University of Computer Studies
B.C.Sc. (Fifth Year)
CS-504(Computer Vision and Interactive Computer Graphics) (Elective)
Course Description

Course Code	CS-504	Course Title	Computer Vision and Interactive Computer Graphics
Semester Hours	3 hours per week Lecture 1 hour Practical 2 hours	No. of Credit Units	3
Prerequisites	CS-402, CS-406	Course Coordinator	Dr. Ah Nge Htwe, Professor Faculty of Computer Science

Course Aims
- To provide knowledge of computer vision and application to students
- To understand computer vision methods and apply them

Course description

This course provides an introduction to computer vision. Major topics include image formation image processing, detection, segmentation and recognition.

Course objectives
- Explain the basic concepts of computer vision.
- Apply computer vision techniques and develop programs to enhance, define, classify and analysis image scenes.

Learning Outcomes
Upon completion of this course, students will:

- Be familiar with both the theoretical and practical aspects of computing with images;
- Have described the foundation of image formation, measurement, and analysis;
- Have implemented common methods for robust image matching and alignment;
- Understand the geometric relationships between 2D;
- Have gained exposure to object and scene recognition and categorization from images and
- Developed the practical skills necessary to build computer vision applications.

Course contents
- Introduction to computer vision
- Image formation
- Image processing
- Feature detection and matching
- Segmentation and recognition

Textbook
1. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010.

Reference Materials:
1. Shapiro and Stockman, Computer Vision, Prentice-Hall, 2001.

2. David Forsyth and Jean Ponce, Computer Vision: A Modern Approach, 2nd edition, Pearson, 2012.

Course Organization
Your participation in the course will involve six forms of activity.
1. Attending the lectures
2. Class participation and presentation
3. Practical assignments
4. Reading assignments
5. Exam
6. Quiz

Assessment
Exam	50%
Tutorial	10%
Project / Practical	10%
Assignment	10%
Presentation + Quiz	10%
Attendance + Moodle	10%

Tentative Schedule

45 Periods for 15 weeks (50 minutes per period)

No.	Chapter	Page	Period
1	**Chapter 1** **Introduction**		**1**
2	1.1 What is computer vision? 1.2 A brief history	3-10	1
3	**Chapter 2** **Image Formation**		**7**
4	2.1 Geometric primitives and transformations 2.1.1 Geometric primitives 2.1.2 2D transformations	29-33	2
5	2.3 The digital camera 2.3.2 Color	69	1
6	Lab + Discussion		4
7	**Chapter 3** **Image Processing**		**12**
8	3.1 Point 3.1.1 Pixel transforms 3.1.2 Color transforms 3.1.3 Compositing and matting 3.1.4 Histogram equalization	89-94	2
9	3.2 Linear filtering 3.2.1 Separable filtering 3.2.2 Examples of linear 3.2.3 Band-pass and steerable filters	98-104	3

10	3.3 More neighborhood operators 3.3.1 Non-linear 3.3.2 Morphology 3.3.3 Distance transforms	108-113	3
11	3.6 Geometric transformations	143	2
12	Lab + Discussion		2
13	**Chapter 4** **Feature detection and matching**		**7**
14	4.1 Points and patches 4.1.1 Feature detectors 4.1.2 Feature descriptors 4.1.3 Feature matching	183-200	2
15	4.2 Edges 4.2.1 Edge detection	210-214	3
16	Lab + Discussion		2
17	**Chapter 5** **Segmentation**		**5**
18	5.3 Mean shift and mode finding 5.3.1 K-means and mixtures of Gaussians	254-256	3
19	Exercises + Lab		2
20	**Chapter 14** **Recognition**		**13**
21	14.1 Object detection 14.1.1 Face detection 14.1.2 Pedestrian detection	278-285	2
22	14.2 Face recognition	288	3
23	14.3 Instance recognition	602	1
24	14.4 Category recognition	611	1
25	14.5 Context and scene understanding 14.5.1 Learning and large image collections	625-627	1
26	Lab + Discussion		5