

DEPARTMENT OF MECHANICAL ENGINEERING
SUNY KOREA

Control System Analysis and Design

Course Title: MEC 411 Control System Analysis and Design, Spring 2021 (4 credits)

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

Lecture: Lec.: Tue/Thr 14:00-15:20 in B206
Lab.: Wed 09:00~11:50 in C605

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

Office Hours: Thu/Thr 15:30 ~ 17:00 or other time by appointment

Course Description: Topics of this course include system modeling; transfer function, block diagram and signal-flow graph; sensors, actuators, and control circuit design; control system characteristics and performance; stability analysis; root locus method; Bode diagram; PID and lead-lag compensator design.

Course Main Topics:

1. Introduction to Control Systems
2. Laplace Transform
3. Modeling of Dynamic Systems
4. System Modeling Diagrams
5. Time Response
6. Stability
7. Stead-State Errors
8. Root Locus Techniques
9. Design via Root Locus
10. Frequency Response Technique

CLO & Assessment Tools

Course Learning Objectives (CLOs)	Assessment Tools
1. Ability to analyze differential equations using Laplace transforms and model the behavior of physical systems using differential equations.	Exam questions
2. Ability to represent a control system using block diagrams, signal flow graphs, and transfer functions.	Exam questions
3. Ability to identify system performance characteristics used for parameter selection.	Exam questions
4. Ability to analyze system behavior using the Root Locus method.	Exam questions
5. Understanding of the functionality of PID controllers.	Exam questions
6. Familiarity with frequency response, the construction and analysis of Bode diagrams, stability in the frequency domain, and compensator design.	Exam questions
7. Understanding of the use and application of technology including oscilloscopes, waveform generators, multimeters, power supplies, and MATLAB software.	Lab Assessment

- Recommended Textbook:**
- Norman S. Nise, “**Control Systems Engineering**,” International Student Version, Wiley, 2013, ISBN: 9780470646120(0470646128)
 - Gene F. Franklin et al., “**Feedback Control of Dynamic Systems**,” Global 7th Ed., Pearson, 2016, ISBN: 9781292068909(1292068906)
 - Katsuhiko Ogata, “**Modern Control Engineering**,” International 6th Ed., Prentice-Hall, 2009, ISBN: 9780137133376(0137133375)

- Homework**
- Homework assignments will be assigned in the class.
 - Homework must be handed in at the beginning of the class on the specified due date unless otherwise stated.
 - Homework should be done on **A4 sized papers** and be stapled neatly in top left corner.
 - Do not forget to write your name and ID on the top of the first page.
 - You can either hand-write your solutions to homework or type them.
 - I will NOT accept your homework sent to my email address unless stated.
 - Late homework will not be accepted.

- Lab Reports**
- Students should form groups of three individuals 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 one reports as the first author.
 - All Lab Reports should be typed.
 - Reports must be submitted through instructor’s e-mail and also handed in on the specified due date unless otherwise stated.
 - For submission on e-mail, please name the PDF file of your Lab Report as MEC411_Exp_#_Group_# (e.g., MEC411_Exp_1_Group_1)
 - For each day your Lab Reports is late, its grade will be reduced by 10%.
 - More information about Lab Reports will be given later.

- Examinations:**
- | | |
|------------------------------|-------------------|
| 1 st Midterm Exam | in class |
| 2 nd Midterm Exam | in class |
| Final Exam | on schedule (TBD) |
- No make-up exams unless in extreme scenarios with Doctor’s notes, police reports.

Grading: Semester letter grade is based upon your performance in the following categories;

1 st Midterm exam	20%
2 nd Midterm exam	20%
Final exam	20%
Homework	10%
Lab reports	20%
Attendance	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)

Calculator: Only NCEES Allowed Calculators will be permitted to be used on all quizzes, midterm, and final exams. Please see the [Calculator Policy on Stony Brook](#) and [NCEES websites](#).

TA: TBD
Office: C604
E-mail:
Course Website Supplementary materials will be posted on the Blackboard

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 Spring 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.