

Image Processing & Analysis

Summary Syllabus (Level 8¹)

EE425: Image Processing & Analysis and EE453: Image Processing & Analysis (Plus)

Section	Indicative Content
Introduction	• Introduction to Python for Image Processing & Analysis • IPA Pipeline • Learning Outcomes • Module Protocol • Assessment Requirement • Code Development • Support Material & Website • Human/Computer/Machine Vision • Case Studies.
Baseline Techniques	• Image Representation • Point Operators • Thresholding • Local Operators • Non-linear Local Operators • Template Matching • Histograms • Edge Detection • Corner Detector
Noise	• Noise in images • Impulse Noise • Gaussian Noise Model • Gaussian Noise Reduction • Noise Metrics
Morphology	• Binary Mathematical Morphology • Grey Scale Morphology • Top-Hat Transform • Conditional Dilation
Transforms	• Global Image Transforms • Distance Transform • Hough Transform • Two-Dimensional Discrete Fourier Transform
Classification & Performance Characterization	• Supervised vs Unsupervised • Feature Selection • Nearest Neighbour Classifier (KNN) • Maximum-likelihood Classifier • Performance Characterisation
Colour Image Processing & Analysis	• Human Perception of Colour • Colour Spaces • Colour Scattergrams • Programmable Colour Filter
EE453: Image Processing & Analysis (PLUS) ONLY	
Texture	• Histogram Features • Co-occurrence (Matrix) Approach • Morphological Texture Analysis • Local Binary Patterns (LBP)
3D Imaging	• Passive Stereoscopic Methods • Camera Calibration • Shape from Stereo • Image Rectification • Stereo Feature Matching • Active Stereoscopic Methods
Interest Point Detection	• SIFT - Scale Invariant Feature Transform • Matching Metrics • BRIEF / ORB
Motion	• Optical Flow • Local / Global Approaches • Feature Matching – Motion Correspondence / Tracking

This is an introductory module. The modules CA will develop solutions within a **Python** based development environment. Specifically we will use the open source and widely adopted **scikit-image**, **opencv** and **scikit-learn** libraries in designing a wide range of image processing & analysis solutions.

See [EE544: Computer Vision \(Incorporating Deep Learning\)](#) for an advanced Level 9 module in this area.

¹ NFQ Level 8 – Honours Bachelor’s Degree.