ME 310 Instrumentation: SPRING 2021

<u>NOTE</u>: It is your responsibility to read over and be familiar with the policies and dates described in this document. Some dates/assignments may be subject to change; changes will be announced in class, via email, and on Blackboard. Please check this document prior to emailing me for logistical information.

LECTURE: A1: MW 10:10 – 11:55 AM, ***REMOTE ONLY***

LINK:
https://bostonu.zoom.us/j/95297083356?pwd=cHYvUWdqOWVCZ1Qrejhqc2xWVTJ6UT09

OR MANUALLY:
Meeting ID: 952 9708 3356
Passcode: 353838

LAB: ***REMOTE ONLY***

LINKS will be section by section:

C1 (Tues 5:30 – 9:15 pm)
https://bostonu.zoom.us/j/93876744385?pwd=b044ODN3ZE1jWWFLTHZQaHJiZUxnUT09

C2 (Thurs 5:30 - 9:15 pm)
https://bostonu.zoom.us/j/91471926933?pwd=UTQ1MGpqWXBUb3p4b0l6SStiaUd1Zz09

C3 (F 8:00 – 11:45 am)
LINK TBD

C4 (F 2:30 – 6:15 pm)
LINK TBD

PROFESSOR: Glynn Holt rgholt@bu
Office hours M 4-6pm, Zoom 586-308-8900 no password

GSTs:

Harley Quinn (hjquinn@bu.edu)	(C1,C2)
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Course description

(4 credits) Designing, assembling, and operating experiments involving mechanical measurements; analyzing experimental data. Safety considerations in the laboratory. Wind

tunnel testing. Mechanical and electrical transducers for flow, pressure, temperature, velocity, strain, and force. Electric circuits for static and dynamic analog signal conditioning. Computer use for digital data acquisition and analysis; instrument control. Introduction to frequency domain analysis. Professional standards for documenting experiments and preparing reports, including formal uncertainty analysis involving elementary statistics. Discussion of commercial instrument development. Interpretation of experimental results. Includes lab and design project.

Goals

1. To teach basic techniques for designing experiments and analyzing data
2. To introduce the operating principles and uses of transducers, output devices and signal conditioning elements of measurement systems
3. To introduce the concepts of signals and systems and their interaction in both static and dynamic measurements
4. To provide hands-on experience in professionally conducting experiments in a modern, real laboratory setting with emphasis on safety, documentation, computer use and uncertainty analysis. The uncertainty analysis reflects standardized practice, providing an introduction to professional codes and standards and elementary probability and statistics.

Hub Learning Outcome: Writing Intensive

School, Department, and/or Program Outcomes

ME310 is a required course for the Mechanical Engineering B.S. degree program. Its prerequisite courses are CAS WR150, ENG EK307, EK381/ME366, and ME303.

Course Learning Outcomes

As an outcome of completing this course, students will successfully:

i. Design and implement experimental solutions to engineering problems, including static and dynamic mechanical, electrical and thermal measurements, and justify the tradeoffs between cost, performance and complexity of measurement schemes.

ii. Analyze the uncertainty of experimental results, including identification of sources & types of uncertainty, combination & propagation of uncertainties

iii. **Hub unit: Writing Intensive**. Demonstrate proficiency in technical writing and documentation of experimental work through use of standardized lab reporting policies and requirements.

iv. Demonstrate the operating principles and justify the uses of transducers, output devices, and signal conditioning elements of measurement systems for flow, pressure, temperature, velocity, strain, and force.

v. Apply the concepts of signals and systems and their interaction in both static and dynamic measurements, including mathematical modeling of such systems' static and time-dependent behavior.

vi. Demonstrate knowledge of the theory and practical application of analog-digital conversion in the context of data acquisition and MATLAB and LabVIEW interface data acquisition control software.

vii. Work efficiently in individual and team settings by performing labs and projects in both self-organized and instructor-organized groups.

viii. Present experimental design and results in an oral presentation.

Instructional Format, Course Pedagogy, and Approach to Learning
For this S21 semester only, the following approach has been adopted:

Lecture:

Synchronous: Lecture is remote only, synchronous, M-W 10:10 – 11:55, Zoom link on first page of this doc.

