DEPARTMENT OF MECHANICAL ENGINEERING

SUNY KOREA

Instrumentation and Solid Mechanics Laboratory

Course Title: MEC 316 Instrumentation and Solid Mechanics Laboratory
Spring 2021 (2 credits)

Instructor: Prof. Changwoon Han, email: changwoon.han@sunykorea.ac.kr

Lecture: Wed 09:00-11:50 in C605

Office: B604, Phone: (032) 626-1817

Office Hours: Tue/Thr 13:30-15:00, or other time by appointment

Course Description: Hands on experience in solid mechanics and instrumentation with focus on the concept of static and dynamic response. Students learn to operate instruments for measuring displacement, angle, acceleration, and strain. Student groups perform eleven experiments to probe the spatial and temporal resolution of modern instrumentation and sensors in relation with fundamental material properties. Lectures at the beginning of the course provide background information and theories of experimentation.

CLO & Assessment Tools

Course Learning Objectives (CLOs)	Assessment Tools
1. Demonstrate the ability to collect data from tensile machine, vibrating cantilever beam, straightness measurement, photoelasticity, fatigue testing machine, buckling machine, strain sensing, and shear modulus tester.	Lab reports
2. Learn how to work in a team and meet deadlines.	Lab reports
3. Produce technical reports that contain all required sections and that are written in grammatically correct English.	Lab reports
4. Demonstrate uncertainty analysis on collected data.	Lab reports
5. Learn how to compare experimental data with theoretical predictions.	Lab reports

List of Experiments

01. Vibration Analysis of a Cantilever Beam
02. Straightness Measurement of Linear Motion
03. Strain Measurement
04. Calibration of a Linear Variable Differential Transformer
05. LabVIEW based DC Voltage and AC Signal Measurement
06. Column Buckling and Critical Load Analysis
07. Shear Modulus Determination using Torsion Tester
08. Deformation of a Cantilever Beam under Static Loading
09. Stress Distribution Determination using Photoelasticity
10. Fatigue Test of Materials
11. Stress Distribution Determination of a Bending Beam

Laboratory Fee

- A laboratory fee is required.
- Related information will be sent from the department via e-mail.

Course Materials

- Lab Manual (Hardcopy will be distributed.)
- Error Analysis
- Optional textbooks for Error Analysis

  R. S. Figliola and D. E. Beasley, *Theory and Design for Mechanical Measurements*, 6th Edition, Wiley, 2014.

  J. R. Talyor, *An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements*, 2nd Edition, University Science Books, 1996.

Pre-Lab Reports

- Before you come to the laboratory, you must study the experiment you are going to perform from the Lab Manual and prepare a Pre-Lab Report. Instructor will sign your Pre-Lab Reports before the experiments. Preparation of these reports is in line with SUNY Korea Flipped Learning Program.
- **Each student** must prepare his/her own report.
- You will NOT be allowed to start to do experiment in the laboratory until you Pre-Lab Report is signed.
- Pre-Lab Reports should contain
  - A brief description of the experiment objective,
  - List of equipment,
  - Equations and any analytical calculations need for the experiment,
  - Empty tables for all data which is needed to be collected,
  - Answers for **Pre-Lab Requirements**.
- Each student should record neatly all data in his/her own report during the experiment.

Lab Reports

- Students should form groups of two or three individual at the beginning of semester to perform all experiments.
- Each group must submit a single Lab Report for each experiment.
- Each student must write at least three reports as the First Author.
- All Lab Reports should be TYPED.
- Reports must be submitted to instructor's e-mail address and also handed in at the beginning of the following session.
  - For submission to e-mail, submit the PDF file of your report until the beginning of the following session. Please name the file as MEC316_Exp_#_Group_# (e.g., **MEC316_Exp_02_Group_A**). There is no need to include your Pre-Lab Reports and handwritten data for e-mail submission.
  - For handing in at the laboratory, attach the completed Pre-Lab Reports of all group members and also all handwritten data to the Lab Report.
- For each day your Lab Report is late, its grade will be reduced 5 pt.

Reports Format

Pre-Lab Reports

- There is no need for Pre-Lab Reports to be typed but they should be prepared on white **A4 sized papers** and be stabled neatly in top left corner. Your name, date, course number, and experiment number should be written on the top of the first page.

Lab Report

All Lab Reports should be typed with a 12 pt. font. The required sections of the Lab Reports are listed in order of appearance as:

1. Title Page (Including course number, experiment number and title, date, names of First Author and group members)
2. Abstract (A single short paragraph which represents the entire experiment including purpose of experiment, the variables to be measured, measurement basic concepts etc.)
3. Introduction (Including answering to these questions: Why this experiment is important? What is the application of this experiment in engineering or real life? Etc.)
4. List of Equipment (Including manufacturer and model number)
5. Experimental Theory (Including detailed theory on experiment)
6. Experimental Procedure (Detailed description of the steps performed during your experiment to obtain the required data. Do not simply copy the steps from the Lab Manual.)
7. Results (Including calculation of experimental results, figures, tables, etc.)
8. Discussion (Including discussing the trends in the results, comparison with theoretical predictions, etc.)
9. Error Analysis (Discussion of error analysis, uncertainty of reported results, source of errors, methods for reducing the errors, etc.)
10. Conclusions (A single paragraph which briefly describe the experiment and the discussed results.)
11. References (If you have any)
12. Appendices (Pre-Lab Reports of all group members, handwritten calculations, codes, etc.)

