

**46. Digital image processing (PH041IU)**

Module designation	<i>This course provides advanced topics in digital image processing. In-class students will be provided in-depth theoretical knowledge of professional themes, including segmentation, morphological image processing, linear image filtering, imaging correlation, imaging transforms, eigenimage, multiresolution image processing, noise reduction and restoration, feature extraction, and recognition tasks.</i>
Semester(s) in which the module is taught	1, 2
Person responsible for the module	Dr. Hồ Đình Duẩn
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/4.62 ECTS
Required and recommended prerequisites for joining the module	Previous course: Introduction to Digital Image Processing (PH038IU)



Module objectives/intended learning outcomes	Upon the successful completion of this course students will be able to:	
	Competency level	Course learning outcome (CLO)
	Knowledge	CLO1. Develop algorithms for digital image analysis and interpretation in engineering areas.
	Skill	CLO2. Analyze digital images using various platforms and programming languages.
Attitude	CLO3. Show abilities of further self-learning and lifelong learning.	



Content	<p><i>The description of the contents should clearly indicate the weighting of the content and the level.</i></p> <p>Weight: lecture session (3 hours)</p> <p>Teaching levels: I (Introduce); T (Teach); U (Utilize)</p>		
	Topic	Weight	Level
	Introduction	1	I, T
	Point Operations, local and global operations for image segmentation.	1	I, T
	Differential operators for segmentation: Gradient and Laplacian.	1	I, T
	Histograms revisited and Statistics-based segmentation.	1	I, T
	Color Science.	1	I, T
	Feature representation.	1	I, T
	Morphological Image Processing.	1	I, T
	Linear Image Processing and Filtering.	1	I, T
	Template Matching.	1	I, T
	Eigen images.	1	I, T
	Feature descriptors.	1	I, T
	Fourier and Morphology-based descriptors.	1	I, T
	Scale-Space Image Processing.	1	I, T
Feature-based Methods for Image Matching.	1	I, T	
Image classification and simple recognition.	1	U	



Examination forms	Project /Exam.
Study and examination requirements	<p>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.</p> <p>Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</p>
Reading list	<p>Textbook:</p> <p>[1] Scott Umbaugh (1998). <i>Computer Vision and Image Processing</i>, Prentice-Hall, Inc., Upper Saddle River, New Jersey.</p> <p>[2] Lecture notes</p> <p>References:</p> <p>[3] Abramowitz, M., and I. A. Stegun (1964). <i>Handbook Of Mathematical Functions with Formulas, Graphs, And Mathematical Tables</i>, U.S. Govt. Print. Off., Washington.</p> <p>[4] Bracewell, R. N. (1986). <i>The Fourier Transform and Its Applications</i>, McGraw-Hill, New York, 2nd edition.</p> <p>[5] Goodman, J.W. (1968). <i>Introduction to Fourier Optics</i>, McGraw-Hill, New York.</p> <p>[6] Pratt, W.K. (1978). <i>Digital Image Processing</i>, John Wiley and Sons, New York.</p> <p>[7] Lillesand and Kiefer (1994). <i>Remote Sensing and Image Interpretation</i>, Third Edition, Wiley, New York</p> <p>[8] Gonzalez, R. & Woods R (2008). <i>Digital Image Processing</i>, 3rd Edition, Addison Wesley.</p>