

**ENGT 3213, 10318, Thermal Fluids Lab  
Spring 2020**

Texas A&M University-Central Texas

**COURSE DATES, MODALITY, AND LOCATION**

This course meets face-to-face from

January 13 – May 8

**on M and W from 10:00 am – 1:00 pm in**

**Warriors Hall (FH) 413**

with supplemental materials made available online through the A&M-Central Texas Canvas Learning Management System [<https://tamuct.instructure.com/>]

**INSTRUCTOR AND CONTACT INFORMATION**

**Instructor: Dr. Taylor Harvey**

**Office: Heritage Hall 302L**

**Phone: 254-519-5414**

**Email: [tharvey@tamuct.edu](mailto:tharvey@tamuct.edu) (prefer direct email)**

**Co-Instructor: Dr. Claudia Beck**

**Office: Founders Hall 408**

**Phone: 254-519-5775**

**Email: [cbeck@tamuct.edu](mailto:cbeck@tamuct.edu) (prefer direct email)**

**Office Hours**

Dr. Harvey

T 1:30 -2:30 pm

Available by appointment at other times. Really, just email me!

Dr. Beck

By appointment via email.

**Student-instructor interaction**

You are strongly encouraged and expected to communicate with the instructor! If you get stuck on a concept or homework problem, don't wait until office hours! Send me an email with a screenshot or photo of the problem you are having difficulty with and we can solve the problem sooner. I will reply to any email within 24 hours (but probably a lot sooner). If you need more help, send me an email and schedule a skype session (id: taylorbharvey). But make sure you are communicating with me!

**WARRIOR SHIELD**

**Emergency Warning System for Texas A&M University-Central Texas**

Warrior Shield is an emergency notification service that gives Texas A&M University-Central Texas the ability to communicate health and safety emergency information quickly via email,

text message, and social media. All students are automatically enrolled in Warrior Shield through their myCT email account.

Connect to Warrior Shield by [911Cellular](https://portal.publicsafetycloud.net/Account/Login) [https://portal.publicsafetycloud.net/Account/Login] to change where you receive your alerts or to opt out. By staying enrolled in Warrior Shield, university officials can quickly pass on safety-related information, regardless of your location.

## **COURSE INFORMATION**

### **Course Overview and description**

This course introduces students to practical applications of fluid properties, fluid statics, fluid dynamics, and kinematics. Conservation of energy and momentum as well as incompressible laminar and turbulent flow are also utilized in experiments.

### **Student Learning Outcomes**

1. Select and apply sensors and measurement techniques appropriately in thermodynamics and fluid mechanics measurements
2. Present, analyze, and interpret correctly the results of experimental measurements
3. Communicate the results of experimental measurements clearly and concisely in written and oral reports
4. Apply experimental results to improve a thermodynamic or fluid dynamic process

### **Required Reading and Textbook(s)**

Text materials from ENGT 3311 and ENGT3312 may be utilized.

Required Laboratory Equipment: Safety goggles and a temporary lab coat (available from the Bookstore)

## **COURSE REQUIREMENTS**

The course will involve lab reports, projects, and exams.

**Laboratory Reports** (50 weighted pts in total) will be due each week on at the start of class on Tuesday for the previous week's lab. Two formats will be used for lab reports. Half the labs will be reported on an assigned handout form. The other half of labs will be reported via lab reports. Lab reports will be graded on the following rubric. (SLO 1-4)

### Laboratory Report Grading Rubric - 10 points total possible

#### *Introduction* (2 points)

Background (0.5 pt): Is context provided for the study?

Hypothesis (0.5 pt): Is the hypothesis stated clearly, and is it well-justified?

Predictions (0.5 pt): Are explicit predictions made that follow from the hypothesis?

#### *Results* (5 points)

Graphs, charts, tables (2 pt): Are all relevant figures included? Are figures and axes

labeled appropriately? Do they only contain appropriate information? Are the tables redundant with the figures?

Description in text (1 pt): Does the text adequately describe the results of the study?

Statistics (1 pt): Are the appropriate statistics included for this study? (e.g., mean, standard deviation, test statistic, p-value)

Handout (1 pt): Is the lab handout (if applicable) attached and appropriately filled out.

#### *Discussion (3 points)*

Are the results related back to the hypothesis and predictions? (1 point)

Is the general significance of the study discussed? (0.5 pts)

Independent thought (0.5 points): Did the student contribute ideas besides those discussed in lab?

