Module Code	CSU44053				
Module Name	Computer Vision				
ECTS Weighting ¹	Choose an item.				
Semester taught	Choose an item.				
Module Coordinator/s	Dr. Kenneth Dawson-Howe				
<u>Module Learning</u> <u>Outcomes</u>	 On successful completion of this module, students will be able to: LO1. design solutions to real-world problems using computer vision. LO2. develop working computer vision systems using C++. LO3. critically appraise computer vision techniques. LO4. explain, compare and contrast computer vision techniques. 				
Module Content	The aim of this module is to give students a firm understanding of the theory underlying the processing and interpretation of visual information and the ability to apply that understanding to ubiquitous computing and entertainment related problems. It provides them with an opportunity to apply their problem-solving skills to an area which, while it is firmly part of computer science/engineering, draws strongly from other disciplines (physics, optics, psychology). The module is based around problems so that the technology is always presented in context and during some tutorials students work in groups to design solutions to real world problems using the techniques that they have been taught. In addition, the module has a significant practical component so that students can appreciate how difficult it can be to apply the technology.				
	Specific topics addressed in this module include:				
	image digitisation and colour;				
	camera modelling;				
	binary image processing;				
	 region based processing including connected components analysis, watershed segmentation and mean shift segmentation; 				
	video analysis;				
	geometric image transforms;				
	 edge based processing including edge detection, contour extraction and representation; 				
	 feature processing including basic corner detection techniques and SIFT; 				
	recognition techniques including template matching, statistical pattern				

¹ TEP Glossary

	recognition, and the Hough transform;						
	Topics will change somewhat from year to year.						
Teaching and Learning Methods	Material is presented through lectures with slides provided online in advance. Students are expected to have a copy of the slides with them and should be annotating the slides.						
	Group tutorials are used to get the students making use of the material to solve real world problems. Groups of 3 or 4 students are given 10-15 minutes to solve a problem and then groups propose solutions to the class which are discussed (in terms of issues/appropriateness).						
	Students are also asked to solve real problems in the assignments, and in one case are asked to implement a solution so that the difficulties of applying the technology can be better understood.						
Assessment Details ²	Assessment Component	Brief Description	Learning Outcomes Addressed	% of total	Week set	Week due	
	Examination	2 hour written examination	L01, L03, L04	80%	n/a	n/a	
	Platform familiarity	Assignment where students are asked to do certain tasks using OpenCV to provide familiarity with the platform	L02	0%	1	3	
	Development Assignment	Computer Vision Problem Solving Assignment, including design, implementation, evaluation and report writing.	LO1, LO2, LO3, LO4	15%	4	8	
	Problem Solving Assignment	Computer Vision Problem Solving Assignment, similar to an exam question where only a report has to be written describing how to solve the problem including details of how the techniques work.	LO1, LO3, LO4	5%	9	11	
Reassessment Details	Examination (2 hours, 100%). The supplemental mark in this module is based only on the written supplemental examination. This examination has one mandatory question which draws on the coursework and will require student to write C++ & OpenCV code. In addition, similar to the annual written examination, students must answer 2 of the other 3 questions.						
Contact Hours and	Contact Hours (scheduled hours per student over full module), broken down by: 33 hours					s	
Indicative Student Workload	lecture				22 hours		
	tutorial				11 hour	11 hours	
					U hours		
	preparation for classes and review of material				80 hours		
	(including	preparation for examination)			40 hour	S	

² TEP Guidelines on Workload and Assessment

	completion of assessments (including examination, if applicable)	ble) 40 hours		
	Total Hours	113 hours		
Recommended Reading List	A Practical Introduction to Computer Vision with OpenCV, by Kenneth Dawson-Howe Wiley, May 2014.			
	Image Processing, Analysis and Machine Vision. Milan Sonka, Vaclav Hlavac & Roger Boyle, Thompson, Third Edition 2008.			
Module Pre-requisites	Prerequisite modules:			
	Other/alternative non-module prerequisites: Competence in advanced mathematics (including	C++. Competence in		
Module Co-requisites				
Module Website	The module is hosted on Blackboard (at mymodule.tcd.ie)			
Last Update	20/06/2019 by Kenneth Dawson-Howe			