

BENG 152 BioSystems Engineering Lab

Prof. Wheeler, Winter 2021
Document for Schedule of Classes
See CANVAS for Latest Version

Lab W 12-4 108 Powell Focht Bioengineering Hall.

Lectures/Discussions: M 9-10; F 10-11. **Hybrid:** zoom link to be announced

Instructor: Bruce Wheeler, 229 Powell-Focht bcwheeler@ucsd.edu

TA: Jason Nan, janan@ucsd.edu

Contacting the Instructors: *We are very pleased to meet with you.*

Office hours: after Lecture and after Lab or email us.

COVID – we will run labs in person. Masks, face shields, and distancing are enforced.

Text: Lab Exercises and supplementary materials to be downloaded from CANVAS.

Suggested: John Webster, Medical Instrumentation: Application and Design. (Wiley). Any edition will do. It likely will be used for your Bioinstrumentation course.

Lab Notebook: See description in Lab 0A Reporting Requirements. Also, you must have your TA initial your lab notebook at the end of each lab.

Grading Philosophy: The instructor assigns grades according to his professional judgment, guided by but not constrained by, typically, percentages in different components.

Grading Details (subject to change; these strongly guide the instructor for final grades)

Prelab submissions: 10% (1% each)

short ones graded all or nothing;

longer ones, graded 10% 90% ... 100%. Average converted to A/B/C etc.

Postlab submissions: 20% (2% each)

short ones graded all or nothing; longer ones, graded 10% 90% ... 100%. Average converted to A/B/C etc.

Lab Notebook: 10%.

Graded Twice. Early February and end of term.

Major lab write-ups: 20% broken into pieces – Abstract (2%), Introduction (4%), Methods (6%), Results (6%), Conclusions (2%). Dates to be determined.

End of Term Project: 30%

Instructors' Appraisal of Performance: 10%.

Notes: Each individual grade will be converted to A=4; B=3; C=2; D=1; F=0. Plus adds 1/3 and Minus subtracts 1/3. Then equivalent GPA scores will be averaged.

Lab Equipment and Supplies

The laboratory has a set of test equipment suitable for a beginning bioengineering laboratory emphasizing electronic instrumentation and signals. Each pair of students will be given a project box of supplies, small tools, electronic chips, etc. These can be stored in the laboratory or taken home when you are required to assemble a circuit before coming to the

lab. They must be returned fully stocked at the end of the quarter.

Work Expectations:

Partner: You will work with a partner either of your choice or as assigned on the first day of lab. The pair will submit one report.

Pre Lab: You are expected to have read the laboratory exercises before coming to class. The prelab reports are intended to make you read the lab exercise; some have more extended calculations and questions. They are graded on an all or nothing basis for short submissions, and at 10% intervals for more extended submissions.

During Lab: You are expected to work diligently through the assignments during lab and to keep ahead of the schedule.

Lab work Outside of Lab: We expect that a considerable part of the electronic project circuit construction will be done before you come to lab.

Post Lab: Due dates for the lab write-ups and instructions will be given.

Project: The last two weeks, plus study/exam week, are dedicated to completing a project in which you design and implement a system that includes biophysical measurement, data acquisition and data processing. You should decide on and then plan your project earlier than the last two weeks. Guidelines will be given so that the projects are manageable.

Note: **The labs do not match one-for-one with weeks of the quarter.** You and your partner will often have to complete one lab and continue on to the next during the 4 hour lab period. You are strongly encouraged to work ahead so that you can not only finish all the labs but also have plenty of time for your project.

COVID Notes:

Mask and shield protocols are to be followed at all times in the lab.

Lectures will be simultaneously zoom broadcast and recorded. It is possible that podcasts will be recorded also.

Learning Expectations

Your most productive sources of learning are your peers – students in this class. You are encouraged to work with them to gain greater understanding.

However, you are expected to learn the material to a level of competency where you individually are expert in settings outside this course – so you can instruct the next set of students or use the techniques for senior design or laboratory work. Accordingly, you must discipline yourself to understand the laboratory exercises yourself and not rely on your lab partners; also complete the lab reports with your partner and not as part of a larger group.

Further, see the following on Academic Integrity.

Statement on Integrity of Scholarship

Academic integrity is of utmost importance. As part of the learning process, discussion of homework assignments with colleagues, TA's, etc., is encouraged, but the final answers you submit must be your own. It is okay to discuss your misunderstandings on homework/lab reports but it is not okay to simply copy answers from other teams.

All infringements of academic honesty will automatically be reported, dealt with aggressively, and may have long-term consequences.