#### *Potential Deductions*

Grammar, Organization, and Mechanics (up to 2 point)

Conciseness (up to 1 point)

There will be no make-up labs for any reason. If a student misses a lab experiment for any reason, he will receive a zero for that experiment. However, the lowest lab experiment grade will be dropped as long as the lowest grade is not a result of violation of lab rules and regulations.

Two large **Projects** will be conducted during the semester (SLO 1-4)

#### Project 1 In-depth Laboratory Report (10 weighted pts);

Students will select one of the experiments from the first 3 weeks of class and expand on the initial lab and write an in-depth lab report. The final project deliverables will be full lab report and a 10 minute in class presentation. The project will be graded up to 100 pts and then scaled to the 10 pt weight. Grading will be according to the rubric at the end of the syllabus.

#### Project 2 Laboratory Design (15 weighted pts)

Students will select one of the equipment areas and design a new lab. The final project deliverables will be new lab experiment and a 10 minute in class presentation. The project will be graded out of 100 pts and then scaled to the 15 pt weight. Grading will be according to the rubric at the end of the syllabus.

Reports for both projects can utilize any style guide, but must be formatted and referenced.

A **Midterm Exam** (10 weighted pts) and a **Comprehensive Final Exam** (15 weighted pts) will be given during the semester. (SLO 1-4)

## Grading Criteria Rubric and Conversion

Activity	Points	% of Final Grade
Laboratory Reports	50	45
Projects	25	30
Midterm Exams	10	10
Final Exam	15	15

Course Grades will be assigned by the following scale based on weighted grade percentage

Grade	Weighted Grade (%)
A	$\geq 90.00$
B	80.00 - 89.99
C	70.00 - 79.99
D	60.00 - 69.99
F	$< 60.00$

### Posting of Grades

All turned in work will be graded within 2 weeks and results posted on Canvas.

### Grading Policies

#### *Late Work*

Late work will not be excepted without **prior** approval. You must plan your time well in order to turn things in on time. If there are extenuating circumstances, an individual extension may be granted after speaking with the instructor.

#### *Missed exams*

If you cannot make an exam session, you **must** schedule an alternative period beforehand. Missed exams should be taken before the scheduled time, but must be taken within a week of the actual exam.

#### *Appeals*

If the student wishes to appeal a grade, they must do so within 1 week of receiving the graded paper. Students should save all their work to ensure that no clerical errors are made in grade reporting.

#### *Plagiarism/Cheating*

Any student found to be cheating and/or having plagiarized will receive an immediate failing grade and be referred to the office of student conduct. More info below under academic integrity.

### Lab Safety

Students must comply with laboratory safety regulations. In particular, the student must wear safety goggles and apron while working in the laboratory. Each lab period, students found not

wearing safety goggles over their eyes will be given one warning. Students found not wearing their safety goggles a second time during that lab period will be dismissed from lab immediately. The student will receive a zero for that lab period. Any zero grades for not wearing safety goggles will not be dropped. Students will not be permitted to wear shorts, short skirts, short dresses, or sandals in the lab. All attire must come down to the ankles. Do not wear baggy clothing. Tank tops and halter tops are not permitted in lab. Shoulders and entire back must be covered. Only closed toe and closed heel shoes are allowed in the laboratory. The shoe must cover the entire foot.

No food or drink is permitted in the lab.

## **COURSE OUTLINE AND CALENDAR**

### **Complete Course Calendar**

A tentative schedule is shown below. Modifications to this schedule may be at the discretion of the instructor.

Week/Dates	Lab Topics	Project
1- Jan 13, 15	Fluid Properties	
2- Jan 20, 22	Static and Moving Fluids	
3- Jan 27, 29	Friction in Pipes	
4- Feb 3, 5	Energy Balance in Pipes	
5- Feb 10, 12	Pumps	
6- Feb 17, 19	Project 1 Testing	
7- Feb 24, 26	Project 1 Testing	
8- Mar 2, 4	Midterm Exam, Presentaitons	
9- Mar 9, 11	Spring Break	
10- Mar 16, 18	Heat Conduction	Project 1 Due
11- Mar 23, 25	Heat Exchangers	
12- Mar 30, 1	Convection	
13- Apr 6, 8	HVAC	
14- Apr 13, 15	Project 2 Testing	
15- Apr 20, 22	Project 2 Testing	
16- Apr 27, 29	Final Exam, Presentations	
17- May 4, 6	-	Project 2 Due

The following dates will not meet for laboratory: None

### **Important University Dates**

See the Academic Calendar: <https://www.tamuct.edu/registrar/academic-calendar.html>

## **TECHNOLOGY REQUIREMENTS AND SUPPORT**

### **Technology Requirements**

Computer access will be needed to complete homework and projects. It is preferable that each

student has a laptop, but not required. Use of a graphing calculator will be permissible on exams.

