



**Faculty of Engineering and Technology**  
**Department of Electrical and Computer Engineering**  
**First Semester, 2023/2024**

Course Information	
Course Title	Computer Vision
Course Number	ENCS5343
Prerequisites	ENCS3340 ARTIFICIAL INTELLIGENCE Computer Programming and Data Structures
Instructors	Ismail Khater, Aziz Qaroush
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References
<ul style="list-style-type: none"><li>• Digital Image Processing: Rafael C. Gonzalez and Richard E. Woods, Pearson Education, Fourth Edition 2017</li><li>• Computer Vision: Algorithms and Applications, Richard Szeliski, Springer, second edition 2022.</li><li>• Computer Vision: A Modern Approach, by D.A. Forsyth and J. Ponce, Prentice Hall, 2012.</li><li>• <b>Lecture Notes.</b></li></ul>

Course Objectives
<p>Computer vision and image processing are important and fast evolving areas of computer science, and have been applied in many disciplines. The aim of this course is to:</p> <ul style="list-style-type: none"><li>• Introduce students the fundamentals of image formation and computing;</li><li>• To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition.</li><li>• Understanding the state-of-the-art image recognition techniques, in particular, the application of convolutional neural networks for supervised learning.</li><li>• Enable students to apply computer vision and image processing techniques to solve various real-world problems, and develop skills for research in the fields.</li><li>• To teach students how to design and implement computer vision algorithms. This involves using programming languages and framework such as Python to develop software that can perform specific computer vision tasks.</li></ul>

Assessment Policy		
Assessment Type	Expected Due Date	Weight
Midterm Exam	TBA	25%
Final Exam	TBA	40%
Assignments	TBA	15%
Project	TBA	20%

Schedule		
Topics		#Lectures
Introduction	<ul style="list-style-type: none"> <li>• Introduction and motivation.</li> </ul>	1
Digital Image Processing Fundamentals.	<ul style="list-style-type: none"> <li>• Digital Imaging Basics.</li> </ul>	3
	<ul style="list-style-type: none"> <li>• Contrast Enhancement.</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Image Filtering (Smoothing, Sharping, Noise Reduction).</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Edge Detection.</li> </ul>	2
Introduction to Deep Learning for Computer Vision	<ul style="list-style-type: none"> <li>• Introduction to Deep Learning.</li> </ul>	1
	<ul style="list-style-type: none"> <li>• Artificial Neural Networks.</li> </ul>	1
	<ul style="list-style-type: none"> <li>• Convolutional Neural Networks.</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Encountered Issues in Deep Learning.</li> </ul>	1
Features Extraction	<ul style="list-style-type: none"> <li>• Classical Techniques [Color Features, Shape Features, Local Features, Histograms of Oriented Gradients, Visual Bag of Words].</li> <li>• Deep Learning Techniques.</li> </ul>	5
Common CV Applications	<ul style="list-style-type: none"> <li>• Object Recognition.</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Object Detection.</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Image Segmentation.</li> </ul>	3
	<ul style="list-style-type: none"> <li>• Optical Flow.</li> </ul>	1
	<ul style="list-style-type: none"> <li>• Object Tracking.</li> </ul>	1
Case Studies (If time permits)	<ul style="list-style-type: none"> <li>• OCR, Face Recognition, ....</li> </ul>	

Teaching and Learning Methods
Lectures, assignments, projects, in-class activities and exams.

Additional Notes	
Assignments	No late assignments.
Exams	Comprehensive exams.
Makeup Exams	<b><u>No makeup exam.</u></b>
Drop Date	TBA
Attendance	Your attendances is very important.
Key to a good grade	Reading the <b>TEXTBOOK and HANDOUT + DOING the PROJECTS.</b>