ENME 351 – Electronics & Instrumentation II: Fall 2017 Syllabus

Department of Mechanical Engineering

Lecture Details

Monday & Wednesday, 10:00 am to 10:50 am
Glenn L. Martin Hall, Room 1202

Lab Details

All labs are held in Glenn L. Martin Hall, Room 3108

- 0101 Tuesday 1:00 pm to 2:50 pm
- 0102 Wednesday 6:00 pm to 7:50 pm
- 0103 Wednesday 1:00 pm to 2:50 pm
- 0104 Tuesday 6:00 pm to 7:50 pm

Instructor

Name: Steven E. Mitchell, Ph.D.
Office: EGR 2128
Hours: Monday 1:00 pm to 3:00 pm
Wednesday 11:00 am to 1:00 pm
Email: mitchels@umd.edu
Preferred Means of Contact: Piazza (Canvas > Navigation Bar > Piazza)
Google Hangouts: mitchels.umd@gmail.com (by request)

Lab Instructor

Dr. Prakruthi Hareesh
Email: phareesh@umd.edu
Office Hours: Thursday 10:00 am to 12:00 pm, EGR 2105 F

Teaching Assistants

Chien-ming Huang (cmhuang@umd.edu) Office Hours: Thursday 1:00-3:00 pm
Lovlesh Kaushik (lkaushik@umd.edu) Office Hours: Thurs 12-1 & 3:30-4:30 pm
Miead Nikfarjam (mieadnik@umd.edu) Office Hours: Fri 11:00 am - 1:00 pm

Teaching Fellows

Matthew Kanter (kanterma@yahoo.com) Office Hours: Wed 3:00-5:00 pm
Arye Kupferberg (akupferb@terpmail.umd.edu) Office Hours: Tues 4-6pm
Eun Park (epark135@terpmail.umd.edu) Office Hours: Tues 11:00 am - 1:00 pm
Ruchir Patel (rpatel18@terpmail.umd.edu) Office Hours: Monday 3:00-6:00 pm
Henry Speaker (Speaker.Henry241@gmail.com) Office Hours: Tuesday 3-5 pm

All TA and TF office hours are held in EGR 3109

Course Description

This is a required, 3-credit course focused on mechatronics. Full course details, including course objectives, can be found on the departmental website: http://www.enme.umd.edu/undergrad/courses/enes351.

The course includes two 50-minute lectures and one 110-minute lab per week.

The material covers a range of topics essential to the design of engineering products that combine mechanics, electronics, and computational/command-and-control software. Topics covered include: digital logic, microcontrollers

and their peripherals (ADC's, DAC's, etc.), programming, sensing, signal conditioning (Fourier transforms, noise, filters), and actuation.

Textbook

There exists no single textbook that comprehensively covers the material included in this course. The following textbooks are helpful and encouraged, but they are ***completely optional***:

Theory and Design for Mechanical Measurements by Richard S. Figliola and Donald E. Beasley, 6th Edition, 2014, John Wiley & Sons.
ISBN 978-1118881279.

Electrical Engineering by Allan R. Hambley, 6th Edition, 2013, Prentice Hall.
ISBN 978-0133116649.

Arduino Cookbook by Michael Margolis, 2nd Edition, 2011, O'Reilly Media.
ISBN 978-1449313876.

Grading Policy

Course grades will be based on the following ***approximate*** grade weights and breakdowns:

Homework & Exercises	10% (lowest 2 grades are dropped)
Quizzes	10% (lowest 5 grades are dropped)
Labs	40%
Midterm Exam	15%
Final Exam	25%

It is your responsibility to confirm the proper grades are recorded online for all graded work. **You have one week from the date graded work is returned to dispute a grade**.

Exams

One 50-minute midterm exam and one 2-hour final exam will be administered in this course. Successful completion of exams and assignments requires the use of calculators and, possibly, additional supplemental handouts. Calculators and additional required material may not be shared during examinations. No collaboration is permitted during examinations, and if violated, is subject to UMCP's Academic Integrity policy.

Homework Assignments

i) Assignment questions will be posted online via Canvas and Gradescope.

ii) Assignments will be submitted and graded using Gradescope. You are encouraged to seek assistance from any legitimate source in understanding homework, including collaboration with other students. The written work, however, must be your own. **No late submissions will be accepted**.

iii) All work must be neat, legible, and contain the following at the top of the first page: printed name, student number, signature, assignment number, and due date. Your signature is your acknowledgment that you have

understood and complied with the requirements of this policy statement and that you have acted honorably in the preparation of submitted work.

iv) For computer work, sufficient documentation must be provided to validate and reproduce the results. Typical documentation includes MATLAB/Arduino/Processing script files, input and parameter data, and results. Source code and scripts should include your name and brief descriptive text (i.e. comments). Plots must contain descriptive titles and appropriate labels.

Absences/Makeups: Class attendance is a prerequisite to success. **It is your responsibility to turn in any course work when due** and to obtain notes and announcements from another class member for classes you have missed. No late submissions will be accepted. If there are extenuating circumstances, discuss with the professor **prior to the due date** and alternate arrangements may be made. Unless a student provides advanced notice that an absence will be caused by serious illness, a death in the immediate family, religious observance, or participation in University activities at the request of University authorities, ***no makeup exams will be offered***.

