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Spring 2021

ME 406-102: Mechanical Laboratory III

Eon Soo Lee

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ME406-102 Mech Lab-III (2021 Spring)

Instructor: Dr. Eon Soo Lee (MEC 327, 973-596-3318, consoo.lee@njit.edu)

- Online Office hour: Before or after the class, T/Th 12-1pm, or by an appointment

TA: Hongling Deng, (MEC 333-E, hd242@njit.edu)

Engine Test: Mr. Joe Glaz (x3320, joseph.glaz@njit.edu)

Class: Mon 6:00-8:50 pm

Class Meeting link: meeting link posted on Canvas to students

Class Meeting number: meeting information posted on Canvas to students

Password: meeting information posted on Canvas to students

I. SCHEDULE

Wk	Date	Group I/II/III	Note	Report Due: 12 PM (Noon)
1	(1/25)	Course intro. Syllabus, Guidelines, Lab schedule, Grouping, Lab introduction	Introduction Lab experiments Report guidelines	
2	(2/1)	Lecture #1	-Theory & background	
3	(2/8)	Experiment #1	Synchronous online video experiment	
4	(2/15)	Analysis & pre-calculation	Prelim report Q&A	
5	(2/22)	Lecture #2	- Theory& background	Report #1- Due 2/22. 12pm
6	(3/1)	Experiment #2	Synchronous online video experiment	
7	(3/8)	Analysis & pre-calculation	Prelim report Q&A	
8	(3/15)	Spring Break	No Class Meeting	Report #2-Due 3/15. 12pm
9	(3/22)	Lecture #3	- Theory& background	
10	(3/29)	Experiment #3	Synchronous online video experiment	
11	(4/5)	Analysis & pre-calculation	Prelim report Q&A	
12	(4/12)	Lecture #4	- Theory& background	Report #3 Due 4/12. 12pm
13	(4/19)	Experiment #4	Synchronous online video experiment	
14	(4/26)	Analysis & pre-calculation	Prelim report Q&A	
15	(5/3)	Report submission.	Final exam info session	Report #4 Due 5/3. 12pm
	Final week	Final exam: date and time TBD		

*Schedules are subject to change depending on the actual running of the class.

Experiments:

1. Refrigeration cycle
2. Engine Test (Mr. Joe Glaz)
3. Convection Heat Transfer
4. Vibration Monitoring

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II. GRADING

Grading Basis:

- Grading scale: A, B, C, (D) and F
- Grading Scheme: Total 110%
 - o Four experiment reports: 15% each * 4 reports = 60%
 - o Final exam: 40%
 - o Participation and Attendance: 10%

Attendance Requirements:

- Experiment (#1, 2, 3, 4) attendance is required.
- Missing of an *Experiment or Analysis class* will go to “30% off” on the report.
- Missing of *two or more* Experiment or Analysis Classes will go to “F” grade.
- Late attendance in class will be checked for grading.

Report and Group Discussion:

- *Individual report submission*: To be written by your own understanding.
- However, *Group discussion* is strongly encouraged for the analysis of the data.
- No share of the individual report is allowed.
- Plagiarism check: Any copied report will be **up to 100% off** on the grading, depending on the level of copied materials.
- Report contents and format: Follow **VI. Lab Report Guideline**.
- Report cover page: follow the template. (posted on canvas)

Report submission: (both pdf and word file)

- Lab Report submission to **Canvas**: **PDF only**
- Lab Report submission by email to **the instructor with cc to TA**: **PDF & Word (both)**.
 - o Email title format: **ME406-Exp#-Group#-Exp name-Student Name**
- Late submission less than 1 week (before 12pm): **30% off** from the grading.
- Late submission more than 1 week (after 12pm): **zero point** on the report.

Final Exam: (date and time TBD). Follow the **Final Exam Guideline**.

- Closed note and materials
- One-page formula sheet only allowed (both sides)
 - o Only formula or figures allowed
 - o No part of example problem solutions allowed.
 - o Formula sheet to be reviewed by instructor before the exam starts.
 - o Formula sheet **MUST** be submitted together with final answers.

Tips on how to be an active participant in this synchronous online class:

- Be on time.
- Turn on your video over the course.
- Raise a question during the lecture.
- Answer the instructor’s question.
- Take a lead in your group for better discussion.
- Take a quick look at the lecture materials before the meeting time.