This course will use the A&M-Central Texas Instructure Canvas learning management system. **We strongly recommend the latest versions of Chrome or Firefox browsers. Canvas no longer supports any version of Internet Explorer.**

Logon to A&M-Central Texas Canvas [<https://tamuct.instructure.com/>] or access Canvas through the TAMUCT Online link in myCT [<https://tamuct.onecampus.com/>]. You will log in through our Microsoft portal.

Username: Your MyCT email address. Password: Your MyCT password

### **Canvas Support**

Use the Canvas Help link, located at the bottom of the left-hand menu, for issues with Canvas. You can select “Chat with Canvas Support,” submit a support request through “Report a Problem,” or call the Canvas support line: 1-844-757-0953.

For issues related to course content and requirements, contact your instructor.

### **Other Technology Support**

For log-in problems, students should contact Help Desk Central  
24 hours a day, 7 days a week

Email: [helpdesk@tamu.edu](mailto:helpdesk@tamu.edu)

Phone: (254) 519-5466

[Web Chat](http://hdc.tamu.edu): [<http://hdc.tamu.edu>]

*Please let the support technician know you are an A&M-Central Texas student.*

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## **UNIVERSITY RESOURCES, PROCEDURES, AND GUIDELINES**

### **Drop Policy**

If you discover that you need to drop this class, you must complete a [Drop Request Form](https://www.tamuct.edu/registrar/docs/Drop_Request_Form.pdf) [[https://www.tamuct.edu/registrar/docs/Drop\\_Request\\_Form.pdf](https://www.tamuct.edu/registrar/docs/Drop_Request_Form.pdf)].

Professors cannot drop students; this is always the responsibility of the student. The Registrar’s Office will provide a deadline on the Academic Calendar for which the form must be completed, signed and returned. Once you return the signed form to the Registrar’s Office, you must go into Warrior Web and confirm that you are no longer enrolled. If you still show as enrolled, FOLLOW-UP with the Registrar’s Office immediately. You are to attend class until the procedure is complete to avoid penalty for absence. Should you miss the drop deadline or fail to follow the procedure, you will receive an F in the course, which may affect your financial aid and/or VA educational benefits.

### **Academic Integrity**

Texas A&M University -Central Texas values the integrity of the academic enterprise and strives

for the highest standards of academic conduct. A&M-Central Texas expects its students, faculty, and staff to support the adherence to high standards of personal and scholarly conduct to preserve the honor and integrity of the creative community. Academic integrity is defined as a commitment to honesty, trust, fairness, respect, and responsibility. Any deviation by students from this expectation may result in a failing grade for the assignment and potentially a failing grade for the course. Academic misconduct is any act that improperly affects a true and honest evaluation of a student's academic performance and includes, but is not limited to, working with others in an unauthorized manner, cheating on an examination or other academic work, plagiarism and improper citation of sources, using another student's work, collusion, and the abuse of resource materials. All academic misconduct concerns will be referred to the university's Office of Student Conduct. Ignorance of the university's standards and expectations is never an excuse to act with a lack of integrity. When in doubt on collaboration, citation, or any issue, please contact your instructor before taking a course of action.

For more [information regarding the Student Conduct process](https://www.tamuct.edu/student-affairs/student-conduct.html),  
[https://www.tamuct.edu/student-affairs/student-conduct.html].

If you know of potential honor violations by other students, you may [submit a report](https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout_id=0),  
[https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout\_id=0].

### **Academic Accommodations**

At Texas A&M University-Central Texas, we value an inclusive learning environment where every student has an equal chance to succeed and has the right to a barrier-free education. The Office of Access and Inclusion is responsible for ensuring that students with a disability receive equal access to the university's programs, services and activities. If you believe you have a disability requiring reasonable accommodations please contact the Office of Access and Inclusion, WH-212; or call (254) 501-5836. Any information you provide is private and confidential and will be treated as such.

