SYLLABUS

1. **Course name:** Image Processing
2. **Course code:** IMPR432463
3. **Credits:** 3 (3/0/6)

   Duration: 15 weeks (45h main course and 90h self-study)
4. **Instructors:**

   1- Nguyen Thanh Hai, PhD

   3- Nguyen Duy Thao, MEng

   4- Nguyen Manh Hung, PhD
5. **Course conditions**

   Prerequisites: Programming Language

   Corequisites: Digital Signal Processing
6. **Course description**

This course introduces fundamental knowledge of image processing. The concept includes basic operation on image domain and its applications. These issues about image fitering, image enhancement, segmentation and edge detection will be discussed.

7. **Course Goals**

Goals	***Goal description*** *(This course provides students:)*	**ELOs**
G1	The fundamental of image processing.	01 (H)
G2	Image filtering and image enhancement	03 (M)
G3	Segmentation and edge detection	02 (M)

** Note: High: H; Medium: M; Low: L*

8. **Course Learning Outcomes (CLOs)**

CLOs		***Description*** *(After completing this course, students can have:)*	**Outcome**
	G1.1	Have ability to present image processing applications in industrial fields and human life.	1
	G1.2	Have ability to present the image acquisition.	1
	G1.3	Have ability to present an image in both space and frequency domain.	1
	G1.4	Have ability to transform the images in space domain and frequency domain.	1
	G2.1	Have ability to enhance the image	3
	G2.2	Have ability to enhance the image by Histogram equalization.	3
	G2.3	Have ability to apply image filtering in spatial domain.	3
	G2.4	Have ability to apply image filtering in frequency domain.	3

G3	G3.1	Have ability to solve the edge detection problems.	2
	G3.2	Have ability to solve the segmentation problems.	2
	G3.3	Have ability to implement image processing methods on a computer.	2

9. Study materials

- Textbooks:

[1] Nguyen Thanh Hai, *Giao trinh xu ly anh*, Dai hoc Su pham Ky thuat TP.HCM, 2014.

- References:

[2] Nguyen Quang Hoan, *Xu ly anh,* Hoc vien Cong nghe Buu Chinh vien thong, 2006.

[3] Do Nang Toan – Pham Viet Binh, *Xu ly anh,* Dai hoc Thai Nguyen, 2007.

10. Sudent Assessments

- Grading points: 10

- Planning for students assessment is followed:

Type	Contents	Linetime	Assessment techniques	CLOs	Rates (%)
Midterms					**50**
Exam01	Short test	The beginning of class	Oral talk in class	G1.2, G2.1, G3.1, G4.1	10
Exam02	Mid-term test	week 9	Individual paper assessment in class	G1.1, G1.2, G3.1, G4.1	20
Exam03	Project presentation	week 15	Presentation	G1.2, G3.2, G4.1	20
Final exam					**50**
Final Exam	- The exam covers all contents related to the expected learning outcomes of the course.		Individual paper assessment	G1.2, G1.3, G2.1, G3.1, G3.2, G4.1, G4.2, G4.3	

11. Course details:

Weeks	Contents	CLOs
	Chapter 1: **< IMAGE PROCESSING INTRODUCTION>** *(3/0/6)*	
	A/ **Contents and teaching methods***: (3)* **Contents:** 1.1 Image processing introduction. 1.2 Image processing applications. **Teaching methods**:	G1.1

	+ Theoretical lectures + Questions	
	***B/* Self-study contents**: *(6)* + Study about the new applied fields of image processing.	G1.1
	***Chapter 2:* < IMAGE PROCESSING>** *(6/0/12)*	
	A/* Contents and teaching methods: (3)*** **Contents:** 2.1 Image acquisition principle. 2.2 Basic image category. 2.3 Basic image parameter. **Teaching methods**: + Theoretical lectures. + Questions.	G1.2
	***B/* Self-study contents**: *(6)* + The basic standards of image compression. + Exercises	G1.1 G1.2
	***Chapter 2:* < IMAGE PROCESSING (cont.) >** *(6/0/12)*	
	A/* Contents and teaching methods:(3)*** **Contents:** 2.4 Matlab instruction for image processing. 2.5 Image import/export. 2.6 Image visulization. **Teaching methods**: + Theoretical lectures + Questions	G1.1 G1.2
	***B/* Self- study contents**: *(6)* + Understand the commands of MATLAB. + Exercises.	G1.1 G1.2
	***Chapter 3:* < IMAGE IN FREQUENCY DOMAIN >** *(6/0/12)*	
	A/* Contents and teaching methods: (3)*** **Contents:** 3.1 Signals in the frequency domain. 3.2 The Fourier transformations. **Teaching methods**: + Theoretical lectures + Questions	G1.2 G1.3 G1.4
	***B/* Self- study contents**: *(6)* + The Fourier transformation for the signals in the time domain. + Exercises	G1.2 G1.3
	***Chapter 3:* < IMAGE IN FREQUENCY DOMAIN (cont.) >** *(6/0/12)*	

