Course Policies

Degree Program:

■ECE-Electrical & Computer Engineering

□ME -Mechanical Engineering

□General Courses for Both ECE & ME Degree Programs

Course Name: Introduction to Signals and Systems

Course Code: VE216

Course Credits: 4

Course Category: ■ Required □ Elective

Terms Offered:

□Fall ■Spring □Summer 2020

Course Pre/Co-requisites:

Vv156 Applied Calculus II

Ve215 Electric Circuits

Textbook:

Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, “Signals and Systems”, Second Edition, 1997, Prentice Hall (Portions of Chapters 1-10)

Other References:

1) Online resources: You are encouraged to view the course “Signals and Systems” of the MIT Open Courseware at http://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/, which includes the video lectures taught by Oppenheim.
2) Charles L.Phillips, John M.Parr and Eve A.Riskin, “Signals, Systems, and Transforms”, Fifth Edition (November 3, 2013), Prentice Hall

Instructors:

Yong Long, yong.long@sjtu.edu.cn (Office), Long Bin Building, Room 402

Lectures:

Tuesday 14:00-15:40, Wednesday and Friday, 10:00–11:40, Zoom

Labs:

TBD (in May)

Office Hours:

15:00-17:00, Wednesday, Long Bin Building, Zoom

Teaching Assistants:

Zhipeng Li, zhipengli@sjtu.edu.cn , Cell 158-9590-2029, 19:00-21:00, Tuesday, Zoom

Ling Chen, chen_ling@sjtu.edu.cn , Cell 199-2187-1093, 19:00-21:00, Monday, Zoom

Yilun Zhu, allanzhu@sjtu.edu.cn, Cell 158-0036-4328, 14:00-16:00, Friday, Zoom

Recitation Classes: 10:00-11:40, Zoom

RC	#1	#2	#3	#4	#5	#6	#7
Date	Mar.13	Mar. 19	Mar. 26	Apr. 2	Apr. 9	Apr. 16	Apr. 24

Grading Policy:

Your final grade will be determined as a weighted combination of your homework, labs and final exam.

- Homework: 30%
- Quizzes: 20%
- Labs: 15%
- Final Exam: 35%

Requests for re-grades of exams must be submitted in writing within one week of exam return. All questions may be re-graded. Letter grades will be assigned using a curve following past practice in the recent 3 years. **The median grade will be B or B+** (depending on overall performance).

Academic Integrity:

1) Homework: There will be six Homework sets. Homework and solutions will be posted on Canvas only. Solutions will be provided for all problems. All homework sets are required to submit to Canvas. **ABSOLUTELY NO LATE HOMEWORK ASSIGNMENTS WILL BE ACCEPTED. The lowest homework score will be automatically dropped.**

HW	#1	#2	#3	#4	#5	#6
Chap. (slides)	1	2	3	4	6、7、8	9
Due date	Mar. 13	Mar. 24	Apr. 7	Apr. 14	Apr. 24	Apr. 30

2) Quiz: **You are responsible for establishing a study group of 3 to 5 students at the beginning of the semester.** Each study group completes each quiz collaboratively and submits one solution set with the group number, IDs, names of each student to Canvas. Based on SJTU's academic regulations, attendance will be randomly taken at least 5 times. There are at least 5 quizzes, and the quiz time will be random and not announced in advance. **ABSOLUTELY NO LATE QUIZ ASSIGNMENTS WILL BE ACCEPTED. The lowest quiz score will be automatically dropped.**

3) Exam: All students must take the final exams during the scheduled time. Exceptions must be approved by Prof. Long, in writing stating why you could not attend (severe disease, for example). **The exams will be closed book. Electronic media (including calculators) are not allowed.** You must solve all exam problems by yourself. Copying exam solutions from another student or from solutions from previous semesters will be considered violations of the JI honor code. Tentative schedules of exam:

   a) Final Exam, Time: TBD (in May). Venue: TBD
   You are permitted to use **three** A4 sheets of notes (both sides), all of which must be your own handwriting.

4) Labs: **ABSOLUTELY NO LATE LAB REPORTS WILL BE ACCEPTED.** The labs will help you develop engineering skills. Unexcused absence will result in a grade of zero. Students have the responsibility of contacting the instructor or teaching assistant to make up the missed lab. The labs will start in the summer semester.

5) Collaboration: You must attempt to solve all homework problems by yourself. Copying homework solutions from another student or from solutions from previous semesters will be considered violations of the JI honor code (http://umji.sjtu.edu.cn/academics/academic-integrity/honor-code/). However, after making a genuine attempt to solve the homework problems, you are encouraged to discuss the answers with other students currently enrolled in 216 to check the answers and compare solution approaches. After such a discussion, you may rewrite your answer as long as you do so individually, without referring to the solutions of other students or to solutions from previous terms. Basically, the answers you turn in should reflect your own level of understanding, not someone else's. This also applies to the Matlab coding portion of the course; these are to be done individually.

