

City University of Hong Kong

Information on a Course offered by Department of Computer Science with effect from Semester A in 2014 / 2015

Part I

Course Title: Computer Vision and Image Processing

Course Code: CS4186

Course Duration: One Semester

Credit Units: 3

Level: B4

Medium of Instruction: English

Pre-requisites: (Course Code and Title)
CS2303 Data Structures for Media or
CS3334 Data Structures or
CS4335 Design and Analysis of Algorithms or
EE2331 Data Structures and Algorithms or
EE3131 Object-oriented Programming Methodology†

Pre-cursors: (Course Code and Title)
Nil

Equivalent to the Old Course Code & Title: (Course Code and Title)
Nil

Exclusive Courses: (Course Code and Title)
Nil

Part II

Course Aims:

The elective course introduces a thorough grounding of the principles of computer vision and image processing, and seeks to develop students' knowledge from basic image processing techniques to advanced computer vision and image analysis systems. It concentrates on the fundamental theory of computer vision and image processing with emphasis on the areas of image compression, image segmentation, object recognition, motion analysis and scene understanding.

Course Intended Learning Outcomes (CILOs)

Upon successful completion of this course, students should be able to:

No.	CILOs	Weighting (if applicable)
1.	explain the main characteristics of different computer vision and image processing techniques through observation of their operations;	
2.	implement different computer vision and image processing solutions;	
3.	perform critical assessment of the effectiveness of different computer vision and image processing approaches;	
4.	apply and combine suitable computer vision and image processing principles to create new and improved solutions for real-world applications.	

Teaching and Learning Activities (TLAs)

(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

Teaching pattern:

Suggested lecture/laboratory mix: 2 hrs. lecture; 1 hr. tutorial.

This course will mainly focus on introducing students to the principles and applications of computer vision and image processing. In particular, an example-based approach will be adopted in which each approach is illustrated with examples from real-world applications. In addition, emphasis will also be placed on the motivation behind each approach to arouse the students' interests, and the combination of suitable approaches to solve real-world problems.

Based on the Course ILOs, the teaching/learning activities of this course may include:

ILO No	TLAs	Hours/week (if applicable)
CILO 1 CILO 3 CILO 4	Lecture - The lecture will focus on the introduction of computer vision and image processing techniques, and related real-world applications such as object recognition, motion analysis and scene understanding. This activity helps support ILO 1, 3 and 4.	
CILO 1	Tutorial - Students will work on a different problem set each week during the tutorial sessions, through which they can discover the main characteristics of different computer vision and image processing techniques. They will also be invited to present their solutions, and the class will be encouraged to provide comments. This activity helps support ILO 1.	

CILO 2 CILO 3	Assignment - The students will implement selected computer vision and image processing approaches, apply these approaches to real images/videos, and interpret the results. In this way, students can observe the characteristics and perform critical assessment of these different approaches. This activity helps support ILO 2 and 3.	
CILO 4	Project - The students will create a new system design which combines different computer vision and image processing approaches to solve a real-world problem. The students will apply the principles they have learnt from the course for their design. This activity supports ILO 4.	

Assessment Tasks/Activities

(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

ILO No	Type of assessment tasks/activities	Weighting (if applicable)	Remarks
CILO 1	Coursework: Students are required to work on different tutorial problem sets each week, and present their solutions in class. The ability of students to discover the main characteristics of different computer vision and image processing techniques through these problems will be used to assess this ILO. Exam: Final exam will include questions to assess the capability of students to identify the important features of different computer vision and image processing techniques.		
CILO 2	Coursework: Students are required to work on an assignment to implement selected computer vision and image processing algorithms, and observe the processing results of these different approaches on real images/videos. The accuracy and efficiency of the implemented algorithms will be used to assess this ILO.		
CILO 3	Coursework: Students are required to perform a critical assessment of different algorithms in their assignment and course project. Their ability to identify the merits and shortcomings of the algorithms will be used to assess this ILO.		

	Exam: Final exam will include questions to assess the capability of students to perform critical evaluation of different computer vision and image processing approaches.		
CILO 4	Coursework: Students will create a new system design which combines different computer vision and image processing approaches to solve a real-world problem. The effectiveness of the new system in solving the specified problem will be used to assess this ILO. Exam: Final exam will include questions to assess the capability of students to apply suitable computer vision and image processing techniques to create a new design for a computer vision/image processing system based on a requirement specification.		

Grading of Student Achievement: Refer to Grading of Courses in the Academic Regulations.

Examination duration: 2 hours

Percentage of coursework, examination, etc.: 30% CW; 70% Exam

Grading pattern: Standard (A+AA-...F)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Part III

Keyword Syllabus

Digital Image Fundamentals. Image Compression. Image Segmentation. Object Recognition. Motion Analysis. Scene Understanding.

Recommended Reading

Text(s):

D. Forsyth and J. Ponce, Computer Vision: A Modern Approach, 2nd Ed, Prentice Hall (2011)

R. Gonzalez and R. Woods, Digital Image Processing, 3rd Ed, Prentice Hall (2007)