	A/* Contents and teaching methods: (3)* **Contents:** 3.4 Present an image in frequency domain. 3.5 Fourier transformation and Inverse Fourier transformation. 3.6 Display an image in frequency domain. **Teaching methods**: + Theoretical lectures + Questions	G1.2 G1.3 G1.4
	***B/* Self- study contents**: *(6)* + Fourier transformation. + Exercises.	G1.2 G1.3
	***Chapter 4:* <IMAGE ENHANCEMENT >** *(6/0/12)*	
	A/* Contents and teaching methods: (3)* **Contents:** 4.1 Pixel based image enhancement. **Teaching methods**: + Questions and answers. + Guide to do exercises.	G2.1 G2.2
	***B/* Self- study contents**: *(6)* + The fundemental transformations.	G2.1 G2.2
	***Chapter 4:* <IMAGE ENHANCEMENT (cont.) >** *(6/0/12)*	
	A/* Contents and teaching methods: (3)* **Contents:** 4.2 Histogram equalization. 4.3 Histogram matching. **Teaching methods**: + Theoretical lectures + Questions	G2.1 G2.2
	***B/* Self- study contents**: *(6)* + Histogram equalization. + Exercises	G2.1 G2.2
	< PROGRAMMING INSTRUCTION > *(3/0/6)*	
	A/* Contents and teaching methods: (3)* **Contents:** 1. MATLAB for image enhancement. **Teaching methods**: + Intrustion.	G3.3 G2.1
	***B/* Self- study contents**: *(6)* + Summarize the knowledges. + Exercises.	G3.3 G2.1 G2.2
	***Chapter 5:* < IMAGE FILTERING>** *(6/0/12)*	

	A/* Contents and teaching methods: (3)* **Contents:** 5.1 Convolution oporator. 5.2 Image filtering in spatial domain. 5.2.1 First order filter 5.2.2 Second order filter **Teaching methods**: + Theoretical lectures + Questions.	G2.3
	***B/* Self- study contents**: *(6)* + Prepare for thematic. + Exercises.	G2.3
	***Chapter 5:* < IMAGE FILTERING (cont.) >** *(6/0/12)*	
	A/* Contents and teaching methods: (3)* **Contents:** 5.3 Image filtering in the frequency domain. 5.4 Low-pass filter. 5.5 High-pass filter. **Teaching methods**: + Theoretical lectures. + Questions. + Thematic guidance.	G2.4
	***B/* Self- study contents**: *(6)* + Summarize the knowledges. + Prepare for thematic.	G2.4
	< EXERCIES AND EXAM > *(3/0/6)*	
	A/* Contents and teaching methods: (3)* **Contents:** 1. Exercises 2. Exam. **Teaching methods**: + Questions and Answers. + Excercises intrustion.	G1.3 – G1.4 G2.1 – G2.4
	***B/* Self- study contents**: *(6)* + Summarize the knowledges.	G1.3 – G1.4 G2.1 – G2.4
	< PROGRAMMING EXERCISE REPORT > *(3/0/6)*	
	A/* Contents and teaching methods: (3)* **Contents:** 1 Image enhancement programming 2 Histogram equalization programming	G2.1-G2.4 G3.3

	3 Image filetring programming. **Teaching methods**: + Theoretical lectures + Questions	
	***B/* Self- study contents**: *(6)* + Group discussion + Review	G2.1-G2.4 G3.3
	***Chapter 6:* < SEGMENTAION AND EDGE DETECTION >** *(6/0/12)*	
	A/* Contents and teaching methods: (3)* **Contents:** 6.1 Edge detection . 6.2 Candy filter based edge detection. 6.3 Sobel filter based edge detection. **Teaching methods**: + Theoretical lectures. + Questions.	G3.1
	***B/* Self- study contents**: *(6)* + Laplace filter based Edge detection. + Exercises. + Prepare for the thematic.	G3.1
	***Chapter 6:* < SEGMENTAION AND EDGE DETECTION (cont.) >** *(6/0/12)*	
	A/* Contents and teaching methods: (3)* **Contents:** 6.4 Segmentation method. 6.5 Otsu Method. 6.6 Thematic reports. **Teaching methods**: + Theoretical lectures. + Questions. + Thematic guidance.	G3.2
	***B/* Self- study contents**: *(6)* + Summarize the knowledge. + Exercises.	G3.2
	PROGRAMMING EXERCISES REPORT	
	A/* Contents and teaching methods: (3)* **Contents:** 1 Program the operations for edge dectection. 2 Program the operations for segmentation. **Teaching methods**: + Report – Assessment.	G3.1-G3.3

	***B/* Self- study contents**: *(6)* + Summarize the knowledge. + Group discussion.	G3.1-G3.3

12. Learning ethics:

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

13. First approved date:

14. Approval level:

Dean	**Department**	**Instructor**

15. Syllabus updated process

1st time: Updated content dated	Instructors
2st time: Updated content dated	Head of department