Asynchronous: Lectures will be recorded and made available on the ME310 S21 A1 Blackboard site

Lab kits and lab section
Due to the LfA mode we can no longer rely on a single set of on-campus laboratory equipment. You have been contacted by the ME Department regarding your location and plans for distributing a ME310 lab kit. We have worked throughout the summer to completely redesign the ME310 labs. Assuming no supply issues, we are planning on 3 lab exercises and a design project. You should already have, or will receive the following LfA Lab kits:

Scope pack: PicoScope 2204A (and cabling)
EK307 pack: Circuit components, breadboard, etc
EK301 pack: Mechanical support (clamps, wooden meter stick, etc)
ME310 course pack: Sensors (vibration, thermocouple, force), thermocouple chip, thermometer

Depending on your response you will either be shipped the kits or you can come to Department (at designated times) to pick up kits

With this kit you will tackle the lab procedures in your home workspace. We have designed the labs to be safely completed in a home, dorm room, or apartment.

Each lab is scheduled to take place over a 3-week time frame, and is split up as follows:

1. Prelab session: A report component that you write, comprising the first few sections of your overall report. For each Lab, your first week section session (via Zoom) will focus on the prelab and procedures elements.
2. Data/troubleshooting session: For each Lab, your second week section session (via Zoom) will focus on following/revising procedures and taking data. Over the course of a week you, both alone and with partners from your lab section, will work through the lab procedure using the lab manual and lab kit.
3. Lab report session: For each Lab, the final scheduled lab section session will focus on data analysis and report writing.

Your full and compiled lab report will be due on the Monday following session 3, by 10am on Gradescope.

Reading resources
Due in part to the technical writing component, you will benefit from carefully reading all of the resources that are available to you. These resources consist primarily of the course textbook (see below), the lab manuals, your course notes, and the various digital documents (including this syllabus and embedded lab manual guide!!) that will be posted on the website and described by

your instructor. Web resources may also contain helpful written explanation. We strongly encourage you to read through these documents carefully, particularly as you prepare your pre- and postlab reports.

Text: Figliola and Beasley, *Theory and Design for Mechanical Measurements,* 6th ed., 2011. Wiley. ISBN: 9780470547410.

Note: The 4th edition is likely cheaper and is acceptable also.

Optional Text: Taylor, *An Introduction to Error Analysis*, 2nd edition, Univ. Sci. Bks., 1997.

Website/Digital materials

All of the course resources, with the exception of an online grade record, are on the course Blackboard website. You are responsible for navigating the website to obtain course documents. Some assignments, including ALL exams, will be hosted on Gradescope. ALL work to be turned in will be turned in to Gradescope.

Lab Notebook: Any bound notebook is fine.

Grading:

20%	Design Project
20%	Homework Sets
20%	Labs and Lab Reports
20%	Each exam (x2)

Class

For this S21 semester only, class will be live and 'in person' on Zoom. Concepts will be covered during class that either elucidate, augment or go beyond what is found in your textbook. Q&A will be encouraged.

Homework

Homework assignments will accompany the major concepts. They are to be uploaded to Gradescope prior to the BEGINNING of class on the due date listed. LATE HOMEWORK WILL NOT BE ACCEPTED unless circumstances merit the exception.

Exams

Your understanding of the class-based material will be assessed via two midterm exams. There will be NO final exam. Each exam will cover a specific section of the material. Both Exams will be administered online during the regularly scheduled lecture time via Gradescope.

Design Project

The details for the project will be announced later in the semester. This will be a group project.

Drop and Withdrawal Dates

You are mostly seniors – you can't drop!

"Incomplete" grades are reserved for the most extreme of circumstances and are a negotiated contract between the student and professor.

Collaboration

A. **Homework**: Do it individually. However, you are encouraged to consult with classmates on general concepts.

B. **Lab reports**: Everything you write must be your own work. This policy extends to **ALL** components (text, figures, tables, etc) of every document (pre-lab, notebook, report). **Do NOT share digital files other than whatever raw data needs to be shared within your group.** Your lab report should be a stand-alone document, and therefore you may not 'reference' any section in one of your lab partners' reports. However, you may and are encouraged to consult with your lab partners even after the lab period to discuss findings and results. Screen sharing your results to facilitate a discussion via Zoom or a similar web conferencing application **is OK** -- just don't use screen shots as part of your report. Take this guidance **very seriously but PLEASE feel free to come talk to us if you're unsure about boundary lines!**

C. **Design project**: This is a group collaborative project, and we expect to see some division of labor here; there will only be 1 report per group, so each group member will receive the same grade. Despite the division of labor each member of the group must understand the other member's contributions.

