San José State University  
College of Engineering/ Electrical Engineering  
EE210-01, Linear Systems Theory, spring, 2019

Course and Contact Information
Instructor: John (JeongHee) Kim  
Office Location: ENG259  
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Email: jeonghee.kim@sjsu.edu  
Office Hours: M 6:00-6:45 & TR 3:30 to 4:15 pm & by appointment.  
Class Days/Time: T & TR 4:30 to 5:45 pm  
Classroom: ENG345  
Prerequisites: Graduate student standing

EE210 Website  
Course materials such as the syllabus, major assignment, handouts, etc. can be found on my web page at [https://groups.yahoo.com/groups/SJSU_EE210]. You are responsible for regular checking of the messages.  

Specific topics covered in EE210-1 include:
1- Discrete-time signals and systems
2- Linear and time-invariant (LTI) systems
3- Discrete-time Fourier transform & properties
4- Convolution and correlation
5- The Z-transform & properties
6- Frequency response and pole/zero relationship
7- Example FIR & IIR filters; linear-phase filters
8- Cascade, parallel and state space filter realization
9- Fourier transform of continuous-time signals & properties
10- Sampling & reconstruction of continuous-time signals
11- The Discrete Fourier Transform (DFT) and fast implementations (FFT)
12- Continuous-time signals and systems in the complex frequency domain
13- Time, frequency, and state space representation of continuous-time systems
14- Selected applications

Course Learning Outcomes
Upon successful completion of this course, students will be able to:
LO1: To learn how to analytically and numerically calculate spectra of continuous-time and discrete-time signals from various Fourier transform definitions and transform properties.

LO2: To learn how to infer from signals and their spectra basic attributes including energy, power, width, moments, among others.

LO3: To learn how to analytically and numerically perform basic signal operations such as convolutions, and correlations in either the time or frequency domain and to relate such operations to real-life applications.

LO4: To learn how to assess various system attributes such as linearity, shift invariance, causality, and stability, and to understand their relationship to the system function.

LO5: To learn how to analyze the time and frequency responses of linear shift invariant systems to aperiodic and periodic temporal or spatial input signals both in the real frequency and complex-frequency domains.

LO6: To relate the developed analysis methodologies to real-life applications such as filtering, sampling, imaging, control, communications, bio, signal processing, among others.

Textbook
Discrete-Time Signal Processing, 3rd Ed., by Oppenheim and Schafer, Pearson/Prentice-Hall 2010 (comprehensive coverage of discrete-time linear systems)

Other Readings
The textbook above will be supplemented by Chapters 4-9 of the textbook Signals and Systems: A Fresh Look, by Chi-Tsong Chen


Software
The Student Version of Matlab is recommended for supporting numerical computations when needed. It’s available at the bookstore or directly from the Mathworks Inc. (http://www.mathworks.com/academia/student_version/). Matlab and many of its “toolboxes” are available on the EE Department PC’s in room ENG387 (an open lab; open times are posted on the door). Matlab may be used to demonstrate some topics in the class.

Course Requirements and Assignments

Lectures
The course will follow the selected subjects as listed on the course description. Additional theory and examples will be given and discussed in class as much as time permits.

☐ Please note that lecture materials are NOT solely based on the required text and so students are responsible for following up the lecture in order to prepare themselves for the exams.

☐ Students are responsible for understanding the text, handouts, lecture presentations, etc.

☐ Students are responsible for following up and keeping track of the in-class lecture materials.

☐ Students are responsible for finding and reading additional books, papers, examples, etc. in order to gain more understanding of the materials discussed in the lectures.

Midterm and Final Exams and Design Project

There will be two midterm exam, a comprehensive final exam and quizzes. The Final exam date is posted by the university. Since make-up exams will NOT be allowed, please make sure that you are able to attend all exams at the
indicated scheduled dates and times (from the beginning of the semester) in order to register for the course.

- All exams are closed-book exams.
  - One sheet (double-side 8.5x11) of hand-written notes is allowed for each midterm exam and two sheets of
    hand-written notes are allowed for the final exam.
  - Only basic calculators are allowed.

- There will be no make-up exams

**Homework Assignments**

- Homework assignments and/or lab exercises will be given with due dates

- If you turn in assignments late, maximum of 10% credits will be given. Solutions to the homework
  assignments and all other info are posted in group site
  ([https://groups.yahoo.com/groups/SJSU_EE210](https://groups.yahoo.com/groups/SJSU_EE210)). Everyone must join in this site to get necessary info
  (Exam sol, Qz sol, HW assignments & sol, and other announcements).

- If 75% of combined HW and quizzes are not done by end of semester, you will get F grade
  automatically.
  - HW has to have cover page given in the group site otherwise you will not get any credits or deducted up to
    100 percent. Final solutions on HW and exam must be boxed. Otherwise you will not get credits. Only one
    side of page must be used in the HWs. (No HW sending through an email will be accepted.) HW should be
    clean, legible, stapled on top left corner and proper paper should be used.

- If unreasonable or out of common sense behavior happens in the class, one will be asked to leave from the
  class and will be given “F” grade. (No feet on a table or chair, taking hat off, no cellphone use or web
  surfing, no talking with neighbors). And I will drop you from the class if the class is disturbed unreasonably
  with my right.

