

**Physics 192M -- Introduction to Measurement using the Arduino
a one-credit course recommended for Physics majors
Syllabus for Spring 2019**

Location: Hasbrouck 235 (old wing of Hasbk)

Section times listed on SPIRE.

Instructor: Prof. Tony Dinsmore, Hasbrouck 404, 545-3786,

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Teach assistant: (TBA)

Number of course credits: 1

Required materials: Arduino Uno R3 Microcontroller A000066, Publisher: ARDUINO

The Arduino is a very powerful yet straightforward interface between your computer and a whole world of hardware (detectors, motors, noise-makers, GPS and Wifi devices – you name it). It consists of a microcontroller (hardware) and software. You will also need a USB cable, type AB.

There are several places where you can purchase Arduino boards (*e.g.*, Amazon, adafruit.com) and a few different versions. The Uno is a basic and tried-and-true model. You might also find cheaper imitations, but I do not know how well these work so I do not recommend them. During the course, you will probably want to purchase one or more accessories, depending on what project you ultimately decide to do. So if you can budget \$10 or so in addition to the Uno, that will be useful. If cost is a concern, please talk to the instructor, who can help.

Learning objectives: Key skills to be developed: (i) Posing a curiosity-driven question in a constructive way; (ii) designing, making, and trouble-shooting an apparatus to measure a physical quantity; (iii) facility with the hardware-software interface; and (iv) developing confidence in completing a technical task independently. By the end of the course, students will have defined their own question, set up a device to collect data, and answered the question. The course also provides a first experience (for many) in creating a logical sequence of steps to carry out a task, in preparation for programming. No technical experience is needed.

What to bring to class: a laptop computer, if possible. If it is not possible, the Physics department will lend you one to use during class time. Notebook and pen/pencil are needed. From time to time, students may wish to purchase small items for their devices.

Course Webpage: The course webpage is on MOODLE (<https://moodle.umass.edu>).

Other resources: 3D printing at UMass: <https://www.library.umass.edu/services/computers/3d-printing/>
Adafruit: <https://www.adafruit.com/>

Course email list: We will use the Spire course email list for occasional announcements. This list uses your UMail account, which UMass considers an official means of communication.

Accommodation Statement: The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify the instructor within the first two weeks of the semester so that we may make appropriate arrangements.

Academic Honesty Statement: Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such

standards is not normally sufficient evidence of lack of intent
(http://www.umass.edu/dean_students/codeofconduct/acadhonesty/).

Specifically in this course, each student will work on his or her own project most of the time. Students are completely free (even encouraged!) to get help from peers, or from any source at all. In that sense, there is no “cheating” in this class as long as you cite your sources. Examples of citing sources include “I talked to [...] in class” or “I found a diagram at www.blah.org.” You must cite your source in all homeworks, reports, and written computer codes.

Requirements and grades:

- **Attendance at the schedule class time is strictly required**. For each missed class, the final grade will be reduced by a full grade point (*i.e.*, by 10 points) unless there is a medical reason (with note) or pre-arranged excuse.
 - In-class time will be used for class discussions and working on devices.
 - The lab will not be freely available, but times will be arranged for students to work in lab outside of the scheduled class time.
- **Homeworks** will be graded and are worth 30% of your grade in total. The expected time for assignments is 2-3 hours per week. In many cases, these will be short electronic summaries of what you did and a plan or code or procedure that you developed. Also include a list of resources that you used, if any. (See “Academic Honesty” section; these sources can be anything but they do need to be listed.)
- **Projects**. The final project will be worth 40% of the grade. There are two mini-projects during the semester, worth a total of 20%.
- **Participation** in class is worth 10%. Participation includes being ready to start work promptly at the start of class, being active in class, and contributing in a positive way to the class environment.
- **Grades** will be based on your efforts and progress made from where you started.
 - The grade of B means that the student has done all of the required elements and demonstrates a satisfactory understanding. The assignments would also have to be intelligible to anyone other than the author.
 - If the assignment has been done better, the grade will go up (*e.g.*, with creativity or critical thinking).
 - Grades below B are assigned if parts of the experiment or questions are done incorrectly, or if the report is poorly organized or otherwise hard to understand. D is given if the student misunderstood the major goal of the lab (which I hope will not happen).

In-class expectations:

- 1) Do not explain or comment without being asked. We can all help one another, but let us first wait to be asked. We will all have a chance to talk about our projects at some point.
- 2) If you want to borrow something, ask first, make a note, and bring the object back the next week.
- 3) Do not eat or drink in class.
- 4) Listen, learn and have fun.

It would help me to get some information about you. Please complete the “Day-1 survey” on Survey Monkey at this address: <https://www.surveymonkey.com/r/CN5KSJD>
It has just 5 questions and will not take long.