For more information please visit our [Access & Inclusion](https://tamuct.instructure.com/courses/717) Canvas page (log-in required)  
[https://tamuct.instructure.com/courses/717]

### **Important information for Pregnant and/or Parenting Students**

Texas A&M University-Central Texas supports students who are pregnant and/or parenting. In accordance with requirements of Title IX and related guidance from US Department of Education's Office of Civil Rights, the Dean of Student Affairs' Office can assist students who are pregnant and/or parenting in seeking accommodations related to pregnancy and/or parenting. Students should seek out assistance as early in the pregnancy as possible. For more information, please visit [Student Affairs](https://www.tamuct.edu/student-affairs/index.html) [https://www.tamuct.edu/student-affairs/index.html]. Students may also contact the institution's Title IX Coordinator. If you would like to read more about these [requirements and guidelines](http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf) online, please visit the website [http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf].

Title IX of the Education Amendments Act of 1972 prohibits discrimination on the basis of sex

and gender—including pregnancy, parenting, and all related conditions. A&M-Central Texas is able to provide flexible and individualized reasonable accommodation to pregnant and parenting students. All pregnant and parenting students should contact the Associate Dean in the Division of Student Affairs at (254) 501-5909 to seek out assistance. Students may also contact the University’s Title IX Coordinator.

### **Tutoring**

Tutoring is available to all A&M-Central Texas students, both on-campus and online. Subjects tutored on campus include Accounting, Advanced Math, Biology, Finance, Statistics, Mathematics, and Study Skills. Tutors are available at the Tutoring Center in Warrior Hall, Suite 111. Tutor.com tutoring **will not offer writing support** beginning August 1, 2019, but will continue to offer other tutoring support.

If you have a question regarding tutor schedules, need to schedule a tutoring session, are interested in becoming a tutor, or have any other question, contact Academic Support Programs at (254) 501-5836, visit the Office of Student Success at 212F Warrior Hall, or by emailing [studentsuccess@tamuct.edu](mailto:studentsuccess@tamuct.edu) .

Chat live with a tutor 24/7 for almost any subject from on your computer! Tutor.com is an online tutoring platform that enables A&M-Central Texas students to log in and receive online tutoring support at no additional cost. This tool provides tutoring in over 40 subject areas. Access Tutor.com through Canvas.

### **University Writing Center**

Located in Warrior Hall 416, the University Writing Center (UWC) at Texas A&M University–Central Texas (TAMUCT) is a free workspace open to all TAMUCT students from 10:00 a.m.-5:00 p.m. Monday thru Thursday with satellite hours in the University Library Monday thru Thursday from 6:00-9:00 p.m. This semester, the UWC is also offering online only hours from 12:00-3:00 p.m. on Saturdays.

Tutors are prepared to help writers of all levels and abilities at any stage of the writing process. While tutors will not write, edit, or grade papers, they will assist students in developing more effective composing practices. By providing a practice audience for students’ ideas and writing, our tutors highlight the ways in which they read and interpret students’ texts, offering guidance and support throughout the various stages of the writing process. In addition, students may work independently in the UWC by checking out a laptop that runs the Microsoft Office suite and connects to WIFI, or by consulting our resources on writing, including all of the relevant style guides. Whether you need help brainstorming ideas, organizing an essay, proofreading, understanding proper citation practices, or just want a quiet place to work, the UWC is here to help!

Students may arrange a one-to-one session with a trained and experienced writing tutor by visiting the UWC during normal operating hours (both half-hour and hour sessions are



available) or by making an appointment via [WOnline](https://tamuct.mywconline.com/) [https://tamuct.mywconline.com/]. In addition, you can email Dr. Bruce Bowles Jr. at [bruce.bowles@tamuct.edu](mailto:bruce.bowles@tamuct.edu) if you have any questions about the UWC and/or need any assistance with scheduling.

### **University Library**

The University Library provides many services in support of research across campus and at a distance. We offer over 200 electronic databases containing approximately 250,000 eBooks and 82,000 journals, in addition to the 85,000 items in our print collection, which can be mailed to students who live more than 50 miles from campus. Research guides for each subject taught at A&M-Central Texas are available through our website to help students navigate these resources. On campus, the library offers technology including cameras, laptops, microphones, webcams, and digital sound recorders.