- No food is allowed (Water is ok). All the exams and quizzes are done in the class and only allowed to use
  pencil, eraser (no pen) and calculator.

- Homework must be submitted in class on time.

- Do NOT submit HW via email. Submit HWs in class as hard-copies (paper) only

- Late submission will NOT be accepted (absolutely!).

- There is no make-up homework/lab. To get credit for your homework/lab assignments, submissions must be
  neat, clean, and must be done professionally and seriously. Your official name (not nickname), course #, and
  homework # must be visibly shown on each assignment.

“Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum
of 45 hours over the length of the course (normally three hours per unit per week) for instruction,
preparation/studying, or course related activities, including but not limited to internships, labs, and clinical
practice. Other course structures will have equivalent workload expectations as described in the syllabus.”
Final Examination or Evaluation

- The final exam is an in-class exam.
- The exam date and time is defined in Course Schedule (last page of this syllabus) or can be found in the university final exam schedule.
- It is a comprehensive exam; the exam covers the all materials covered in the class.
- More details can be found in University policy S17-1 (http://www.sjsu.edu/senate/docs/S17-1.pdf)

Grading Information

The overall course grades (letter-grades) will be assigned based on a defined grading standard as shown below. The weights of the whole course work assignments are:

1. Homework assignments & Labs & Quizzes  20% (Quiz=HW)
2. Two midterm exams  50% (25% each)
3. One final exam  30%

And the overall course grade (letter-grade) will be assigned based on the distribution below:

Grading criteria (Example: 74% results in a grade of C+):

\[ 0 < F < 57 < D^- < 60 < D < 64 < D^+ < 67 < C^- < 70 < C < 74 < C^+ < 77 < B^- < 80 < B < 84 < B^+ < 87 < A^- < 90 < A < 100 \]

Classroom Protocol

EE210 students understand that professional attitude is necessary to maintain a comfortable academic environment in the classroom. For examples:

- Students will put their cell phones in quiet/vibration mode during the lecture.
- Students understand that drinking water, juices, etc. during the lecture is acceptable but NOT eating.
- Students will not skip the lecture and then ask the instructor to summarize the lecture later on. Office hours are for students to have questions, not for the instructor to summarize the lecture for any specific student.
- Students will come to the class on time and leave the class at the end of the lecture.
- Students will consult the course syllabus for class policies and requirements before requesting the instructor for any special considerations and/or exceptions.
- To minimize possible tension during the exams, students are requested to follow the exam rules closely.
- Students will works, HW and labs, by their own and will not share the work with other students.
- Students understand that long-term learning is their responsibility and will always keep it up.

If you need explanations on lecture materials, homework assignments, exams, etc..., please see me in-person during my office hours. Do NOT email me for these matters. If you must send me an email, please clearly specify your full-name, course, section, etc. I will not respond to email that I do not know the author or emails that have no manners.

University Policies (Required)

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs’ Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/’
EE Department Honor Code

The Electrical Engineering Department will enforce the following Honor Code that must be read and accepted by all students.

“I have read the Honor Code and agree with its provisions. My continued enrollment in this course constitutes full acceptance of this code. I will NOT:

• Take an exam in place of someone else, or have someone take an exam in my place
• Give information or receive information from another person during an exam
• Use more reference material during an exam than is allowed by the instructor
• Obtain a copy of an exam prior to the time it is given
• Alter an exam after it has been graded and then return it to the instructor for re-grading
• Leave the exam room without returning the exam to the instructor.”

Measures Dealing with Occurrences of Cheating

• Department policy mandates that the student or students involved in cheating will receive an “F” on that evaluation instrument (paper, exam, project, homework, etc.) and will be reported to the Department and the University.
• A student’s second offense in any course will result in a Department recommendation of suspension from the University.
## EE210-01, Linear Systems Theory, spring, 2019

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
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| 1    | Introduction  
       | Signals and Systems |
| 2    | Continuous Time (CT) Signals & Fourier Transform (FT)  
       | CT Fourier transform & properties 1 |
| 3    | CT Fourier transform properties & Fourier Series  
       | CT Convolution |
| 4    | Properties of time domain vs. Frequency domain relationships  
       | Sampling process of CT signals |
| 5    | DT LTI (discrete time linear time invariant) Systems and properties  
       | DT Fourier transform (DTFT) |
| 6    | DT Fourier transform (DTFT): properties |
| 7    | The z-transform & its inverse: definitions, example pairs  
       | **Midterm Exam I** |
| 8    | The z-transform: properties, system function  
       | Z transform and filtering relationships |
| 9    | Laplace transform |
| 10   | The discrete Fourier transform (DFT)  
       | The DFT: circular and linear convolutions |
| 11   | Discrete Fourier Series (DFS)  
       | DFT vs. FFT (Fast Fourier Transform) |
| 12   | FFT: DIT (decimation in time) & DIF (decimation in frequency)  
       | **Midterm Exam II** |
| 13   | Finite Impulse Response filter (FIR) filter design |
| 14   | Infinite Impulse Response filter (IIR) filter design |
| 15   | Review |
| Final Exam | Monday, May 20 1445-1700 |