(Subject to correction and change)

Schedule by Week

Week	Weds	Complete this Lab	Start This Lab
1		0A. Reporting Requirements;	0B. Safety Quiz
1	5-Jan	1. Equipment	1. Equipment, 2. LabVIEW
2	12-Jan	2. LabVIEW; 0B Safety Quiz	3. OpAmps
3	19-Jan	3. OpAmps	4. Filters
4	26-Jan	4. Filters, 5. Instr. Amps	5. Instr Amps
<5	Before 2-Feb	0C. Soldering – before ECG lab	
5	2-Feb	6. ECG 7. EMG	6. ECG, 7. EMG
6	9-Feb	8. Arduino	8. Arduino
7	16-Feb	9. Temp, 10. PPG	9. Temp, 10. PPG
8	23-Feb	11. To be determined	11. To be determined
9	2-Mar		12. Project
10	9-Mar		12. Project
Exam	16-Mar	12. Project Due	

LAB SAFETY – You Must View the Laboratory Safety Podcast and Complete a Short Quiz before coming to lab. (to be announced on CANVAS)

Lab 0A is a description of reporting requirements. You must read it completely before coming to the first lab. You must bring a hardcover bound notebook to the first lab.

Lab 0B is the Electrical Safety Quiz. It is to be finished by the Weds, January 17.

Lab 0C is the Soldering Lab. Make sure your group asks a TA for instruction some time before the ECG lab when you may have to do soldering for leads.

We have moved the Arduino Lab up to Week 6 –you will need this for Lab 9, photoplethysmography and many students will want to use Arduinos for their final project.

Lecture Schedule (subject to change)

Week	Mondays	Held Regularly	Fridays	When Needed – especially early
1	3-Jan	Intro/Equip/LabVIEW; Electrical Safety	7-Jan	Digital Signals; OpAmps and Circuits
2	10-Jan	OpAmps/Filters	14-Jan	No Class
3	17-Jan	MLK Holiday	21-Jan	Instrumentation Amplifiers
4	24-Jan	ECG recordings, circuits; EMG	28-Jan	If needed
5	31-Jan	Arduino	4-Feb	If needed
6	7-Feb	Temp, PPG; Project Q&A	11-Feb	If needed
7	14-Feb	Temp, PPG	18-Feb	To Be Announced
8	21-Feb	To Be Announced	25-Feb	To Be Announced
9	28-Feb	To Be Announced	4-Mar	To Be Announced

10	7-Mar	To Be Announced	11-Mar	To Be Announced
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Due Dates for Lab Reports

The due dates are: very late on Tuesdays (Prelab), very late on Mondays (the Post-Lab). You may stay up as late as you wish on Tuesdays for prelab and Mondays for postlab. Accordingly, the Prelab clock says “9 am on Wednesdays” and the Postlab clock says “9am on Tuesdays”.

Lab #	Title	Start Week	Finish Week	Prelab Due Weds 9 am	Post Lab Due Tues 9 am	Formal Reports Due	Lab Notebook to be Graded
	LabSafety	1	1	5-Jan			
0A	Reporting	1	1				
0B	Safety	1	1		Quiz by 12-Jan		
1	Equip	1	1	5-Jan	12-Jan		
2	LabVIEW	1	2	5-Jan	19-Jan		
3	OpAmps	2	3	12-Jan	26-Jan	Intro	
4	Filters	3	4	19-Jan	2-Feb		
5	Instr Amps	4	4	26-Jan	2-Feb	Methods	Leave NB in lab Jan 26
0C	Soldering	Before 5	Before 5				
6	ECG	5	5	2-Feb	9-Feb		
7	EMG	5	5	2-Feb	9-Feb		
8	Arduino	6	6	9-Feb	16-Feb	Results ECG	
9	Temp	7	7	16-Feb	23-Feb	Discussion/ Conclusion/	
10	PPG	7	7	16-Feb	02-Mar	Abstract	
11	Project	8	11	Proposal: 22-Feb	Final Report: 16-Mar	Final Report is Formal 16-Mar	Leave in Lab at End of Quarter

Formal Lab Reports:

1. Introduction to OpAmp Lab– due 26-Jan
2. Methods for Instrumentation Amps Lab– due 5-Feb
3. Results for ECG Lab – due 16-Feb
4. Discussion/Conclusion for Temperature Lab –due 23-Feb
5. Abstract for PPG Lab – due 02-Mar

Project Proposal: 22-Feb

Final Report: 16-Mar

Notebooks: collected at end of Lab 5 Feb 26; collected on Mar 02 in lab.