems
Week 5: Review, **Midterm Exam #1**
Week 6: Chapter 5: Capacitors and Inductors, **Lab #1 Due**
Week 7: Chapter 6: Operational Amplifiers, **Lab #2 Due**
Week 8: *Spring Recess*
Week 9: Chapter 7: Diodes, **Lab #3 Due**
Week 10: Chapter 8: Transistors, **Lab #4 Due**
Week 11: Review, **Midterm Exam #2**
Week 12: Chapter 9: Sinusoids and Phasors, **Lab #5 Due**
Week 13: Chapter 10: Sinusoidal Steady-State Analysis, **Lab #6 Due**
Week 14: Chapter 11: AC Power Analysis, **Lab #7 Due**
Week 15: Chapter 12: Three-Phase Circuits

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, materials, assignments, and deadlines, 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 Brightspace announcements.

University Policies and Statements

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 is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html.

Student Accessibility Support Center (SASC) Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center (SASC). For procedures and information go to Evacuation Guide for People with Physical Disabilities and search Fire Safety and Evacuation and Disabilities.

Critical Incident Management Statement

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Copyright Statement

Course material accessed from Brightspace or the Stony Brook 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 SUNY copyright policy.

Required Parts List (all through-hole components) [Sample Cart from Digikey*]

#	Item Type	Value	Quantity
1	Resistor	100Ω	10
2	Resistor	1kΩ	10
3	Resistor	10kΩ	10
4	Resistor	100kΩ	10
5	Resistor	1MΩ	10
6	Capacitor	0.01μF	2
7	Capacitor	0.1μF	2
8	Capacitor	1μF	2
9	Capacitor	10μF	2
10	Capacitor	100μF	2
11	Capacitor	470μF	2
12	Integrated Circuit (IC)	LM555	1
13	Integrated Circuit (IC)	LM324	1
14	Integrated Circuit (IC)	LM317	1
15	Integrated Circuit (IC)	CD4511B	1
16	Transistor	N-Channel MOSFET (e.g., IRLZ34NPBF or CSD18537NKCS)	1
17	Transistor	TIP31C	1
18	Potentiometer	10kΩ	2
19	Potentiometer	100kΩ	1
20	Diode	1N4148	2
21	Diode	LED, Red	2
22	Diode	7-Segment LED Array, NKR161 (Common Cathode)	1
23	Microcontroller	Arduino Uno (get a genuine one to ensure compatibility)	1
24	Prototyping	Solderless Breadboard (at least 10 × 30 with 2 power busses)	1
25	Prototyping	Jumper wire assortment	1
26	Prototyping	9-volt battery	1
27	Prototyping	9-volt battery holder	1
28	Measurement	Multimeter (one that reads voltage, current, resistance, and continuity)	1
29	DC Motor	Small DC Motor, M260, Rated voltage: 3 V DC, No load current: 110 mA, No Load Speed: 6600 RPM	1
30	Misc.	USB cable for Arduino	1
31	Misc. (Optional)	Parts Box	1

* Note that this is just a sample of the parts needed and can serve as a reference. There are other variations that may work as well, and you are not limited to these parts and this vendor. For example, you might find a less expensive multimeter.