BME354L Class Syllabus

1 Personnel & Lab / Lecture Information

Instructor: Dr. Kathy Nightingale
Lectures: Monday & Wednesday, 08:30 - 09:45 (207 Hudson Hall)
Labs: Thursday, 13:25 - 16:25 (03L) & 16:40 - 19:40 (04L) (P05/P07 Teer)
Lab Head Honcho: Matt Brown
Teaching Assistants: 13:25-16:25: Will Eldridge, Morgan Simons & 16:40-19:40: Sam McCachren and Elena Haag

2 Office Hours

Who	When	Where
Nightingale	Mon, 13:30-14:30	277 Hudson Hall Annex
TAS:	See Sakai Site for Times	Teer Basement

Alternate days / times can always be scheduled with Dr. Nightingale by email.

3 Textbooks, Class Website & Communication

3.1 Required

- Starter Pack for Arduino (Adafruit)

- LCD Shield Kit w/ 16x2 Character Display (Adafruit)

3.2 Other References

- Blum, J. "Exploring Arduino: Tools and Techniques for Engineering Wizardry," 1st ed., Wiley, 2013.

- Horowitz and Hill "The Art of Electronics," 2nd ed., Cambridge University Press, 1989.

- Webster, J.G. "Medical Instrumentation: Applications and Design," 4th ed., NY, Wiley, 2010.

- Khandpur, R.S., "Biomedical Instrumentation Technology and Applications," McGraw-Hill, 2004.

- Figliola, R.S. and Beasley D.E. "Theory and Design for Mechanical Measurements," 4th ed., NY, Wiley, 2000.

All class announcements will be communicated through our Sakai site. In addition, we will use piazza for interactive communication and electronic help on problem sets and labs.

4 Class & Lab Attendance

Lecture attendance is *strongly* recommended since a considerable amount of the material will be exclusively covered during lecture and not in a textbook.

Lab attendance is *mandatory* for all labs. Labs can only be made up with an official excuse (Short Term Illness form) filed in advance of the scheduled lab or a legitimate conflict that have you discussed with Dr. Nightingale **at least a week in advance** of your scheduled lab. Days/times to make up labs will be decided by your TA, Matt Brown and Dr. Nightingale **in advance** of missing lab, and your lab partner may be asked to attend that make up time depending on the lab exercise. All labs must be performed and complete lab reports submitted to pass this class. *Two unexcused lab absences will result in automatic failure of this class.*

5 Problem Sets

- Problem set due dates will be posted with each assignment.

- Late problem sets will not be accepted unless (1) Short Term Illness prevents completion, or (2) arrangements are made *in advance* with Dr. Nightingale.

- Unless otherwise stated, all assignments are due in the `BME354L (Nightingale)` grader box on the second floor of the Hudson Hall Annex at the specified time.

- Please make sure that your submitted problem sets are clearly labeled with your name, problems are clearly numbered, and the pages are secured with a staple or paper/binder clip. You can't receive credit for missing pages!

- When solving circuit analysis problems in the assignments:

  - Always draw the circuit/diagram for each problem involving a circuit/diagram.
  - Label all circuit elements with symbols. Solve problems symbolically before substituting in numerical values.
  - Please write legibly and include all relevant steps in arriving at your solution.
  - Please place a box around all final solutions.
  - Attach any computer code (e.g., Matlab code) used to solve problems. Place comments in the code where appropriate to indicate your thought process.
  - **All answers must have units.** No units = No credit!
  - All graphs must have appropriately labeled axes/legends with units.

6 Lab Policies & Reports

6.1 Policies

- Laboratory work is worth 30% of your final grade for this course. This includes your pre-lab assignments, active participation during lab, appropriate data recording / documentation in your Sakai group lab folder, and your submitted work for each lab.

- Labs are due 1 week after you perform the lab. Reports will be **electronically submitted via Sakai**. When in doubt about a due date, please check Sakai to determine when a lab report is due.

- Late lab reports will be penalized 50% of otherwise earned credit for being up to one day late. Lab reports greater that one day late will receive no credit, but must be completed and turned in to pass the class. **Late lab reports must be submitted through Sakai, which Dr. Nightingale will have to give you access to do after the original due date.**

- You must inform Dr. Nightingale if you have a known conflict with attending a lab *at least one week before that lab*. **Two unexcused absences from lab will result in an automatic failure of the course.**

- **You cannot attend the lab section that you are not enrolled in!**

- All laboratory exercises and reports must be completed to pass this course.

6.2   Pre-lab Assignments, Sakai Data Storage / Documentation, Lab Procedures

- All pre-laboratory questions and calculations must also be completed <u>before</u> lab and electronically submitted before the start of lab (one per group). Additionally, for some labs, you will be asked to complete Arduino code before lab. Lab-specific details will be provided when appropriate. These pre-laboratory assignments are 10% of each lab's grade, and late pre-laboratory submissions will not receive any credit.