Research assistance from a librarian is also available 24 hours a day through our online chat service, and at the reference desk when the library is open. Research sessions can be scheduled for more comprehensive assistance, and may take place on Skype or in-person at the library. Assistance may cover many topics, including how to find articles in peer-reviewed journals, how to cite resources, and how to piece together research for written assignments.

Our 27,000-square-foot facility on the A&M-Central Texas main campus includes student lounges, private study rooms, group work spaces, computer labs, family areas suitable for all ages, and many other features. Services such as interlibrary loan, TexShare, binding, and laminating are available. The library frequently offers workshops, tours, readings, and other events. For more information, please visit our [Library website](http://tamuct.libguides.com/index) [http://tamuct.libguides.com/index].

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## **OPTIONAL POLICY STATEMENTS**

### **A Note about Sexual Violence at A&M-Central Texas**

Sexual violence is a serious safety, social justice, and public health issue. The university offers support for anyone struggling with these issues. University faculty are mandated reporters, so if someone discloses that they were sexually assaulted (or a victim of Domestic/Dating Violence or Stalking) while a student at TAMUCT, faculty members are required to inform the Title IX Office. If you want to discuss any of these issues confidentially, you can do so through Student Counseling (254-501-5955) located on the second floor of Warrior Hall (207L).

Sexual violence can occur on our campus because predators often feel emboldened, and victims often feel silenced or shamed. It is incumbent on ALL of us to find ways to actively create environments that tell predators we don't agree with their behaviors and tell survivors we will support them. Your actions matter. Don't be a bystander; be an agent of change. For additional information on campus policy and resources visit the [Title IX webpage](https://www.tamuct.edu/departments/compliance/titleix.php) [https://www.tamuct.edu/departments/compliance/titleix.php].

## **Behavioral Intervention**

Texas A&M University-Central Texas cares about the safety, health, and well-being of its students, faculty, staff, and community. If you are aware of individuals for whom you have a concern, who are exhibiting concerning behaviors, or individuals causing a significant disruption to our community, please make a referral to the Behavioral Intervention Team. Referring your concern shows you care. You can complete the [referral](#) online [https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout\_id=2].

Anonymous referrals are accepted. Please see the [Behavioral Intervention Team](#) website for more information [https://www.tamuct.edu/student-affairs/bat.html]. If a person's behavior poses an imminent threat to you or another, contact 911 or A&M-Central Texas University Police at 254-501-5800.

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## **OTHER POLICIES**

### **Copyright Notice**

Students should assume that all course material is copyrighted by the respective author(s). Reproduction of course material is prohibited without consent by the author and/or course instructor. Violation of copyright is against the law and Texas A&M University-Central Texas' Code of Academic Honesty. All alleged violations will be reported to the Office of Student Conduct.

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## Project 1 Rubric

Category	Excellent (A) 95%	Good (B) 85%	Fair (C) 75%	Poor (D) 65%	Fail (F) 0%	Score
Title (5%)	Clearly describes the content of the current lab exercise. Uses descriptive words that are associated with the lab.	Describes the content but the usage of descriptive words is not appropriate	The content is not clearly described. Fair use of descriptive words	No title. Poor description or poor use of descriptive words.	No submission/No effort exhibited	
Introduction & Objectives (15%)	Clear background information based on a thorough literature search. Uses proper “in text” citations. Includes a rationale for the study along with a hypothesis.	Contains background information but is not complete. The hypothesis is partially stated.	Background information is not complete and lacks proper “in text” citations. The hypothesis is not clearly stated.	Very little or no background information. No “in text” citations. Unrelated introduction	No submission/No effort exhibited	
Materials and Methods (15%)	Contains a complete list of the experimental procedures. Steps taken during the lab are easy to follow in a paragraph form. The section is organized in a way that the reader understands the logical flow of the lab. Proper use of third person and past tense.	One or more relevant pieces of information are missing. The section is not very well organized. Use of first person or improper use of verb tense appears in part of the text.	Misses several components of the experimental procedures. There is a lack of organization and there is not proper use of grammar standards.	Procedural steps are incorrect, illogical, unrelated or plagiarized.	No submission/No effort exhibited	
Results (20%)	Key results are presented in an orderly and logical sequence using both text and illustrative materials (Tables and Figures). All the relevant information obtained in the experiment is included. All calculations are provided in a logical manner using proper units	One or more key results are missing. Figures and tables are present but contain minor errors.	Misses several key results. Figures lack proper identification in the Y and X axis. Tables have missing titles. The text doesn’t follow the sequence of the tables and/or figures.	Major results are not included. Figures and tables are poorly constructed or not present.	No submission/No effort exhibited	