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III. GROUP ACTIVITIES

Grouping

- This is an experimental activity-based laboratory course.
- The class will be split into 4 groups with (5) members as a standard size.
- The forming a group or joining a group is initiated by the instructor as a basis.
- If you want to switch the group number, you can do that on a one-to-one basis as per your preference. If such an event happens, please let me know by email, and get a confirmation and approval from the instructor.

Group Leader role assignment (with a standard size of (5) members)

- Each member in a group needs to take each leading role as per each experiment (#1, 2, 3, 4).
- Three Major Roles in a Group: an example.
 - o **Group Lead:** Lead discussions; Build a strong teamwork; Set a frequent group meeting schedule; Open an active group discussion; Arrange a team's easily-accessible virtual space to discuss, Raise productive questions, etc.
 - o **Lead in Analysis:** Leading the calculations/sample calculations from the raw data to the post-process, etc.
 - o **Lead in Data management:** Responsible to manage the data; to collect, arrange and distribute the post-processed data and calculations and information. Check if there is any missing calculation, etc.

*Here is my suggestion as a reference: 5 members (A, B, C, D, E) with 4 Experiments (#1, 2, 3, 4).

Exp#1:

- o A/B - Group Lead
- o C/D- Lead in Analysis
- o E- Lead in Data management

Exp#2:

- o C/D - Group Lead
- o E/A- Lead in Analysis
- o B- Lead in Data management

Exp#3:

- o E/A - Group Lead
- o B/C- Lead in Analysis
- o D- Lead in Data management

Exp#4:

- o B/C - Group Lead
- o D/E- Lead in Analysis
- o A- Lead in Data management

- Note: Each group may adjust the role of each member depending of their need.

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IV. COURSE WEBSITE

NJIT Canvas

<https://njit.instructure.com/courses> (UCID login required)

- Be familiar with Canvas!!!
- Check and update your contact email address in Canvas. Everything will be emailed through it.
- Every notice, change and exam information will be posted on Canvas. and sent through it.

V. ACADEMIC INTEGRITY

NJIT Honor Code is strictly enforced over the course of all the activities including Reports and EXAM.

****** NJIT Honor Code – Strictly Enforced******

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

“Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

*Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu”*

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VI. LAB REPORT GUIDELINE

Questions?

Instructor: Dr. Eon Soo Lee

Email: eonsoo.lee@njit.edu

Tel: 973-596-3318

Office hour: Tue/Thu 12-1pm or an appointment. (send email first for questions)

Online meeting: all meetings will be done via class WebEx meeting room.

A. ITEMS TO INCLUDE ON THE LAB REPORT

1. Cover page (use the cover page word-template posted on Canvas.)
 - Title of the experiment
 - Student's name
 - Group number
 - List names of all team mates and underline the name of the leader
 - Dates on which experiment was performed and it was submitted
 - Instructor's name and course number
 - Teaching assistant's name
2. Table of Contents
 - List contents in sequential order:
TopicPage #
3. Abstract (less than one page 150-250 words)
 - State objectives (What was performed?)
 - Methodology (How was it performed?)
 - Conclusive findings and remarks
4. Introduction
 - Application background: it's applications (examples)
 - Objectives of the experiment: brief summary of methodology of experiment
5. Theoretical Principles
 - Theory behind the experimental method
 - Theory behind data analysis
 - No sample calculations
6. Experimental Methodology
 - Experimental system (describe it; create schematic diagram; present photo of actual system; brief description of the operation)
 - Major measurement systems (schematic diagram with photos; brief description of the system: make and model of the major components)
7. Sample Analysis

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- Step by step details of sample calculations with explanation
- Select and use actual data (show real data in the equations used)
- Show data using figures and tables (both initial and final data)
- Identify software if used

8. Results and Discussion

- Itemized presentation
 - i. Measurement based or phenomena or objective based
- Use figures or tables in discussion
 - i. Using figures (preferred)
 - ii. Complete data (tables) in Appendix
 - iii. Comparison with theory
 - iv. Physical interpretation
- Error analysis
 - i. Identify sources of errors
 - ii. Quantify error margins (if possible)
 - iii. Suggestions for improvement (not required)

9. Conclusions

- Major findings
- Range of experimental data and error margins
- Conclusive interpretation