- Electronically record notes of your procedures and results throughout the lab using the PCs in the laboratory, and upload all electronic documents (text files, spreadsheets and screen captures) to your Sakai account so your TAs can review this materials if necessary. *Make sure that your notes have adequate details to complete your lab report, including all necessary data and screen captures.*

- You and your lab partner must clear your lab bench space and return all parts after you have completed your experiment.

6.3   Lab Reports

- Each lab <u>group</u> (i.e., you and your lab partner) must complete a lab writeup for each lab. Like performing the lab exercise, the writing of the report and the data analysis should be even between the lab partners.

- For most of your labs, you will NOT write a formal report. Rather, you will submit the pre-lab, as well as submitting answers to all the questions interspersed throughout the labs and the post-lab questions.

- For two of your labs (Lab 6 (Incubator), and Lab 9 (Pheumotachometer)), you will submit formal lab reports, using a standard 4-page conference proceedings paper format (a boiler plate will be posted on Sakai for formatting). The lab report cannot exceed 4 pages. You must adequately present results, discuss those results (including things that do not make sense, and why that may be the case), and appropriately answer any questions raised during the procedure and in the post-lab questions. Distilling your information down to the pertinent points is more important than including the "kitchen sink" in these lab reports. For the Materials and Methods, you should list the material and equipment used during the lab (e.g., Oscilloscope Tektronix TDS-1012). You should NOT repeat the procedure already mentioned in the lab handout; simply reference it. However, be sure to include any deviations from the protocol, reasons for those deviations, etc. After reading this section of the lab report, someone should be able to replicate what you did along with lab handout.

- <u>Results & Discussion</u>: Provide all of the data acquired in the lab in a meaningful and efficient format (e.g., tables, plots, etc.). All figures, tables, plots *must* be numbered and labeled, with captions, and

properly referenced in the text. All figure and plot axes must be labeled and include units!! All results must include units!! Include all analyses discussed in the lab handout, and provide equations that were used in these analyses (and any intermediate steps if they are not obvious and are significant). Answer all questions posed in the lab handout and post-lab questions (be sure to indicate the question number you are answering).

- Conclusions: A few sentences providing an overview of your findings, interesting observations, and overall success of your experiment.

- All lab submissions (formal reports and weekly lab summaries) must be generated using a word processor (e.g., Word) or typesetting program (e.g., LaTeX) using a reasonable font size and single-spaced with clear section headings.

- **PDF electronic versions of your lab submissions will be submitted to Sakai via the specific Lab Assignment that you and your lab partner will have access to. Only one lab report needs to be submitted for each group.**

7 Grading

There will be one midterm exam and one final exam. Make-up exams will only be given for official excuses provided as early as possible in advance of the scheduled exam. Make-up exams must be scheduled in advance of missing the exam or within 24 hours of submitting a short-term illness form.

The distribution of your grading is outlined in the table below:

Problem Sets	15%
Labs	30%
Mid-term Exam	25%
Final Exam	30%
Class Participation:	extra credit (grade boundary consideration)

8 Duke Community Standard

Engineering is inherently a collaborative field, and in this class, you are encouraged to work collaboratively on problem sets and lab reports.

The work that you submit must be the result of your own effort and reflect your understanding of the material.

There are inherently gray areas when working in groups, but submitting individual assignments. Given that, you are strongly advised to consult with your instructor and your teaching assistants whenever you are unsure if you are crossing the line between collaboration and copying another student's work. As an internal benchmark, you should be able to explain all work being submitted with your name on it and be able to justify your choice for a solution methodology, analysis technique or the way that you arrived at a final answer.

All students are expected to adhere to all principles of the Duke Community Standard. Violations of the Duke Community Standard will be referred immediately to the Office of Student Conduct.

9   Words of Wisdom

- Check Sakai often for assignments, lab-related documents, and other important class information.

- Make the most out of attending lecture... briefly review notes from the previous lecture before class and make sure that you're understanding the "why", not just the "what". For example, instead of just memorizing that current and voltage lead/lag one another in capacitive/inductive devices, make sure that you understand the physics behind those behaviors. Remembering the lead/lag relations becomes a lot easier when you know why they exist.

- Don't wait until the last minute to do the problem sets!! They're designed to provide you with opportunities to figure out what you do and don't know; leaving them until the last minute compromises that objective. Working on problem sets in advance will also provide a catalyst to...

- Ask questions and attend office hours. BME354L is your opportunity to learn about medical device electronics. Take advantage of your instructors and TAs to help your learn this material–we're here for you!

- Feedback is a two-way street. I'll let you know how you are doing throughout the semester, and in return, you should feel free to let me know what you are or are not understanding. I'd rather cover less material that you understand well than covering lots of material that you'll forget sooner rather than later.