D. **Exams:** Done individually.

Academic Conduct Statement

Cheating on homework, quizzes, exams, project reports, or any form of assignment, may be a form of plagiarism and is an infringement of every code of engineering ethics. Plagiarism is a serious academic offense and should not be taken lightly. Understanding your ethical responsibilities is an integral part of becoming a professional. A copy of the Code of Ethics of engineers, promulgated by the Accreditation Board for Engineering and Technology (ABET) and the National Society of Professional Engineers, can be found on the main course web site.

Recall that when you enrolled at Boston University, you agreed to an Academic Honesty Pledge. The Academic Conduct Code details your responsibilities as well as the results of code violations, and is posted at: *https://www.bu.edu/academics/policies/academic-conduct-code/*

Accommodations for students with documented disabilities: If you are a student with a disability or believe you might have a disability that requires accommodations, requests for accommodations must be made in a timely fashion to Disability & Access Services, 25 Buick St, Suite 300, Boston, MA 02215; 617-353-3658 (Voice/TTY). Students seeking academic accommodations must submit appropriate medical documentation and comply with the established policies and procedures *http://www.bu.edu/disability/accommodations/*

We will make every effort to accommodate such requests but (a) please notify us at the beginning of the semester if you've received approved accommodations in previous semesters (even if you haven't received your paperwork for this semester yet!) and (b) our policy is that we need at least one week's notification prior to each exam so we can make the necessary arrangements.

Matlab Access

We recommend the use of MATLAB for analysis and plotting for ME310, and will require it for some of the homework analysis. You can download Matlab to your personal computer: http://www.bu.edu/tech/services/cccs/desktop/distribution/mathsci/matlab/

LAB AND LAB REPORT POLICIES AND PROCEDURES

1. **Groups**
   You are encouraged (but not required) to work with a group of your peers as you work through the lab procedure. We recommend organizing yourselves into groups of no more than 4 students each. However, Lab reports are individual assignments.
2. **Notebooks and Reports**
   a. Lab Notebook: You must keep and maintain an organized set of notes for documenting data, observations, and general experimental setup notes. Any bound notebook is fine. Any electronic method is also fine. But, critically, this is a static, archival document – you do not 'revise' a lab notebook entry, no matter whether handwritten or electronic. All lab notebook entries must be permanent. Do not erase or delete entries that, at some later time, you deem incorrect or mistakes. Instead, cross out with ONE mark and explain and date your later reasoning.
   b. Lab Report: Each student will generate a lab report for each experiment, the elements of which are spelled out in the sections below. These reports will be generated on a word processor with inclusion of graphs and plots (typically generated in a spreadsheet or other calculation program)
   c. Format, content and neatness will be graded. Your writing or typing must be legible, intelligible, and concise but complete. As mentioned above, these reports are stand-alone documents. Do NOT assume that 'everyone knows that'.
   d. If you use information from a previous class or from some textbook (even our own) or even use pictures, plots, text, etc. from the lab manual handout, or from the Web, you MUST document such with a citation. A standard point deduction of 10 points will be applied for missing citations (when relevant).
3. **Lab preparation**
   The lab component for this course bears considerably more responsibility than other lab exercises you've had. The GST-led Prelab session will provide feedback on the lab goals and procedure, and they will provide troubleshooting assistance in the subsequent Lab session. In order to complete everything, you'll need to be adequately prepared. To help you stay organized, you're expected to carefully read through the lab manual and prepare a thorough prelab document (see below).
4. **Due dates**
   Based on the schedule posted earlier in the syllabus, you are required to submit to Gradescope a full lab report at the conclusion of a course of 3 weeks during which you're engaged with a lab exercise. LATE LAB REPORTS WILL NOT BE ACCEPTED OR GRADED unless dire circumstances warrant the exception; see your instructor if you are unable to complete your report on time.
5. **Uncertainty Analysis**
   Certain labs will require a formal uncertainty analysis, as described at the top of the lab manual. **Lab 1** will **not** require a formal uncertainty analysis.
7. **Lab Report Content**
   A section by section breakdown of what is expected appears following this policy.
8. **Academic Honesty**
   These labs are meant to be individual efforts. While discussion of the analysis with your peers is ok (and encouraged), 'sharing' of ANY written/digital content among your current peers (or those who have already completed the course) is plagiarism and will

result in an Academic Misconduct investigation. It **IS** permissible to discuss your data and results via Zoom. **Do NOT share digital files other than whatever raw data needs to be shared within your group.**

9. **Safety**

Safety is paramount. You only have the one set of equipment that was delivered to you at the beginning of the semester. Treat it carefully, since there will not be a replacement readily available. Make sure to keep liquids away from your lab equipment!!

