

Course descriptor B31BF

Course code	B31BF
Course title	Image and Vision Computing
Credits	10
School	Mathematical and Computer Sciences
SCQF Level	11
Semester	1
Aims	<p>In this course students learn how images are formed given the objects in the three dimensional world, and the basics of how computer vision inverts this process - computing properties of the world from digital images. The course will cover topics including basic image formation, image processing, detection, matching and recognition that allow computers to understand the world based on image content.</p>
Syllabus	<p>Learning experience: the course will be delivered in a flipped format, with the students reading material and watching recorded lectures, with the lecture functioning as a discussion session.</p> <p>Content: The course proceeds in five parts from foundational concepts such as image formation, through to low-level image processing operations, before building upon those to develop image representations for higher level tasks such as recognition and detection.</p> <p>The following four parts are roughly two weeks each:</p> <p>Image formation. The basic mathematics and physics of how images are formed based on light reflected by real-world objects. Includes ideal pinhole camera and lens models, some basic 3d geometry, radiometry and photometry.</p> <p>Low level image analysis. The course will introduce basic algorithms such as convolution and filtering for image processing, and RANSAC for fitting. These will be applied for tasks such as edge detection and line-fitting. To provide a taste of recognition students will perform shape recognition using Bayes theorem.</p> <p>Image representations. To support working with more unconstrained realistic images, the course introduces feature representations for both local and global features including colour histograms, HOG/SIFT and descriptor bag of words.</p> <p>High level image analysis: Building upon these image representations, students will discuss the topical tasks of object recognition and sliding window-based object detection.</p>

	The course will finish up with introduction to some applications including basic video processing (optical flow) and foreground detection.
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Learning Outcomes	
Subject Mastery	<p>On completion of this course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Explain the basic physics and mathematical principles of image formation. 2. Understand basic image processing operations such as convolution. 3. Write programmes to solve basic image analysis tasks such as edge detection and line fitting. 4. Understand the concepts of local and global image descriptors, and descriptor matching. 5. Write programmes to perform image analysis tasks of recognition and detection.
Personal Abilities	<p>The activities in this course will develop skills in:</p> <ul style="list-style-type: none"> • lab work, report writing and programming • Team working through group (probably in pairs) participation in the course mini-project. • Also the flipped classroom discussion sessions will promote SCQF11 skills such as: • Develop original and creative responses to problems and issues • Develop the ability to critically review, consolidate and extend knowledge, skills, practices • Develop the ability to think in a subject/discipline/sector

Assessment method	30% course work 70% examination
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