Collaboration Policy Collaboration of any kind or the use of references and other sources of external information on exams is forbidden unless otherwise stated in this policy or as indicated in writing on assignment cover sheets. Selective collaboration on learning assignments (homework and in-class exercises) can often assist in the learning process. This should be done in moderation, however, since the ultimate measure of this course (and your final grade) is the level of an individual's knowledge, not the collective knowledge of all of his/her associates.

Laboratory Policy Labs will typically be completed individually, on your own time, almost every week. The laboratory assignments supplement the lectures and are an integral part of the course, providing you with hands-on experience.

The labs will primarily be based on the Arduino, an electronics prototyping platform; for further information see http://www.arduino.cc. Students must purchase their own Arduino and parts kit at the start of the semester; instructions are posted on Canvas. Students will need a personal computer to complete the labs, which will be due during your scheduled lab session. It will be most convenient if that PC is a laptop.

Lab sessions will be held in Room 3108 of Martin Hall. Students must complete the laboratory assignments to obtain a passing grade for the course. Please note the following:

- You must attend your assigned lab session. Students may switch to another section if space is available and only with a University-approved excuse. **Contact Dr. Prakruthi Hareesh (**phareesh@umd.edu**) immediately if you need to reschedule a lab session!**

- A tentative version of the complete lab manual is available on Canvas. Check Canvas regularly, however, as specific instructions for each lab will be updated as required and posted on Canvas.
- The instructor, TA, or TF will check off during each lab that you have successfully completed the required components.
- ***Pre-lab assignments must be completed prior to your lab section.*** If you have not made a sufficient effort, you will be asked to leave and make up the lab with a 30% penalty the following week.
- Grades for late lab makeups without a documented, approved excuse will be reduced by 30% the first week and 50% anytime through the final week of the course.

Office Hours Policy

If you have questions about the lectures, labs, or clarification on homework, office hours are an excellent opportunity to get help. This time may also be used if you have questions about how you might explore this material in greater depth. Remember: ***we want you to do well!*** However, office hours are not a substitute for lecture and **the course staff will definitely not solve your homework for you**.

The instructor, TAs, and TFs will keep office hours. You may contact them through Canvas/Piazza or email to set up an appointment outside of regular office hours if you are not able to make these office hours.

Academic Integrity

By enrolling in this course, each student assumes full responsibility as a participant in UMCP's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. **You will be cheating if you turn in anyone's work (homework, exam answers, schematics, figures, etc.) but your own.** Students caught cheating will receive a zero on the assignment and will immediately be referred to the Office of Student Conduct. Facilitating cheating in any form is the same thing. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.shc.umd.edu.

ABET Program Criteria

In addition to teaching the subject material, accreditation of the Department of Mechanical Engineering at UMCP by ABET requires the curriculum to meet certain criteria. This course is designed to provide the students with the following ABET originated concepts:

a) An ability to apply knowledge of mathematics, science, and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints
i) A recognition of the need for, and an ability to engage in life-long learning
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Syllabus Note

This course syllabus is subject to change. The most recent version is available on the course Canvas website. ***Please check regularly for updates***.

ENME 351 – Electronics & Instrumentation II: Fall 2017 Class Schedule

Department of Mechanical Engineering

Week	Date	Day	#	Topic / Event	Reading / Other
1	8/28	Monday	1	Course Introduction Digital Signals & Logic **Lab 0: Purchasing Lab Supplies**	
	8/30	Wednesday	2		
2	9/6	Wednesday	3	(*Campus closed Monday 9/4*) Introduction to Arduino **Lab 1: Digital Logic**	
3	9/11	Monday	4	Variables Arrays & Processing **Lab 2: Introduction to Arduino**	
	9/13	Wednesday	5		
4	9/18	Monday	6	Timers & Analog Signals Analog to Digital Conversion **Lab 3: Processing**	
	9/20	Wednesday	7		
5	9/25	Monday	8	Sampling & Aliasing Waveforms **Lab 4: 1st Order Systems**	
	9/27	Wednesday	9		
6	10/2	Monday	10	Frequency Domain Fourier Transforms **Lab 5: Sampling & Aliasing**	
	10/4	Wednesday	11		
7	10/9	Monday	12	Introduction to Sensing 1st Order Sensors **Labs 1 to 5 Make-up**	
	10/11	Wednesday	13		
8	10/16	Monday	14	2nd Order Sensors Review & problem solving -- **Midterm Exam** --	
	10/18	Wednesday			
9	10/23	Monday	15	Review of Midterm Exam Amplifiers Strain Sensing **Lab 6: Operational Amplifiers**	
	10/25	Wednesday	16		
10	10/30	Monday	17	Strain Sensing Noise & Filters **Lab 7: Strain Sensing**	
	11/1	Wednesday	18		
11	11/6	Monday	19	Improved Filters Sensor Errors & Calibration **Lab 7: Strain Sensing (cont.)**	
	11/8	Wednesday	20		
12	11/13	Monday	21	Digital to Analog Conversion Actuation **Lab 8: Servo Motors**	
	11/15	Wednesday	22		
13	11/20	Monday	23	DC Motors (*Campus closed Wednesday 11/22*)	
14	11/27	Monday	24	Transistors Motor Control **Lab 9: Final Projects**	
	11/29	Wednesday	25		
15	12/4	Monday	26	Alternate Actuation Induction Motors **Lab 9: Final Projects (cont.)**	
	12/6	Wednesday	27		
16	12/11	Monday	28	Putting It All Together **Labs 6 to 8 Make-up** -- **Final Exam: Date & Time TBD** –	