10. **Equipment**

Two bad things happen to lab equipment: An instrument or component fails or is made to fail via an accident. Do your best to prevent the latter (set your power connections carefully and handle with care!). Please report broken equipment directly to your instructor and GST as soon as possible, so we can diagnose and fix or replace as necessary, but also please note that replacing stuff is very difficult at this time.

ME 310 LAB REPORT CONTENT AND LAB NOTEBOOK USE

GENERAL INFORMATION

- Include page numbers for your report.
- A full report will consist of a prelab document, in lab notes and data, and a postlab document, combined into one complete document and structured following the content guidelines below. All elements are written by you, based on the sections detailed below.
- You should take notes during the lab and include them as part of the report, by writing them in your lab notebook for your in-lab data and notes (as you would do in an industry or academic research setting). If your lab notebook notes are handwritten, be sure to include a scanned copy. If your lab notebook notes are recorded electronically, include them unmodified and as-recorded in your lab report.
- Longer ≠ better! We absolutely do not expect 40-50 page reports. As a technical report, communicating the relevant information in a clear & **concise** manner should be your main goal. The theory section has a maximum page length but do your best to keep the overall length of your report to a minimum length as well.

PREPARATION BEFORE LAB (Prelab Report Section)

- Title page
- Objectives of lab
- Theory and preparation for analysis
- Appropriate tables of symbols and equations
- Listing of data needs
- Tentative equipment lists
- Procedure checklist

1. Title Page

This should include only the title of the experiment, the date the experiment was actually done, your name, and all other students who did the experiment with you. *(of course most of this info can only be recorded after you complete the lab)*

2. Objectives

First, the objectives of the lab should be stated. This should be a **brief and concise** statement of what the scientific and/or engineering goals of the experiment are (e.g., investigate a phenomenon and/or demonstrate a theorem).

Do not just copy the handout. In the conclusion section at the end of your lab you should return to the objectives to ascertain how well the objectives were realized. Since the conclusions depend on the results of the experiment, what is included in the results section will also depend on the objectives, so check what is asked for (or what will be obtained) in the results section before writing your objectives.

3. Theory

Next, a **brief** summary of pertinent theory or established empirical evidence related to the experiment should be given. You should base (and cite!!) your explanation off the lab manual, class notes, and textbook, so read these sources carefully. The purpose is to understand the basis of the experiment and how these data are to be reduced and analyzed to meet the lab's objectives prior to arriving to lab. It is your responsibility to understand the theory well enough to know what measurements need to be made (e.g., if a Reynolds Number is required, then you need to measure temperature, which will allow you to look up the fluid's viscosity). All derivations or dimensional analyses requested in the lab manual should be done in this section.

Longer ≠ better! You will be graded, in part, on conciseness. The Theory section should be no longer than 5 pages, double-spaced (this is a limit, not a goal!).

4. Equation Summary

This is a listing of the equations you will need to find your results from your data and the theoretical values to which you will be comparing them. Also, list the meaning of all the symbols used in your equations and their units.

5. Data Needs

This section should include a list of data needs, including the range of variables the data will include. The purpose of this is to simplify in lab the construction of neat data tables that are easy and informative to read. It also allows you to determine a complete list of the data you'll need in lab, to reduce the chance you'll forget or miss a measurement. Headings for table rows and columns should be devised as well as tentative unit assignments.

6. Equipment and Component List

Next should come a tentative list of equipment. It is a tentative list because you may need to add to the list once you work through the procedure. You should include information on the **equipment/component manufacturer and model number**. You should construct this list in the form of a table.

Equipment and Component Specification Sheets: You'll need these for your Uncertainty Analysis. It is your responsibility to go to the manufacturer's website for this information.