10. Nomenclature (list of symbols used)

- Alphabetic order
 - i. Upper case first, followed by lower case for each symbol
 - ii. English, Greek, superscripts, subscripts

11. References

- Use any standard format
 - i. See a book or a scientific journal

Example:

- Zhuang, S., Lee, E.S., Nunna, B.B., Lei, L., Kuang, L., Zhang, W. (2016). Synthesis of Nitrogen-Doped Graphene Catalysts by Wet Ball Milling for Electrochemical Systems, International Journal of Energy Research. Volume 40, Issue 15, Pages 2136–2149
- Zhuang, S., Nunna, B.B., Boscoboinik, J.A., **Lee, E.S.**, (2017). Synthesis of Nitrogen-Doped Graphene Catalysts by Wet Ball Milling for Electrochemical Systems, International Journal of Energy Research, 2017;1–19, <https://doi.org/10.1002/er.3821>

12. Appendix

- Lab manual
- **Original data sheet**
- **Complete set of tables and data**

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- Manufacturer's calibration copy or service provider's calibration document if different from the manufacturer's (if any)

B. GENERAL GUIDELINE

1. Body text font size: 12 (except headings or outlines)
2. Spacing: Single spacing in lines
3. Page margins:
 - 1-inch margin for Top, Bottom and Sides (except for figures/tables)
4. Page limit: Max. 20 pages (excluding Appendix)
 - Item #1: cover page to #11: References

C. GRADING BASIS for Each Report

Grading basis: Long report –
max. 20 pages (excl. appendix)

- Introduction – 10%
- Theoretical principles – 20%
- Experimental methodology – 10%
- Sample analysis – 20%
- Results and discussion – 20%
- Conclusions – 10%
- Cover page + TOC + Abstract + Nomenclature + References + Appendix = 10%

Note: Any lab report not following the guidelines will result in the **30% off** in the grading.

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VII. Final Exam Guideline – Online mode

1. Exam date and time

ME406 Final Exam schedule

TBD

2. Exam Room link:

Basically, same as the class meeting room, otherwise announced via Canvas and emails.

3. Topics covered

Class materials covered in the class and your lab reports:

- lab manuals, lecture notes, supplementary materials.
- Internal combustion engine,
- Vapor Compression Refrigeration Cycle,
- Heat Transfer (natural and forced convection. condensation)
- Vibration monitoring

4. Exam requirements

- Closed book, closed note: No lecture notes or lecture materials allowed.
- **Formula sheet: letter-size one-page (both sides) formula sheet.**
 - : No example problems nor any part of a solution process allowed;
 - : Formula only allowed.
 - : Formula sheet to be reviewed before the start of the exam.
 - : Formula to be submitted together with answer sheets.
- No cellphone or computer use (no keyboard/mouse) allowed during the exam.
- Pen, eraser, calculator, only allowed.
- **Blank sheets for your answer to be prepared.**
- **Clean out all the other papers or materials except the allowed above.**

5. Video setting requirements

- **Video MUST be set to capture the followings all the time during the exam.**
 - : **your face or head,**
 - : **both hands,** (Don't get any of your hands out of the screen)
 - ; **your working desk area,**
 - : **your formula sheet.**
 - : **your answer sheets.**

- Recommend to use a separate webcam at a distance from your desk to capture all the view. Be prepared earlier before the exam.

- **A cellphone can NOT be used for both** scanning for submission and video monitoring.

- Problems will be shown on your screen through WebEx.

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6. How to raise your Questions during Exam?

- Raise your hand for questions, and wait until I give you a chance to ask questions.
- **DON'T touch** your mouse, computer or any electronic devices until you are told to do so.

7. Submission of the answer sheet.

- Scan your answer sheets and create one single pdf file
- Upload the file to the Final Exam link. (similar to the Lab report submission)
- Uploading time is **limited within 10 minutes** after the end.
- **Late submission is NOT accepted** for grading (zero point).
- During uploading, **the video must keep turned on** and not be turned off.
- **A Cellphone can NOT be used for both** scanning and video monitoring.

Again,

- Clean out your desk except for the allowed materials.
- Be sure to check all the settings before the start of the class.
- All the other than the above is going to be considered as cheating.

This is the **requirement to be eligible to take the quiz** over the online mode.
Please be ready and set your video before the exam.