6) MATLAB: Knowledge of the MATLAB software environment will be a required part of this course. MATLAB will be required for solving some weekly homework assignments. If you are not familiar with MATLAB, you are strongly encouraged to study the MATLAB tutorial on Canvas. Remember that you will be responsible for knowing MATLAB in exams, so you are encouraged to work as

independently as possible.

Course Description:

This course introduces students to basic concepts in continuous-time linear system theory. The analysis of continuous-time systems is considered in both the time and frequency domains. Topics include linearity, impulse response, convolution, frequency response, filtering, Fourier series, Fourier transforms, sampling theorem, relationship between continuous-time and discrete-time systems (as time perm its), Laplace transforms, system transfer function, poles and zeros, stability. Applications of these techniques will be discussed using examples from circuits, signal processing, communication and control. Weekly recitations and hardware laboratories will also be included in this course.

Teaching Schedules: (Tentative: subject to adjustment.)

Lecture slides will be posted on SAKAI one day before each lecture and updated after each lecture according to the actual coverage in class.

Week	No.	Date	Lectures and Exams	Labs
1	1	Mar. 3	• course policies • overview • signal and system definition • classifications of signals	-
	2	Mar. 4	• signal notation • transforms of CT signals (time and amplitude transforms, more signal operations, operations with two signals) • signal characteristics (even and odd symmetry)	
	3	Mar. 6	• signal characteristics (average value and energy, energy and power signals) • Exponential signals • Singularity functions (unit step signal, rect function, unit impulse function)	

2	4	Mar. 10	• Input-output description of systems • Block diagrams • Interconnection of systems • System classes	-
	5	Mar. 11	• Amplitude properties (linearity, stability) • Amplitude properties (inevitability) • Time properties (causality, memory, time-invariance) • Summary of chap. 1	
	6	Mar. 13	• Recitation class	
3	7	Mar. 17	• impulse response • Impulse representation of CT signals • Convolution for CT LTI systems • Properties of convolution and LTI systems • LTI system properties via impulse response • Step response • diffeq systems (important class of LTI systems) • Summary of Chap. 2	-
	8	Mar. 18	• Introduction to Chap. 3 • LTI system response for complex-exponential input signals • Preview • Fourier series	
	9	Mar. 20	• Convergence of Fourier series • Properties of Fourier series (one signal properties, two signal properties, Parseval's relation)	-
4		Mar. 21	• Power density spectrum • Fourier series and LTI systems • Filtering and applications	
	10	Mar. 24	• Filters described by diffeqs	-

			• Summary of Chapter 3	
	11	Mar.25	• Fourier transform (FT) definition • FT Existence • FT Examples	
5	12	Mar. 27	• FT of periodic signals • FT Properties	
	13	Mar. 28	• convolution property and LTI systems • Parseval's relation / energy density spectrum • Time-domain multiplication • Partial fraction expansion (PFE)	-
	14	Mar. 31	• Application of FT to RLC and diffeq systems • Summary of Chapter 4 ideal filters • Application of FT to RLC and diffeq systems • Summary of Chapter 4 ideal filters	
6	15	Apr. 1	• ideal filters • real filters	
	16	Apr. 3	• Bode Plots • Summary of Chap. 6	
	17	Apr. 7	• Introduction to sampling • FT of impulse-train sampled signals • sampling theorem •	
7		Apr. 8	• aliasing • Reconstruction via interpolation	Lab 1: LTI Systems
	18	Apr. 10	• Realistic non-impulse sampling • Discrete-time Fourier transform (DTFT) • Summary of Chap. 7	
	19	Apr. 14	• Introduction to communications • Sinusoidal amplitude modulation • Demodulation	
8	20	Apr.15	• Frequency-division multiplexing (8.3) • Summary of Chap. 8	Lab 2: AM Radio
	21	Apr. 17	• Laplace transform (LT) definition / computation by integration • ROC of Laplace transform	

			• Rational Laplace transforms • Pole-zero plot	
	22	Apr. 18	• Some important Laplace transform pairs • Inverse Laplace transform • ROC and causality and stability of LTI systems • Geometric properties of FT from pole-zero plot	
9	23	Apr. 21	• Laplace transform properties • System functions and block diagram representations • Feedback control • summary of Chapter 9 • Introduction to discrete-time signals and systems • Z-transform	Lab 3: Feedback Systems
	24	Apr. 22	• Introduction of Lab 1, 2 and 3 by TAs	
	25	Apr. 24	• Recitation Class	
10		TBD	Final Exam	-