

Course Syllabus

MEC 411: Control System Analysis and Design

Spring 2018

Course Detail

Title	MEC 411: Control System Analysis and Design
Credit	4
Location	C605 (Lectures and Labs)
Meeting Times	Lecture: 10:30-11:50 AM, TuTh; Lab: 12:30-3:20 PM Spring 2018
Prerequisites	MEC 262; MEC 316; AMS 361 or MAT 303
Website	https://sites.google.com/site/AminFakhariSUNYK/teaching/mec411

Instructor Detail

Instructor	Amin Fakhari, Ph.D.
Office	B620 Academic Building
Office Hours	Wed & Thu: 2:30-4:00 PM (and any other time by appointment)
Phone	+82-32-626-1816
Email	amin.fakhari@stonybrook.edu, amin.fakhari@sunykorea.ac.kr
Website	https://sites.google.com/site/AminFakhariSUNYK

TA Detail

TA	Shubhada Santoshi Garnaik, ME Graduate Student
Office	C604
Office Hours	Wednesday, 10-11 AM
Email	ShubhadaSantos.Garnaik@stonybrook.edu

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. Steady-State Errors
8. PID Controllers
9. Root Locus Techniques
10. Design via Root Locus
11. Frequency Response Techniques
12. Design via Frequency Response

Course Learning Objectives

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

References:

- Norman S. Nise, *Control Systems Engineering*, 7th Edition, Wiley, 2015 (ISBN: 978-1-118-17051-9) [[Publisher](#), [Amazon](#)].
- Gene F. Franklin, J. Da Powell, Abbas Emami-Naeini, *Feedback Control of Dynamic Systems*, 7th Edition, Pearson, 2015 (ISBN10: 0133496597, ISBN13: 978-0133496598) [[Publisher](#), [Amazon](#)].
- Katsuhiko Ogata, *Modern Control Engineering*, 5th Edition, Pearson, 2010 (ISBN10: 0136156738, ISBN13: 978-0136156734) [[Publisher](#), [Amazon](#)].

Tools

Blackboard	It is required that you use the Blackboard for this course. Blackboard is used for facilitation of communications between faculty and students, submission of assignments, posting of the course materials, important announcements, and grades.
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.
Course Website	Supplementary materials will be posted on the course website .

Assignments

Homework	<ul style="list-style-type: none">• Homework assignments will be assigned in the class or posted on Blackboard.• Homework must be handed in at the beginning of the class on the specified due date unless otherwise stated.• You can either hand-write your solutions to homework or type them.• I will not accept your homework sent to my email address.• Late homework will <u>not</u> be accepted in any case.• Homework should be done on A4 or letter 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.
Lab Reports	<ul style="list-style-type: none">• 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 on Blackboard and also handed in on the specified due date unless otherwise stated.• For submission on Blackboard, 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 Report is late, its grade will be reduced by 10%, regardless of who was the first author of the report. No exceptions will be made.• I will not accept your reports sent to my email address.• More information about Lab Reports will be given later.

Examinations

First Midterm Exam	On Tuesday, April 3, 2018 (in class).
Second Midterm Exam	On Thursday, May 3, 2018 (in class).
Final Exam	On Tuesday, June 19, 2018, 9:00 – 11:30 AM (in class).

- (I) The exams are closed book/notes.
- (II) All exams will be scheduled in class unless otherwise announced.
- (III) There will be no make-up exams unless arranged prior to the exams or provided me an official proof of the reason.

Grading

Semester letter grade will be based on the following assessments:

Homework	10%
Lab Reports	20%
First Midterm Exam	20%
Second Midterm Exam	20%
Final Exam	30%

Grading Scale

Grading will not be on a curve. It will be absolute as follows:

A [100, 95]%	A⁻ (95, 90]%	
B⁺ (90, 85]%	B (85, 80]%	B⁻ (80, 75]%
C⁺ (75, 70]%	C (70, 65]%	C⁻ (65, 60]%
D⁺ (60, 55]%	D (55, 50]%	D⁻ (50, 45]%
F (50, 0]%		

Subject to Change Notice

All materials, 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 SBU email and the course site Announcements often.

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.

Attendance Policy of SUNY Korea

1. All students of SUNY Korea are required to attend every class.
2. Unexcused absences will affect seriously the student's final grade in the course.
3. If a student has over 20% unexcused absence, the student's final course grade will be an 'F'.
 - (I) If the class is a 150 minute class, and is held once a week, the 4th unexcused absence of a student will lead to an F grade of the course.
 - (II) If the class is a 75 minute class, and is held twice a week, the 7th unexcused absence of a student will lead to an F grade of the course.
 - (III) If the class is a 50 minute class, and is held three times a week, the 10th unexcused absence of a student will lead to an F grade of the course.
 - (IV) In Intensive English Course (IEC), if a student misses the class more than 40 hours in a semester, the student will receive an F grade on the course.
4. Students should report the reason of absence to the instructor in advance, or immediately after the absence.
5. When a student excuses his/her absence, the student must provide documentation of the reason for the absence to the instructor.
6. The instructor of the course reserves the right to excuse absences.
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) Severe medical reasons with doctor's note (Not a slight illness)
 - (III) Very important events (e.g. national conference, official school event)
8. At the end of semester, the course instructor should submit a copy of the attendance sheet to the Academic Affairs Office.

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.