7. Procedure Checklist

The lab manual provides the goals and the main procedural steps for accomplishing those goals. You must transcribe these steps into a single bulletized checklist of steps for you to follow, referred to as that lab's Procedure. Note that while you are not asked to re-write the procedure in your own words for the prelab, you are still expected to have read through and familiarized yourself with the procedure BEFORE your Prelab session.

These Procedure steps should be your direct guide to completing each step involved in the lab exercise. This is to help you to remember when to power on a circuit, when to take crucial data, or perform spot checks so you don't have to repeat portions, or all, of an experiment. The labs can become somewhat confusing while in progress and it is not difficult to forget a procedure step, so pay close attention to this section. You may find that you will need to revise or add further steps to this list during the lab.

There is a fair amount of work involved in prelab preparation. It is a very significant part of doing an experiment and should not be raced through just prior to performing the lab. The prelab comprises 23% of your lab grade.

LAB NOTEBOOK USE DURING LAB (Inlab Report Section)

- Make and record a safety inspection
- Follow procedure checklist
- Take data
- Perform spot checks
- Note general observations
- Draw experimental setup

1. Perform Safety Inspection

Before beginning the experiment, consider and document the safety issues related to this experiment. Include both issues that were addressed in the Lab Manual and also those that were not addressed that you either observe in lab or from reading equipment and component specification sheets (e.g., what is the maximum DC voltage you can present to the Picoscope channel input? AC? What is the minimum value of resistance you can drop across the C+ pin of the AD595 chip in Lab 2 without damaging the chip?). For those issues that were not addressed, comment on how the safety of the experiment might be improved in the future. Note that this is safety FOR the equipment, not just FROM it – you should be aware of the limitations of all equipment you use, and take appropriate steps to ensure no input or output loads exceed those limits.

2. Follow Procedure Checklist

Check off each step as you proceed through the checklist. You should write in procedure changes if they become necessary. If there is extensive revision of the procedures necessary, you should record the revised procedures in the lab notebook.

3. Take Data

Record data in the data tables you developed in your prelab. Be sure to include appropriate units and other comments (e.g., which of several instruments you were using or which scale you were using on your instrument). Be sure to record the raw data before you make any calculations. All data must be recorded neatly and be easily legible to the graders (including the units of the data) or else loss of credit will result. The 5% credit given for this section is primarily given for format, presentation, and completeness. More credit will be lost if the data is faulty, leading to poor analysis and results.

4. Perform Spot Checks

It is always desirable to do an analysis of some data points in the lab while the experiment is running. This is called a 'spot check'. A spot check permits you to see if the results make sense, or if the experiment is generating data that is obviously erroneous and either the experiment or your method of analysis needs correcting. All ME310 labs include spot checks to help you identify problems relating to faulty data, incorrect analysis, lab technique or faulty equipment.

Usually you will be told what spot checks to do, but for some labs (and your project) you are expected to come up with some of your own. Regarding spot checks, it is not enough to simply do them. Comment on what information they supply, e.g. "demonstrates a linear relationship", or , "corresponds to a theoretical expectation", etc. Spot checks should be performed in the data section, near the relevant data. The goal here is to prevent you from wasting time taking bad data.

5. Note general observations

In addition to taking data, general observations that relate to the lab, such as problems and inconsistencies, should be recorded.

7. Document experimental setup

Finally, draw a functional block diagram of the measurement and instruments involved. Nothing fancy is necessary, but it should show the electrical and mechanical connections between the instruments, components and sensors.

ANALYSIS AFTER LAB (Postlab Report Section)

- Analysis
- Uncertainty analysis
- Results
- Discussion and Conclusions

1. Analysis

The chief purpose of the analysis section is to show the calculations ("analysis") that you performed to transform the data into results. The analysis should appear in the lab report following data and other pages from the lab notebook. It is very important that your analysis be clear to someone who did not do the lab. Therefore, you should describe it with text to orient the reader. Sample calculations for each unique analysis must be included. Specify which data point is being used in each sample calculation and identify the source (including the page number in the lab notebook) of the data and reference data you use (e.g. viscosity values). Use and check units. Hint: sometimes it is easier to convert all data into SI units and then do your calculations.

