City University of Hong Kong
Course Syllabus

offered by Department of Electronic Engineering
with effect from Semester B in 2017/2018

Part I Course Overview

Course Title:	Topics in Computer Vision
Course Code:	EE5811
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil Mathematical knowledge reaching the equivalent of [MA3150 Advanced Mathematical Analysis, or MA3151 Advanced Engineering Mathematics] and [MA3160 Probability and Stochastic Processes, or EE3313 Applied Queueing Systems] and Programming knowledge reaching the equivalent of [CS2363 Computer Programming or equivalent]
Precursors: *(Course Code and Title)*	Specifically, C programming will be required.
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course aims to provide students with an in depth critical understanding of the principles, concepts, and advanced techniques in Computer Vision.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Apply techniques to extract useful features from an image.		✓	✓	✓
2.	Apply techniques to extract 3D information from one or more images.		✓		
3.	Apply techniques to recognize 3D objects.		✓		
4.	Apply techniques to extract information from object motion.		✓	✓	✓
5.	Apply and evaluate advanced techniques in computer vision.		✓	✓	
		100%			

A1: *Attitude*
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: *Ability*
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5		
Lecture	Key concepts of image understanding and computer vision are described and illustrated	✓	✓	✓	✓	✓		2 hrs/wk
Tutorial	Key concepts are worked out based on questions and problem solving	✓	✓	✓	✓	✓		1hr/wk (*Some of the tutorials will be conducted in the laboratory)*
Assignments	Through working on the assignments, students will learn how to use image processing and computer vision related tools for solving computer vision problems	✓			✓	✓		
Quizzes	Evaluate the ability to implement computer vision techniques	✓	✓	✓	✓			

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.						Weighting	Remarks
	1	2	3	4	5			
Continuous Assessment: 40%								
At least 3 assignments and quizzes	✓	✓	✓	✓	✓		40%	
Examination: 60% (duration: 2hrs)								
							100%	

Remark:

To pass the course, students are required to achieve at least 30% in course work and 30% in the examination.

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Examination	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level

6. Constructive Alignment with Programme Outcomes

PILO	How the course contribute to the specific PILO(s)
1	The student will acquire an ability to describe current and anticipated trends in computer vision through an overview of the field as well as an in depth understanding of selected topics through lectures, tutorials and laboratories.
2	The student will be able to evaluate and analyze new technologies in computer vision through an understanding of the performance and limitations of current computer vision technology through lectures, tutorials and laboratories.
3	The student will be able to apply specialist knowledge in the computer vision laboratories.
4	The student will be able to assess, evaluate and formulate solutions to problems or specifications in computer vision through theoretical and practical knowledge learnt during lectures, tutorials and laboratories.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

Introduction
Goals of computer vision; applications; relations with other fields; resources.

Image Processing
Image acquisition; image degradation; types of noises; noise filtering techniques.

Feature Extraction
Edge detection; corner detection; line and curve detection; color; texture.

Pattern Recognition
Classifiers; object recognition; image retrieval.

Motion from Image Sequence
Optical flow; visual surveillance; video processing.

Perceiving 3D from Images
Camera calibration; shape-from-X.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	O. Marques, Practical Image and Video Processing Using MATLAB, (John Wiley & Sons, 2011)
2.	L. G. Shapiro, G.C. Stockman, Computer Vision, (Prentice Hall, 2001)

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	E. Trucco, A. Verri : Introductory Techniques for 3-D Computer Vision, (Prentice Hall, 1998)
2.	D.A. Forsyth, J. Ponce, Computer Vision A Modern Approach, (Prentice Hall, 2003)
3.	R. Jain, R. Kasturi, B.G. Schunck, Machine Vision, (McGraw-Hill, 1995)
4.	R. Szeliski, Computer Vision, (Springer, 2011)
5.	A. Del Bimbo, Visual Information Retrieval, (Morgan Kaufmann, 1999)