



Course Name	Probabilistic Graphical Models		
References	1. Szeliski, Richard. Computer vision: algorithms and applications. Springer Science & Business Media, 2010 2.		
Course instructor	Dr. Behrooz Nasihatkon		
Syllabus	1. Introduction to computer vision and its applications. 2. Image representation, sampling and quantization, light spectrum, visual perception, Color	Lab0: Introduction to Python.	
	3. Pixel-wise operations, brightness, contrast, Histograms, 4. Histogram equalization, Color Histograms	Lab1: Introduction to numpy, scipy, and matplotlib, Reading and displaying images with scipy and matplotlib	
	5. Noise, Gaussian Noise, Linear filtering, convolution, blurring, 6. 2D Fourier transform, DFT, FFT	Lab2: Introduction to OpenCV, reading, writing and displaying images. image blending Lab3: Working with Videos, histograms	
	7. Normalized correlation, template matching, 8. Other types of noise, median filtering, Bilateral filtering	Lab4: Noise, blurring, filtering, Gaussian filtering, Median Filtering, Bilateral filtering	
	9. Image Gradients, Edge Detection, 2D edge operators, 10. Laplacian of Gaussian, Canny Edge detector.	Lab5: Reading from camera devices, edge detection	
	11. Image Thresholding, Binary Images, Connected Components, Morphology		
	PART II - Computer Vision		



	12. Hough Transforms, Line Hough transform, Circle Hough Transform	Lab6: Binary Images, Connected Components, Thresholding, Morphology
	13. Introduction to features and feature matching, Corner Detection, Harris corner detector, Multiscale corner detection	Lab7: Hough Transforms
	14. Image Pyramid, Scale invariance, Scale-space analysis, 15. Introduction to SIFT, SIFT detection	Lab8: Corner Detection
	16. SIFT description 17. SIFT matching, KD-trees 18. Other types of features (SURF, ORB, etc.)	Lab9: Image Pyramid, Multiscale Corner detection
	19. Geometric Image Transformation, Homography & Perspective, 20. Image Registration and alignment 21. Robust alignment, RANSAC	Lab10: SIFT detection, description and matching
	22. Introduction to Video analysis, background subtraction. 23. Introduction to image recognition, Bayesian classification	Lab11: Geometric Image Transformations, Perspective Correction
	24. More of Bayesian Classification, Feature extraction, Nearest neighbour, kNN 25. Support Vector Machines	Lab12: Feature-based Image Alignment, RANSAC, feature-based object detection
	26. Hog features, Local Binary Patterns, Feature Channel 27. Object Detection, Sliding window	Lab13: Image Classification
	28. Boosting, Cascades & face detection, 29. Harr, Integral Images, Viola-Jones	Lab14: Object Detection
	30. Introduction to Neural Networks 31. Convolutional Neural Networks	Lab15: Neural Networks