SYLLABUS

1. **Course name:** Digital Signal Processing Laboratory
2. **Course code:** LDSP412546E
3. **Credits:** 1 (1/0/2)

   Duration: 09 weeks (45 hours for in-class and 90 hours for self-study)
4. **Instructors**
   a. Lê Minh Thành, MEng.
   b. Đặng Phước Hải Trang, MEng.
   c. Huỳnh Thị Thu Hiền, MEng.
5. **Course conditions**

   Prerequisites: Digital Signal Processing

   Corequisites: N/A
6. **Course description**

This course provides students with the skills to use Matlab software to simulate continuous-time (CT) signals and discrete-time (DT) signals. Through the simulating the types of signal, students can analyze, design and evaluate the CT and DT systems in both time and frequency domain. In addition, students are also involved in the analysis and evaluation of DT systems on Texas Instruments DSPs dedicated kit such as C6713 DSK, C6416 DSK and C6437 EVM.

7. **Course Goals**

Goals	Goal description *This course provides students:*	ELOs
G1	Basic knowledge of the simulation theory and methods of simulating the signals and systems in DSP applications.	01 (M) 07 (M)
G2	An ability to identify the simulation problems and to use skills and analytical methods to design the required systems with the appropriate softwares.	02 (M) 03 (H) 07 (M)
G3	An ability of team working, communication, and comprehension of the technical documents in English.	04 (M) 05 (M) 06 (H) 07 (M)
G4	An ability to identify the significance of the observation, analysis, and design by using simulation methods.	07(M) 08 (H) 09 (L)
G5	An ability of programming and simulating the properties of the DT signals and systems, filters on Matlab and DSP platforms.	10 (H) 11(M)

** Notes: H: **H**igh; M: **M**edium; L: **L**ow*

8. Course learning outcomes (CLOs)

CLOs		Mô tả *Sau khi học xong môn học này, người học có thể:*	ELOs
G1	G1.1	Introduction to Matlab and Code Composer Studio including how to make a project, how to run, how to see the results, and the supported commands in DSP applications.	01 07
	G1.2	Represent the expressions of signals and systems.	01, 07
	G1.3	Understand how to simulate a signal or a system on software.	01, 07
G2	G2.1	Use Matlab to simulate the CT and DT signals.	02, 03, 07
	G2.2	Use Matlab to simulate the DT systems.	02, 03, 07
	G2.3	Identify the properties of the Dt systems in the time domain.	02, 03, 07
	G2.4	Identify the properties of the Dt systems in the frequency domain.	02, 03, 07
	G2.5	Identify the frequency response of magnitude and phase.	02, 03, 07
	G2.6	Identify the supported functions of CCS software to view the numerical and graphical results.	02, 03, 07
G3	G3.1	Comprehend the English manuals of Matlab.	04, 05, 06, 07
	G3.2	Comprehend the English manuals of CCS.	04, 05, 06, 07
	G3.3	Present the report in English.	04, 05, 06, 07
G4	G4.1	Follow the lab's regulations.	07, 08, 09
	G4.2	Form a good learning style during class time.	07, 08, 09
	G4.3	Form honesty in reporting the experiment results.	07, 08, 09
G5	G5.1	Design and simulate a signal with any math expression on Matlab.	10, 11
	G5.2	Design and test the sinusoidal waveforms on DSP kit.	10, 11
	G5.3	Design, implement, and evaluate the DT systems on Matlab and DSP kit.	10, 11
	G5.4	Implement and test the operstors used in DSP on Matlab and DSP kit.	10, 11
	G5.5	Simulate the process of sampling, quantizing, digitizing and evaluating the effect of changing the sampling frequency.	10, 11

9. Study materials

a. Textbooks:

[1] Sanjit K. Mitra, *DSP Laboratory Using Matlab*, McGraw Hill College, 2005, ISBN-13: 978-0073108582.

[2] Kermit Sigmon, *Matlab Primer*, 3rd edition, Department of Mathematics, University of Florida, 1993.

[3] Rulph Chassaing, *Digital Signal Processing and Aplications with the C6713 and C6416 DSK*, John Wiley & Sons, Inc., 2005.

b. References:

[4] Rulph Chassaing, *DSP Applications Using C and the TMS320C6x DSK*, John Wiley & Sons, Inc., 2002.

10. Student assessments

a. Grading points: 10

b. Plan for student assessments is followed:

Types	Contents	Time-lines	Assessment techniques	CLOs	Rates (%)
Formative assessments					**70**
M	Draw continuous signals, natural sampling signals, sample and hold signals at a given frequency.	Week 1	In-class programming exercise and Submit report in English.	G1, G2.1, G3, G4, G5.1	10
M	Investigate the properties of discrete systems, find and draw impulse and step responses, find the output responses of the system.	Week 2	In-class programming exercise and Submit report in English.	G1, G2.2, G2.3, G3, G4, G5.1, G5.3	10
M	Investigate the properties of discrete systems in the frequency domain; determine and draw the frequency response and output response; zero-poles plot.	Week 3	In-class programming exercise and Submit report in English.	G1, G2.2, G2.4, G2.5, G3, G4, G5.1, G5.3	10
M	Investigate the sampling in the time domain; sampling effects in the frequency domain; anti-aliasing by using LPF.	Week 4	In-class programming exercise and Submit report in English..	G1, G2.6, G3, G4, G5.5	10
M	Create and draw the multiple frequency sinusoidal signals on DSP kit.	Week 5	In-class programming exercise and Submit report in English.	G1, G2.6, G3, G4, G5.2	10
M	Implement the linear convolution, circular convolution, and their relations on DSP kit.	Week 6	In-class programming exercise and Submit report in English.	G1, G2.6, G3, G4, G5.4	10
M	Implement the moving average filter, FIR/IIR, and other DT systems with the given difference equation.	Week 7-8	In-class programming exercise and Submit report in English.	G1, G2.6, G3, G4, G5.6	10
Summative assessments					**30**
F	Covering all contents related to the ELOs of the course.	Week 9	Multi-choice	All	10
			Programming		20