Discussion and Conclusion (15%)	Proper interpretation of results. Summarizes data used to draw conclusion Discusses applications or real-life situations. Addresses hypothesis and cites sources of errors Connects the conclusion with the introduction by way of the stated hypothesis and literature cited.	Interpretation of results is presented. However, there is a disconnection between the discussion and the testable hypothesis identified in the introduction.	Misses the interpretation of key results. There is little connection between the discussion and the introduction.	Very poor interpretation of the results. No connection between discussion and introduction. Evidence of plagiarism.	No submission/No effort exhibited	
Literature Cited (5%)	Provides a complete list of the “in text” references provide in the text of the paper. Uses a correct style (i.e. APA, MLA) for citations.	Most but not all “in text” references are provided. Some inconsistency in the style used is evident.	Misses several references or doesn’t adhere to the correct style.	Most references are not included and/or the style used is incorrect.	No submission/No effort exhibited	
Report format and quality (10%)	Lab report submitted as directed, and on time. Directions were followed, questions (if any) were answered correctly.	Minor errors in format or procedures were encountered.	Directions were not explicitly followed.	Directions were not followed.	No submission/No effort exhibited	
Class Presentation (15%)	<b>Language use and delivery (6%)</b> Effectively uses eye contact. Speaks clearly, effectively and confidently using suitable volume and pace. Fully engages the audience. Selects rich and varied words for context and uses correct grammar.	Maintains eye contact. Speaks clearly and uses suitable volume and pace. Takes steps to engage the audience. Dresses appropriately. Selects words appropriate for context and uses correct grammar.	Some eye contact, but not maintained. Speaks clearly and unclearly in different portions. Occasionally engages audience. Dresses inappropriately. Selects words inappropriate for context; uses incorrect grammar.	Poor eye contact. Not audible and uses unsuitable pace. No audience engagement. Uses incorrect words or grammar	No submission/No effort exhibited	

	<p><b>Visual Aids</b> Simple and focused (2%)</p> <p>Appropriate and relevant to topic (2%)</p> <p>Neatness and quality (2%)</p> <p><b>Organization and Preparation</b> (3%) Introduces the topic clearly and creatively. Maintains clear focus on the topic. Effectively includes smooth transitions to connect key points. Ends with logical, effective and relevant conclusion.</p>	<p>Simple but not focused</p> <p>Some material not relevant</p> <p>Quality not appropriate</p> <p>Introduces the topic clearly. Maintains focus on the topic. Include transitions to connect key points. Ends with coherent conclusion based on evidence.</p>	<p>Aids are poorly prepared and not used appropriately</p> <p>Most of the information not relevant to the topic</p> <p>Most of the slides were of poor quality</p> <p>Introduces the topic. Somewhat maintains focus on the topic. Includes some transitions to connect key points. Ends with a conclusion based on evidence.</p>	<p>Aids were not used and was difficult to read and follow</p> <p>No appropriate or relevant information</p> <p>All slides were of very poor quality No</p> <p>Does not clearly introduce or focus on the topic. Points rarely connect. No conclusion.</p>		
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**Project 2 Rubric**

<b>Category</b>	<b>Excellent (A) 95%</b>	<b>Good (B) 85%</b>	<b>Fair (C) 75%</b>	<b>Poor (D) 65%</b>	<b>Fail (F) 0%</b>	<b>Score</b>
<b>Title (5%)</b>	Clearly describes the content of the lab experiment. Uses descriptive words that are associated with the experiment.	Describes the content but the usage of descriptive words is not appropriate	The content is not clearly described. Fair use of descriptive words	No title. Poor description or poor use of descriptive words.	No submission/No effort exhibited	
<b>Abstract (10%)</b>	Clear summary of the experiment, including the following components: identifies the objective(s) of the project, includes a brief description of experimental methods, major findings and a brief conclusion(s).	The summary is clear but misses one or two components such as the methods used or major results from the experiment.	Misses several components and the summary doesn't reflect the entire experiment.	Misses several major components. Unrelated or plagiarized components.	No submission/No effort exhibited	
<b>Introduction &amp; Objectives (15%)</b>	Clear background information based on a thorough literature search. Uses proper "in text" citations. Includes a rationale for the study along with a hypothesis.	Contains background information but is not complete. The hypothesis is partially stated.	Background information is not complete and lacks proper "in text" citations. The hypothesis is not clearly stated.	Very little or no background information. No "in text" citations. Unrelated or plagiarized introduction	No submission/No effort exhibited	
<b>Materials and Methods (15%)</b>	Contains a complete list of the experimental procedures. Including: the experimental design used, variables measured, number of samples collected, and statistical procedures. The section is organized in a way that the reader understands the logical flow of the experiment. Steps taken during the lab are easy to follow in a paragraph form. The section is organized in a way that the reader understands the logical flow of the lab. Proper use of third person and past tense.	One or more relevant pieces of information are missing. The section is not very well organized. Use of first person or improper use of verb tense appears in part of the text.	Misses several components of the experimental procedures. There is a lack of organization and there is not proper use of grammar standards.	Procedural steps are incorrect, illogical, unrelated or plagiarized.	No submission/No effort exhibited	

