

COURSE CODE: IVP501
DEGREE LEVEL: MASTER

IMAGE AND VIDEO PROCESSING

Ho Chi Minh City, June 2023

COURSE INTRODUCTION

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- COURSE DESCRIPTION
- COURSE OBJECTIVES
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INSTRUCTOR'S INFORMATION

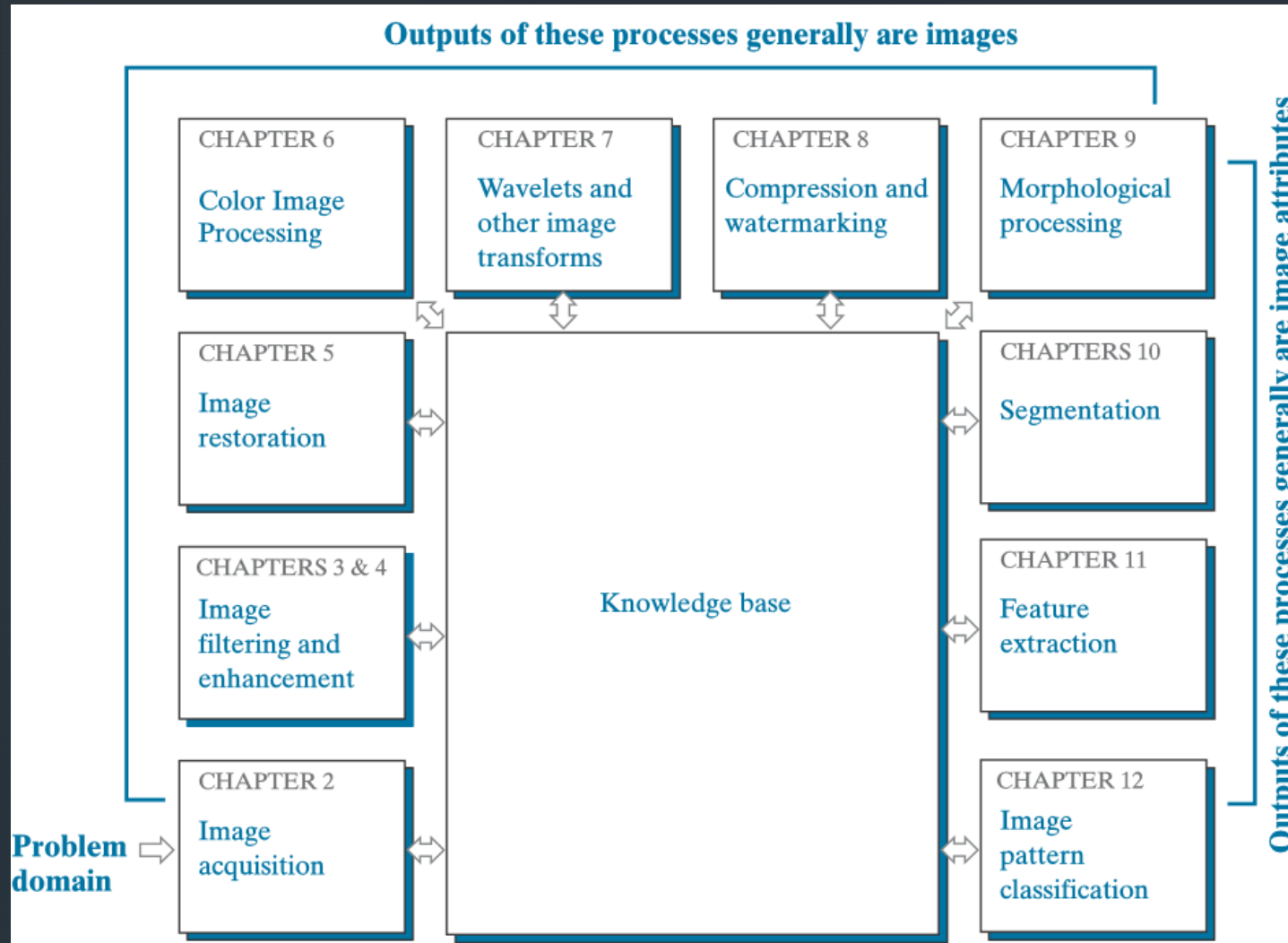
- **NAME:** NGUYEN NGOC TRUONG MINH
- **TITLE:** Doctor of Philosophy (UPMC, France, 2011)
- **SPECIFICATIONS:** Telecommunications & Signal Processing
- **CURRENT POSITION:** Head of Dept. of IoT and Wireless App.
- **AFFILIATION 1:** School of Electrical Engineering (since March 2012)
- **AFFILIATION 2:** International University, VNU-HCMC
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- **MOBILE:** 0903.760.100

COURSE DESCRIPTION

- The course is to combine **image and video processing** with a **practical MATLAB- (or Python-) oriented approach** in order to *demonstrate the most important image and video techniques and algorithms*
- The course has been organized into two parts:
 - Part I: Image Processing begins with an overview of the field, then introduces the fundamental concepts, notation, and terminology associated with image representation and basic image processing operations. Next, it discusses MATLAB (and its Image Processing Toolbox - IPT)/Python with the start of a series of chapters with hands-on activities and step-by-step tutorials.
 - Part II: Video Processing presents the main concepts and terminology associated with analog video signals and systems, as well as digital video formats and standards. It then describes the technically involved problem of standards conversion, discusses motion estimation and compensation techniques, shows how video sequences can be filtered, and concludes with an example of a solution to object detection and tracking in video sequences using MATLAB/Python.