Following the sample calculations, analysis of all of the data points should be summarized in tables, including intermediate as well as final results. The data points used in the sample calculations should also be included in these analysis tables as a check that the analysis behind the tables is working properly. All tables must have a name (e.g., Table 1) which you should use in your text (eg. "Table 1 lists the intermediate calculations performed for determining the relativistic correction to the mass"), clearly labeled columns and rows (variable names and units), and an explanatory caption. The name and caption are usually combined, for example, "Table 3a. List of relevant acoustic and thermal properties for tissue-mimicking gel. All values are experimentally determined as described in Section 2, except where citation indicates another source for the values".

Calibration curves and other curves needed for the analysis of data should also be included in the Analysis Section, however, all results graphs belong in the Results Section only. All graphs must have name (e.g., Figure 1), which you should use in your text (eg. "Figure 1 plots the output gain as a function of frequency"), and an explanatory caption below the graph which describes the features and parameters of the graph. The name and caption are usually combined, for example, "Figure 5. Light emission as a function of duty cycle for 5 different pressures with symbols as indicated in the legend. Frequency = 1 MHz, DGC = 0.03"). If there is more than one curve on a graph, clearly distinguish them by different symbols, line types, and/or colors in a legend included somewhere on the graph. The scales of the x- and y-axes must be clearly shown and labeled with variable names and units. Be sure to use the appropriate graph axis type in your graphing application: log-log, semi-log, etc. Graphs should be sized so that they take up most of a report page width.

Sample calculations may be done by hand or using a *symbolic* manipulator program (such as Mathematica or Maple), but the rest of analysis, as well as uncertainty analysis and graphs should be done with a computer. Hand-written sample calculations may be done in the lab notebook for convenience, then photocopied for the report. Alternatively, you may simply leave space in your report pages for the appropriate hand-written calculations.

2. Uncertainty Analysis

The uncertainty analysis should include your estimated elemental experimental uncertainty in each measurand (both systematic and random, identified as such, as well as total uncertainty), statistical analysis of data where appropriate, and uncertainty propagation for equations and results using partial differential root sum square propagation equations, and sample calculations. Discuss the uncertainties introduced by all relevant instrumentation and combine & propagate with the random uncertainty for all results, as relevant.

Sample calculations must be shown for a single point for each unique analytical equation and a single example for each type of resultant. Following the sample calculations, uncertainty in ALL values and results must be calculated and displayed in tables. Uncertainty analysis counts for 20% and is **only** required for certain labs (at the time of publication, labs 2 – 3 and the project). The lab manual will clearly specify whether uncertainty analysis is required.

3. Results

This section is where you show the result of the experiment's objectives, in terms of tables and plots whenever possible (refer to above paragraph on plots for format). Interpretation and explanation of the results belongs in the Discussion section but you should include at least **some** guiding text so that the reader can understand what is being presented. **Do not include intermediate calculations (those belong in the analysis section), only final results in the results tables and plots**. Data points should have error or uncertainty ranges indicated, where appropriate, in both tables and plots (on plots it should be represented as error bars when possible). **If a plot will convey the same information as a table, then just use a plot.**

4. Discussion and Conclusions

Were the lab's objectives met? In the discussion section you should evaluate your results and discuss the physical meaning of the numbers and plots. If there are relevant theoretical or empirical results available, compare your results with them, and attempt to explain any discrepancies. Answer any and all questions asked in the procedure section of the lab handout. Mention experimental limitations and ways the lab might be improved. Remember to include uncertainty in this discussion. If results or experimental objectives were unsuccessful, try to provide a coherent discussion as *why* this was the case. Because it is important to think about and communicate experimental results as well as get them, this section comprises 16% of your lab grade.

ADDITIONAL GRADING

Presentation

The presentation quality of your lab report will, at a minimum, be graded for readability, conciseness, completeness and placement of items in the proper section.