<b>Results (20%)</b>	Key expected results are presented in an orderly and logical sequence using both text and illustrative materials (Tables and Figures). All the relevant information obtained in the experiment is included. All calculations are provided in a logical manner using proper units	One or more key results are missing. Figures and tables are present but contain minor errors.	Misses several key results. Figures lack proper identification in the Y and X axis. Tables have missing titles. The text doesn't follow the sequence of the tables and/or figures.	Major results are not included. Figures and tables are poorly constructed or not present.	No submission/No effort exhibited	
<b>Discussion and Conclusion (15%)</b>	Proper interpretation of results. Summarizes data used to draw conclusion. Discusses applications or real-life situations. Addresses hypothesis and cites sources of errors Connects the conclusion with the introduction by way of the stated hypothesis and literature cited. Reflects on the next step(s) to be performed in light of the results of the current investigation.	Interpretation of results is presented. However, there is a disconnection between the discussion and the testable hypothesis identified in the introduction.	Misses the interpretation of key results. There is little connection between the discussion and the introduction.	Very poor interpretation of the results. No connection between discussion and introduction.	No submission/No effort exhibited	
<b>Literature Cited (5%)</b>	Provides a complete list of the "in text" references provide in the text of the paper. Uses a correct style (i.e. APA, MLA) for citations.	Most but not all "in text" references are provided. Some inconsistency in the style used is evident.	Misses several references or doesn't adhere to the correct style.	Most references are not included and/or the style used is incorrect.	No submission/No effort exhibited	
<b>Report format and quality (10%)</b>	Lab submitted as directed, and on time. Directions were followed, questions were answered correctly.	Minor errors in format or procedures were encountered.	Directions were not explicitly followed.	Directions were not followed.	No submission/No effort exhibited	

Class Presentation (15%)	<b>Language use and delivery</b> (6%) Effectively uses eye contact. Speaks clearly, effectively and confidently using suitable volume and pace. Fully engages the audience. Selects rich and varied words for context and uses correct grammar.	Maintains eye contact. Speaks clearly and uses suitable volume and pace. Takes steps to engage the audience. Dresses appropriately. Selects words appropriate for context and uses correct grammar.	Some eye contact, but not maintained. Speaks clearly and unclearly in different portions. Occasionally engages audience. Dresses inappropriately. Selects words inappropriate for context; uses incorrect grammar.	Poor eye contact. Not audible and uses unsuitable pace. No audience engagement. Uses incorrect words or grammar	No submission/No effort exhibited
	<b>Visual Aids</b> Simple and focused (2%)	Simple but not focused	Aids are poorly prepared and not used appropriately	Aids were not used and was difficult to read and follow	
	Appropriate and relevant to topic (2%)	Some material not relevant	Most of the information not relevant to the topic	No appropriate or relevant information	
	Neatness and quality (2%)	Quality not appropriate	Most of the slides were of poor quality	All slides were of very poor quality No	
	<b>Organization and Preparation</b> (3%) Introduces the topic clearly and creatively. Maintains clear focus on the topic. Effectively includes smooth transitions to connect key points. Ends with logical, effective and relevant conclusion.	Introduces the topic clearly. Maintains focus on the topic. Include transitions to connect key points. Ends with coherent conclusion based on evidence.	Introduces the topic. Somewhat maintains focus on the topic. Includes some transitions to connect key points. Ends with a conclusion based on evidence.	Does not clearly introduce or focus on the topic. Points rarely connect. No conclusion.	



