

**Title (Units):** COMP 7040 Computer Vision and Pattern Recognition (3,3,0)

**Course Aims:** To give students some advanced topics in the area of contemporary research of computer vision and pattern recognition

**Prerequisite:** Research Postgraduate Student Standing

**Course Intended Learning Outcomes (CILOs):**

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

No.	Course Intended Learning Outcomes (CILOs)
	<b>Knowledge</b>
1	Explain basic theories and techniques of computer vision and pattern recognition
2	Identify various approaches and design for computer vision and pattern recognition systems
3	Discuss the advanced topics in computer vision and pattern recognition
	<b>Professional Skill</b>
4	Design and implement a simple computer vision and pattern recognition system which can handle certain problem
5	Apply some new techniques to computer vision and pattern recognition
	<b>Attitude</b>
6	Appraise a variety of research issues in this field

**Calendar Description:** This course gives students some advanced topics in the areas of computer vision and pattern recognition.

**Teaching and Learning Activities (TLAs):**

CILOs	TLAs
1-5	Students will learn all knowledge of computer vision and pattern recognition through lectures and tutorials. Besides, assignment(s), and final examination will be designed to evaluate the students' learning performance.
1-6	Students are required to read the research papers and write a term paper focusing on a specific topic in the fields of computer vision and pattern recognition, whereby gaining an in-depth understanding of the latest status of the research development in these two fields.

**Assessment:**

No.	Assessment Methods	Weighting	CILOs to be addressed	Remarks
1	Continuous Assessment	50%	1-6	Continuous assessments are designed to measure how well students have learned the fundamentals and major concepts of computer vision and pattern recognition. Some advanced topics are required to read and provide a term paper.
2	Final Examination	50%	1-6	Final examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be analysis and skills based to assess students' knowledge in computer vision and pattern recognition as well as their applications.

**Rubrics:**

	Excellent (A)	Good (B)	Satisfactory (C)	Fail (F)
<b>Creativity and originality on group project</b>	All of the concepts and content are different from the lectures with impressive creativity	Most of the concepts and content are different from the lectures with good creativity	Some of the new concepts	No new idea
<b>Explain, analysis and the use of pattern recognition algorithms</b>	Make good use of algorithms	Often make good use of algorithms	Sometimes make good use of algorithms	Not able to make good use of algorithms
<b>Explain and describe the</b>	Well explain and describe basic	Explain and describe basic	Sometimes explain and describe basic	Not able to explain and describe basic

<b>basic principle of a pattern recognition system</b>	principles of a computer vision and pattern recognition system	principles of a computer vision and pattern recognition system	principles of a computer vision and pattern recognition system	principles of a computer vision and pattern recognition system
<b>Implementation of pattern recognition algorithm</b>	Fully correct in implementing computer vision and pattern recognition algorithms	Mostly correct in implementing computer vision and pattern recognition algorithms	Partially correct in implementing computer vision and pattern recognition algorithms	Not able to implement computer vision and pattern recognition algorithms

### Learning Outcomes and Weighting:

Content	CILO No.
I - V	1 - 5
VI	6

- References:**
- C.H. Chen, Handbook of Pattern Recognition & Computer Vision, 5<sup>th</sup> Edition, World Scientific, 2016.
- R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, 2<sup>nd</sup> Edition, John Wiley & Sons, Inc, 2001.
- Reinhard Klette, Concise Computer Vision: An Introduction into Theory and Algorithms, Springer, 2014.
- IEEE Transactions on Pattern Analysis and Machine Intelligence
- IEEE Transactions on Image Processing
- IEEE Transactions on Circuit Systems and Video Technology
- International Journal on Computer Vision
- The Journal of the Pattern Recognition Society, Pattern Recognition.

### Course Content in Outline:

#### Topic

- I. Image Formation
  - A. Photometric image formation
  - B. Geometric primitives and transformations
- II. Segmentation
  - A. Active contours
  - B. Split and merges
  - C. New techniques
- III. Feature Extraction
  - A. Bag of words
  - B. SIFT
  - C. New techniques
- IV. Object Tracking
  - A. Point tracking
  - B. Kernel tracking
- V. Classification Approaches
  - A. Statistical Method
  - B. Structural Method
  - C. Hybrid Method
- VI. Applications