SUMMARY OF LAB REPORT ORDER AND CREDIT

For each experiment, the report should consist of:

	Section	**Max. Credit**
Prelab	Title page	1%
	Objective	3%
	Theory	7%
	Equation summary	2%
	Data needs	5%
	Equipment list	2%
	Procedure checklist and safety	3%
Inlab	Data	5%
	Spot checks, block diagram	5%
Postlab	Analysis	14%
	Uncertainty analysis	20%
	Results	12%
	Discussion	16%
All Sections	Presentation	5%

Some thoughts on lab report word processing…

You are free to use whatever word processor you prefer when you go about typing up your weekly lab reports. HOWEVER: Personal experience and lots of student feedback has shown that Microsoft Word can make your life very difficult when it comes to assembling long documents that contain both embedded figures and equations. It can be done, but you might have gained some bags under your eyes and lost a few hairs by the time you're finished. As a less stressful alternative, I recommend learning how to use LaTeX. It's an open source platform (so its name was clearly not generated by a marketing team!) and it has a short learning curve, but it will be your best friend after the initial time investment. Also, it's (virtually) free, in that the package for the Mac platform (TeXShop) is free and the Windows platform (WinEdt) has a recommended payment reminder that can be ignored if you've got the patience. There is also an online platform that is free called Overleaf.

So what's LaTeX you ask? LaTeX is a document formatting software that relies on a user-programmable typeset language that makes embedding figures, figure numbers, equations, equation numbers, tables, table numbers, and section headings, etc, all much easier to update and position within your document. It performs all this and produces a slick-looking report that's sure to get you an A based just on its appearance! (if you were still in high school, that is…)

In a nutshell, the program consists of an editor window, where you write your text, provide links to your figure files, and program your equation symbols, and a window where it displays the typeset document in PDF format.

The only downside is that proofreading can be difficult, since the editor window is not always formatted in a well-presented manner (depending on the particular software package you're using). I highly suggest carefully proofreading the PDF version, and then making notes where you'll want to make changes on the editor window side.

There are many versions available, so feel free to search online yourself, or you can use either of these links:
Mac download:
http://pages.uoregon.edu/koch/texshop/

Windows download:
http://www.tug.org/protext/
or
http://www.winedt.com

Online only Overleaf:
http://www.overleaf.com

Don't be surprised if it's a large download! I've posted a lab report template on Blackboard for your reference. Feel free to use it as a basis for your reports.

For group projects, you may want to take advantage of a good online resource for sharing Latex code: http://www.sharelatex.com

ME310 Spring 2021 Semester Schedule and Syllabus						
Wk	**Lecture dates**	**Concept**	**HW due**	**Lab section schedule**	**Reports due**	
1	1/25 (M), 1/27 (W)	Introduction		*Zoom only*	*All reports due*	
2	2/1 (M), 2/3 (W)	Uncertainty	HW 1		*Mondays by 10am*	
3	2/8 (M), 2/10 (W)	Uncertainty	HW 2	Lab 1 prelab session	*Gradescope*	
4	2/16 (T), 2/17 (W)	Static systems/lin regress	HW 3	Lab 1 data session		
5	2/22 (M), 2/24 (W)	inst. Error (AD);Rev Ex1	HW 4	Lab 1 report session		
6	3/1 (M), 3/3 (W)	Exam 1; TC intro	HW 5	Lab 2 prelab session	Lab 1 Report (M3/1)	
7	3/8 (M), 3/10 (W)	First order systems		Lab 2 data session		
8	3/15 (M), 3/17 (W)	Second order systems	HW 6	Lab 2 report session		lose Thursday 18th to wellness
9	3/22 (M), 3/24 (W)	Coupled system response	HW 7	project session	Lab 2 Report (M3/22)	
10	3/29 (M)	FFT analysis;Rev Exam 2	HW 8	project session		lose Wednesday 31 to wellness
11	4/5 (M), 4/7 (W)	Exam 2; project/lab3 help	HW 9	Lab 3 prelab session		
12	4/12 (M), 4/14 (W)	in-lecture project/lab3 help	HW 10	Lab 3 data session	Project Report (M4/12)	
13	4/21 (W)	in-lecture project/lab3 help	HW 11	Lab 3 report session		lose Monday 19 patriots day
14	4/26 (M), 4/28 (W)	Project Presentations	HW 11	project due	Lab 3 Report (M4/26)	

Concept	Textbook (Chapter: section)
Overview	Ch 1
Uncertainty Analysis	Ch 4: 1-4, Ch 5: 1-6
Temperature sensing	Ch 8: 2, 4, 5
Regression	Ch 4: 7
Analog filters	Ch 6: 8
Digital filters	Ch 7: 7
General signal conditioning	Ch 6: 9
Amplifiers	Ch 6: 6
Aliasing	Ch 7: 2
Dynamic inputs	Ch 2
System response to dynamic input	Ch 3
Sensors	Remaining chapters!