COURSE DESCRIPTION

Fundamental steps in Digital Image Processing (DIP)



- Image and Video Processing, more commonly known as **IVP**, is a field to emulate some of the attributes of the human visual system.
- The fields of image and video processing have experienced tremendous growth and become more popular and accessible.

COURSE OBJECTIVES

By the end of the course, students will:

- Master the underlying **principles of digital image and video processing** and its many applications;
- Carefully develop **MATLAB/Python examples** throughout the text illustrate the mathematical concepts and use of **digital image and video processing algorithms**;
- Develop a deeper understanding of **how to apply the algorithms by manipulating the codes** in the examples to see their effect.

TEXTBOOKS

- Oge Marques, “*Practical Image and Video Processing Using MATLAB,*” 1st edition published 2011 by John Wiley & Sons.
- Rafael C. Gonzalez, and Richard E. Woods, “*Digital Image Processing,*” 4th edition published 2018 by Pearson.
- A. Murat Tekalp, “*Digital Video Processing,*” 2nd edition published 2015 by Prentice Hall.
- *Class Hand-outs*

STUDENT'S TASKS

- Students must attend **at least 80% of contact sessions** in order to be accepted to the presentation assignment.
- Student is responsible to **do all exercises** given by instructor in class or at home and submit on time.
- **Do not interrupt** the class to submit an assignment. Students must submit your assignment either before or after class or during the break.
- **Constantly follow announcements** on intranet/CMS at <http://cms.fpt.edu.vn> for up-to-date course information.
- Required knowledge: Intro to Computers (MATLAB), Python Programming, Linear Algebra, DSP

ASSESSMENT SCHEME

1) On-going assessment:

- 02 in-class activities: 20%
- 04 exercises: 20%
- 02 homework: 20%
- 01 final exam: 40%

2) Final Result: 100%

- Completion Criteria:
 - Both Assignment (exercises + quiz) and Final Result ≥ 5.0
- Scoring scale: 10

ASSESSMENT STRUCTURES

#	Evaluation Category	Duration	Type of exercises	Number of questions	Scope of knowledge and skills of exercises	How?	Note
1	In-class Activities	45-60'	Individual (Open)	2-3/each	studied chapters knowledge and skills	by instructor	20% final result
2	Exercises	From start to finish in schedule	Individual (Open)	2-3/each	studied chapters knowledge and skills	by instructor	20% final result
3	Homework	From start to finish in schedule	Individual (Open)	3-4/each	studied chapters knowledge and skills	by instructor	20% final result
4	Final Exam	180'	Group Work	05	Requirements: software on MATLAB, or Python and Q&A	by instructor	40% final result

SCHEDULE

<u>Weekday</u>	<u>Date</u>	<u>Lecture Time</u>	<u>Lecture Hours</u>
Tuesday	07/06/2023	18.00 – 21.00	03 hours
Thursday	09/06/2023	18.00 – 21.00	03 hours
Saturday	11/06/2023	13.30 – 16.30	03 hours
Tuesday	14/06/2023	18.00 – 21.00	03 hours
Thursday	16/06/2023	18.00 – 21.00	03 hours
Saturday	18/06/2023	13.30 – 16.30	03 hours
Tuesday	21/06/2023	18.00 – 21.00	03 hours
Thursday	23/06/2023	18.00 – 21.00	03 hours
Tuesday	07/06/2023	18.00 – 21.00	03 hours
Thursday	09/06/2023	18.00 – 21.00	03 hours
Saturday	11/07/2023	13.30 – 16.30	03 hours
Tuesday	14/07/2023	18.00 – 21.00	03 hours

SCHEDULE

<u>Session</u>	<u>Content</u>
1	Course introduction
	Introduction to IVP
	Introduction and Overview
2	Image Processing Basics
	MATLAB/Python Basics
	Exercise 1
3	The Image Processing Toolbox at a glance
	Image Sensing and Acquisition
	Arithmetic and Logic Operations
4	Geometric Operations
	Gray-Level Transformations
	Exercise 2
5	Histogram and Neighborhood Processing
	Quiz 1
	Exercise 3

SCHEDULE

<u>Session</u>	<u>Content</u>
6	Frequency-Domain Filtering
	Image Restoration
7	Morphological Image Processing
	Edge Detection
	Exercise 4
8	Image Segmentation
	Color Image Processing
	Image Compression and Coding
9	Feature Extraction and Representation
	Visual Pattern Recognition
	Exercise 5
10	Video Fundamentals
	Video Sampling Rate and Standard Conversion
	Quiz 2
11	Digital Video Processing Techniques and Applications
12	Final Exam by Group Work

Q&A

- Q: How to learn this course and get pass?
- A: *Main resources available (on-class lectures, reference books both in English and Vietnamese, yourselves)*
- Q: How I collaborate with classmates?
- A: *You are welcome to discuss assignments and laboratory projects with other students, provided that all work turned in must be your own. Cheating will not be tolerated.*
- Q: How can I be absent from class if personal issues?
- A: *Inform me in advance or no later than 02 days since class happens.*

▶ **NOW LET'S START THE COURSE**