Notes

- Don’t simply copy the sentences form the Lab Manual. Express the concepts in your own words.
- Handmade drawings of experimental setups are permitted.
- Be sure to check your spelling.
- Number all the pages.
- All equations should be numbered.
- All figures and tables must be labeled with a number and a caption.
- All the numerical quantities must have proper units.
- Use MS Excel or MATLAB for making graphs of your experimental data.
- Refer to figures and tables in the text as: Fig. # and Table #.

Grading

Each Lab Reports is graded on a scale of 0 to 100 as

Contents	Full Score
Abstract	5
Introduction	5
List of Equipment	5
Experimental Theory	10
Experimental Procedure	10
Results	15
Discussion	15
Error Analysis	15
Conclusions	5
Pre-Lab Report	10
Writing/ Style/ Clarity	5
Sum	**100**

Note

- Peer or TA evaluation survey will be conducted during the semester to prevent the free rider.
- All group members will not necessarily receive the same grade for the course.

The semester letter grade will be based on the following categories.

Total Lab Reports	80%
Attendance	10%
TA or Peer Evaluation	10%

Grading Scale

A: [100 - 92], A-: (92 - 88], B+: (88 - 84], B: (84 - 80],
B-: (80 - 76], C+: (76 - 72], C: (72 - 68], C-: (68 - 64],
D: (64 - 60], F: (60 or below)

TA

TBD

Blackboard

It is required that you use the Blackboard for this course (https://blackboard.stonybrook.edu/). Blackboard is used for facilitation of communications between faculty and students, submission of assignments, posting of the course materials, important announcements, and grades.

Class Guidelines for Fall 2021 in COVID-19 situation

(1) Masks should be worn at all times while on campus. Students who do not wear masks should leave the classroom immediately.

(2) After entering the room, make sure to have as much distance as possible between individuals. If seat movement or temperature check is required, please cooperate.

(3) Students should use only designated seats in order to maintain the distance between individuals.

(4) The distance between students should be maintained during group discussions and intermission.

(5) Students who have fever or respiratory symptoms (coughs, difficulty breathing, etc.) during the class should immediately notify the instructor of the incident and move to the designated classroom for COVID-19.

SUNY Korea Attendance Policy

(1) All SUNY Korea students are required to attend every class.

(2) Unexcused absences will significantly affect seriously the student's final course grade.

(3) Students who are absent without a valid excuse (see below) from more than 20% of scheduled class meetings will receive a grade of "F" for the course as follows:

i) For 150-minute classes meeting once a week, the 4th unexcused absence

ii) For 75-minute classes meeting twice a week, the 7th unexcused absence

iii) For 50-minute classes meeting three times a week, the 10th unexcused absence

iv) For Intensive English (IEC) Courses, students who miss more than 40 hours during a semester will receive a grade of "F" for the course.

(4) Students should report the reason for absences to the instructor in advance, or immediately after the absence.

(5) Absences may be classified as "excused" at the instructor's discretion.

(6) For an absence to be "excused," the student must provide the instructor with acceptable documentation for the reason for the absence.

(7) The course instructor may excuse the absence if the submitted documentation fulfills the conditions below:

i) Extreme emergencies (e.g., death in the family)

ii) Major medical reasons with doctor's note (not minor ailments)

iii) Very important events (e.g., national conferences, official school events)

(8) At the end of semester, the course instructor will submit the class attendance record to the Academic Affairs Office.

(9) If a student experiences fever(37.5°C or higher) or respiratory symptoms (such as

coughing, difficulty breathing, etc.), he or she should not come to school and notify the instructor of the fact via email. If the instructor is not reachable, please contact the Academic Affairs or the Department Coordinator.

(10) For students who have left the class due to suspected symptoms or who are unable to attend the class due to the COVID-19 symptoms, they should not get any disadvantage in attendance score due to the absence of the class.

Disability Support Services (DSS) Statement:

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact One-Stop Service Center, Academic Building A201, (82) 32-626-1117. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

In addition, this statement on emergency evacuation is often included, but not required: Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and One-Stop Service Center.

Academic Integrity Statement:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website.

Critical Incident Management Statement:

The State University of New York, Korea expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

Subject to Change Notice

All material, assignments, and deadlines are subject to change with prior notice. It is your responsibility to stay in touch with your instructor, review the course site regularly, or communicate with other students, to adjust as needed if assignments or due dates change.

Syllabus Disclaimer

The instructor views the course syllabus as an educational understanding between the instructor and students. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes via email or in the course site Announcements. Please remember to check your email and the course site Announcements often.