



THE CHINESE UNIVERSITY OF HONG KONG
DEPARTMENT OF CSE ENGINEERING

COURSE OUTLINE

CMSC5711 Image Processing and Computer Vision

<https://blackboard.cuhk.edu.hk/ultra/courses/CMSC5711>

1. Course description

This course includes fundamental topics in image processing, e.g., image enhancement techniques, color image processing, image segmentation and image compression. In addition, the course also focuses on topics concerning methodologies of recovering 3D information from 2D images. Specifically, techniques for camera calibration, stereopsis, motion analysis, pose estimation and structure from motion will be discussed. These techniques will have practical applications to virtual reality, model reconstruction and graphics.

2. Number of credit units: 3

3. Course timetable

2025-26	Semester 2a	Venue
Lecture	Wednesdays 06:30 to 9:15 p.m.	To Be Announced

4. Course instructor

Name: Professor Kin Hong Wong
Office Location: SHB1012
Telephone: 3943 8415
Email Address: khwong@cuhk.edu.hk

5. Teaching assistants: (Name, Building/Room Number, Email Address, Office hours)

	<u>Name</u>	<u>Office</u>	<u>Telephone</u>	<u>Email:</u>
1.	None			

6. Learning outcomes

At the end of the course of studies, students will have acquired the ability to

1. understand the mathematics of image formation and modelling of digital cameras,
2. understand how to extract information and features such as point, lines, corners and color information from images,
3. understand the methods of object tracking
4. understand the methods of extracting 3D information from 2D images, such as stereo vision, pose estimation and model reconstruction from image sequences.

7. Use of course website

The course website is <https://www.cse.cuhk.edu.hk/%7Eekhwong/www2/cmssc5711/cmssc5711.shtml> and teaching materials are also available on Blackboard for the distribution of course-related announcements, documents, lecture notes, and tutorial materials.

8. Teaching mode and learning activities

Inside classroom (face-to-face)

- Lectures
 - The lectures cover the principles of the course topics according to the teaching plan.

Online

- Reading materials
- Online exercises

9. Teaching schedule and content

<u>Week</u>	<u>Date</u>	<u>Topics/Content</u>	<u>Remarks</u>
1	January 7, 2026	Camera model	
2	January 14, 2026	Edge detection	
3	January 21, 2026	Feature extraction and tracking	

4	February 4, 2026	Hough Transform	
5	February 11, 2026	Histogram equalization	
6	February 18, 2026	Manshift object tracking and stereo computer vision	
7	February 25, 2026	Factorization for structure from motion	
8	March 4, 2026	Linear Pose estimation method	
9	March 11, 2026	Bundle adjustment method for structure from motion and 3D display	
10	March 18, 2026	Camera calibration	
11	March 25, 2026	Neural networks for computer vision: CNN model	
12	April 1, 2026	Neural object detection and Radiance field approaches	
13	April 15, 2026	Final Examination	

10. Assessment type, percentage, policies and rubrics

<u>Assessment type</u>	<u>Weighting (%)</u>	<u>Remarks</u>
▪ Class Participation	0	
▪ Assignments	40	
▪ Quiz	0	
▪ Midterm Test	0	
▪ Final Examination	60	
▪ Project / Report		
100		

Policy for Late submission:

- NO late submission will be accepted.

Policy for Absence from test examinations: (Select / revise)

- For quiz/test/examinations arranged by course instructor:
 - **Absence due to non-medical reasons:** submit absence request to course instructor at least 1 week in advance of the exam date, with supporting documents from the organizer involved.
 - **Absence due to medical reasons on exam/test day:** submit valid medical proof issued by registered medical doctor in Hong Kong to course instructor within 2 calendar days after the exam/test date.
 - No make-up exam or special arrangements will be arranged if the above requirements are not met.
 - Final decision will be made by the course instructor.
- For centralized examinations arranged by (Registration and Examination Section) RES:
 - Make-up examinations can be requested according to the rules set by RES.

Grade Descriptors:

A: EXCELLENT – exceptionally good performance and far exceeding expectation in all or most of the course learning outcomes; demonstration of superior understanding of the subject matter, the ability to analyze problems and apply extensive knowledge, and skillful use of concepts and materials to derive proper solutions.

A-

B+,B: GOOD – good performance in all course learning outcomes and exceeding expectation in some of them; demonstration of good understanding of the subject matter and the ability to use proper concepts and materials to solve most of the problems encountered.

B-

C+,C: FAIR – adequate performance and meeting expectation in all course learning outcomes; demonstration of adequate understanding of the subject matter and the ability to solve simple problems.

C-

D+, D: MARGINAL – performance barely meets the expectation in the essential course learning outcomes; demonstration of partial understanding of the subject matter and the ability to solve simple problems.

F: FAILURE – performance does not meet the expectation in the essential course learning outcomes; demonstration of serious deficiencies and the need to retake the course.

11. Required and recommended readings

Required readings

Reference Books

- Hartley and Zisserman, Multiple geometry in computer vision, Cambridge University Press. 2011
- Digital image processing, R.C. Gonzalez, R.E. Woods Ed.4, Gatesmark Publishing. (<http://books.google.com/>). 2019
- Learning OpenCV: Computer Vision with the OpenCV Library by Gary Bradski, O'Reilly. 2008
- Deep Learning in Object Detection and Recognition by Xiaoyue JiangAbdenour HadidYanwei PangEric GrangerXiaoyi Feng, Springer 2019

12. Feedback for evaluation

Students are encouraged to give comments and make suggestions using the following channels:

1. There is course evaluation at the end of the course. This is a formal channel for students to rate the teacher, the course, and the course tutors. Students can give specific comments or suggestions in addition to the numeric ratings.
2. Students can provide feedbacks using informal channels, such as email, or simply by discussing with the tutors or the instructor directly.