** Notes: Q: **Q**uiz; H: **H**omework; P: **P**roject; M: **M**idterm Exam; F: **F**inal Exam;*

11. Course details:

Weeks	Contents	CLOs
1	***Chapter 1:*** **Discrete time signals in the time domain** *(5/0/10)*	

	Contents: *(5)* 1.1 Introduction to Matlab software. 1.2 Background review. 1.3 Matlab commands used in simulating the DT signals. **Teaching methods**: + Slide presentation + Discussion	G1, G2.1, G3, G4, G5.1
	Self-study contents: *(10)* Continue simulating and reporting on sections 1.5 and 1.6 in textbook [1].	
2	***Chapter 2:*** **Discrete time systems in the time domain** *(5/0/10)*	
	Contents: *(5)* 2.1 Background review. 2.2 Matlab commands used in simulating the DT systems. **Teaching methods**: + Slide presentation + Discussion	G1, G2.2, G2.3, G3, G4, G5.1, G5.3
	Self-study contents: *(10)* Continue simulating and reporting on sections 2.4 and 2.5 in textbook [1].	
3	***Chapter 3:*** **DT signals and systems in the frequency domain** *(5/0/10)*	
	Contents: *(5)* 3.1 Background review. 3.2 Matlab commands used in simulating the DT signals and systems in the frequency domain. **Teaching methods**: + Slide presentation + Discussion	G1, G2.2, G2.4, G2.5, G3, G4, G5.1, G5.3
	Self-study contents: *(10)* Continue simulating and reporting on sections 3.4, 3.5, 3.6, 4.4, 4.5 and 4.6 in textbook [1].	
4	***Chapter 4:*** **Processing of CT signals** *(5/0/10)*	
	Contents: *(5)* 4.1 Background review. 4.2 Matlab commands used in simulating the processing of CT signals. **Teaching methods**: + Slide presentation + Discussion	G1, G2.6, G3, G4, G5.5
	Self-study contents: *(10)* Continue simulating and reporting on sections 5.4, 5.5, 5.6 and 5.7 in textbook [1].	
5	***Chapter 5:*** **Thực hiện mô phỏng tín hiệu trên kit** *(5/0/10)*	
	Contents: *(5)* 5.1 Introduction to CCS v3.1 and overview of C6713 DSK platform. 5.2 Methods to create a sinusoidal signal on kit.	

	Teaching methods: + Slide presentation + Discussion	G1, G2.6, G3, G4, G5.2
	Self-study contents: *(10)* Continue simulating and reporting on sections 1.2, 1.3 and 1.6 in textbook [3].	
6	***Chapter 6:*** **Operations of DSP application on kit** *(5/0/10)*	
	Contents: *(5)* 6.1 Background review. 6.2 Implementing the convolution and FFT operation on kit. **Teaching methods**: + Slide presentation + Discussion	G1, G2.6, G3, G4, G5.4
	Self-study contents: *(10)* Do assignments as required by instructor.	
7	***Chapter 7:*** **Implementing FIR/IIR on kit** *(5/0/10)*	
	Contents: *(5)* 7.1 Background review. 7.2 Implementing FIR on kit. **Teaching methods**: + Slide presentation + Discussion	G1, G2.6, G3, G4, G5.6
	Self-study contents: *(10)* Continue simulating and reporting in section 4.7 in textbook [3].	
8	***Chapter 7:*** **Implementing FIR/IIR on kit (cont'd)** *(5/0/10)*	
	Contents: *(5)* 7.3 Background review. 7.4 Implementing IIR on kit. **Teaching methods**: + Slide presentation + Discussion	G1, G2.6, G3, G4, G5.6
	Self-study contents: *(10)* Continue simulating and reporting in section 5.4 in textbook [3].	
9	**Review and summative assessment**	**All**

12. Learning ethics:

Homework assignments and projects must be done by the students themselves. Plagiarism found in the assessments will get point of zero.

13. First approved date: 15 / 01 / 2012

14. Approval level:

Dean **Department** **Instructor**

Nguyễn Minh Tâm, PhD. **Nguyễn Ngô Lâm, MEng.** **Lê Minh Thành, MEng.**

15. Tiến trình cập nhật ĐCCT

1st updated content date: 15/01/2014	**Instructor**: Lê Minh Thành, MEng. **Head of dept.**: Võ Minh Huân, PhD.
2nd updated content date: 15/01/2016	**Instructor**: Lê Minh Thành, MEng. **Head of dept.**: Phan Văn Ca, PhD.