13. Academic honesty and plagiarism

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at

<http://www.cuhk.edu.hk/policy/academichonesty> (CUHK)

<https://www.erg.cuhk.edu.hk/erg/AcademicHonesty> (Engineering Faculty)

With each assignment, students will be required to submit a signed **declaration** (Attachment) that they are aware of these policies, regulations, guidelines and procedures.

- In the case of group projects, all members of the group should be asked to sign the declaration, each of whom is responsible and liable to disciplinary actions, irrespective of whether he/she has signed the declaration and whether he/she has contributed, directly or indirectly, to the problematic contents.
- For assignments in the form of a computer-generated document that is principally text-based and submitted via VeriGuide, the statement, in the form of a receipt, will be issued by the system upon students' uploading of the soft copy of the assignment.
- Students are fully aware that their work may be investigated by AI content detection software to determine originality.
- Students are fully aware of the AI approach(es) adopted in the course. In the case where some AI tools are allowed, students have made proper acknowledgment and citations as suggested by the course teacher.

Assignments without a properly signed declaration will not be graded by teachers.

Only the final version of the assignment should be submitted via VeriGuide.

The submission of a piece of work, or a part of a piece of work, for more than one purpose (e.g. to satisfy the requirements in two different courses) without declaration to this effect shall be regarded as having committed undeclared multiple submissions. It is common and acceptable to reuse a turn of phrase or a sentence or two from one's own work; but wholesale reuse is problematic. In any case, agreement from the course teacher(s) concerned should be obtained prior to the submission of the piece of work.

The copyright of the teaching materials, including lecture notes, assignments and examination questions, etc., produced by staff members/ teachers of The Chinese University of Hong Kong (CUHK) belongs to CUHK. Students may download the teaching materials produced by the staff members/ teachers from the Learning Management Systems, e.g. Blackboard, adopted by CUHK for their own educational use, but shall not distribute/ share/ copy the materials to a third-party without seeking prior permission from the staff members/ teachers concerned.

14. Use of Generative Artificial Intelligence (AI) Tools in Teaching, Learning and Assessment

Approach 1 - All use of AI tools is prohibited in assignments and assessment tasks

15. Guideline on sharing lecture recordings

Attention is drawn to the following:

- The copyright of any lecture recordings shared in the course, whether they are produced by teachers, students, or peer note-takers, belongs to the University.
- Students should not share these recordings with others without obtaining prior written consent from the teacher(s).

Attachment

Declaration for written assignment

I am/we are submitting the assignment for:

- ☐ an individual project or
- ☐ a group project on behalf of all members of the group. It is hereby confirmed that the submission is authorized by all members of the group, and all members of the group are required to sign this

declaration.

I/We declare that: (i) the assignment here submitted is original except for source material explicitly acknowledged/all members of the group have read and checked that all parts of the piece of work, irrespective of whether they are contributed by individual members or all members as a group, here submitted are original except for source material explicitly acknowledged; (ii) the piece of work, or a part of the piece of work has not been submitted for more than one purpose (e.g. to satisfy the requirements in two different courses) without declaration; and (iii) the submitted soft copy with details listed in the <Submission Details> is identical to the hard copy(ies), if any, which has(have) been / is(are) going to be submitted. I/We also acknowledge that I am/we are aware of the University's policy and regulations on honesty in academic work, and of the disciplinary guidelines and procedures applicable to breaches of such policy and regulations, as contained in the University website <http://www.cuhk.edu.hk/policy/academichonesty/>.

In the case of a group project, we are aware that all members of the group should be held responsible and liable to disciplinary actions, irrespective of whether he/she has signed the declaration and whether he/she has contributed, directly or indirectly, to the problematic content.

I/we declare that I/we have not distributed/ shared/ copied any teaching materials without the consent of the course teacher(s) to gain unfair academic advantage in the assignment/ course.

I/we declare that I/we have read and understood the University's policy on the use of AI for academic work. I/we confirm that I/we have complied with the instructions given by my/our course teacher(s) regarding the use of AI tools for this assignment and consent to the use of AI content detection software to review my/our submission.

I/We also understand that assignments without a properly signed declaration by the student concerned and in the case of a group project, by all members of the group concerned, will not be graded by the teacher(s).

Signature(s)

Date

Name(s)

Student ID(s)

Course code

Course title

Appendix (DELETE the Appendix after copying the chosen approach description to section 14)

Approach 1 – Prohibit all use of AI tools

In assessing the level of achievement of learning outcomes and students' performance, students are expected to produce their own work independently without any collaboration with the use of AI tools.

All use of AI tools is prohibited in assignments and assessment tasks

For assignments and assessment tasks that count towards the final course grades, students are not allowed to submit work which is produced with the collaboration of or supported by the use of any generative AI tools (e.g. ChatGPT)*.

Any breach of the regulations will be considered an act of academic dishonesty and will be handled according to the University's *Procedures for Handling Cases of Academic Dishonesty*.

In case of queries, students should seek advice from the course teacher.

* Teachers may add examples of AI tools relevant to their disciplines.