SLIIT Discover Your Future	DEPARTMENT OF INFORMATION TECHNOLOGY FACULTY OF COMPUTING

MODULE OUTLINE				
Module Name	**Image Understanding and Processing**			
Module Code	IT4130	Version No.	2017 - 1	
Year	4	Semester	1	
Credit Points	04			
Pre-requisites	None			
Co-requisites	None			
Methods of Delivery	Lectures (Face-to-face) Tutorials Labs		2 Hours/Week 1 Hours/Week 2 Hours/Week	
Course Web Site	http://courseweb.sliit.lk/			
Date of Original Approval	January, 2017			
Date of Next Review	January, 2022			

MODULE DESCRIPTION	
Introduction	Today, the Digital Image Processing has become one of the important and essential areas in many industrial software applications. Digital Image Processing provides a solid working knowledge about most commonly use methods and procedures for digital image manipulation including enhancement, filtering and restoration. The course will provide the basic techniques, algorithms and applications of Digital Image Processing, including Intensity Transformation, Spatial Filters, Edge Detection, Morphological Operators, Feature Extraction and Color Image Processing. Also, empowers learners to develop image processing programs and leverage OpenCV functionalities to implement sophisticated image applications.

<table>
<tr><td rowspan="7">Learning Outcomes</td><td colspan="5">At the end of the module student will be able to:</td></tr>
<tr><td>LO1:</td><td colspan="4">Explain the process of formation of digital images</td></tr>
<tr><td>LO2:</td><td colspan="4">Describe the importance of different image enchantment techniques</td></tr>
<tr><td>LO3:</td><td colspan="4">Compare the performance and applicability of different spatial filters</td></tr>
<tr><td>LO4:</td><td colspan="4">Derive sharpening filters based on the first and second order derivatives</td></tr>
<tr><td>LO5:</td><td colspan="4">Apply morphological image processing techniques</td></tr>
<tr><td>LO6:</td><td colspan="4">Understand different color models and their applicability</td></tr>
<tr><td>Assessment Criteria</td><td colspan="5">During the semester, there will be Practical assessment, Tutorial assessments, Midterm examination and a Final examination exam. The distribution of marks for the assessed components of the unit are as follows:</td></tr>
<tr><td rowspan="6"></td><td colspan="2">Continuous Assessments</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">• Practical Assessment</td><td>15</td><td>%</td><td>LO2-LO6</td></tr>
<tr><td colspan="2">• Tutorial Assessment</td><td>15</td><td>%</td><td>LO2-LO6</td></tr>
<tr><td colspan="2">• Midterm Examination</td><td>20</td><td>%</td><td>LO1-LO3</td></tr>
<tr><td colspan="2">End Semester Assessment</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">• Final Examination</td><td>50</td><td>%</td><td>LO1-LO6</td></tr>
<tr><td colspan="2">TOTAL</td><td>100</td><td>%</td><td></td></tr>
<tr><td rowspan="9">Estimated Student Workload</td><td colspan="2">Contact Hours</td><td colspan="3"></td></tr>
<tr><td colspan="2">• Lecture</td><td colspan="3">26 hours</td></tr>
<tr><td colspan="2">• Tutorial</td><td colspan="3">13 hours</td></tr>
<tr><td colspan="2">• Laboratory</td><td colspan="3">26 hours</td></tr>
<tr><td colspan="2">Time Allocated for Assessments</td><td colspan="3"></td></tr>
<tr><td colspan="2">• Continuous Assessments</td><td colspan="3">04 hours</td></tr>
<tr><td colspan="2">• Final Examination</td><td colspan="3">03 hours</td></tr>
<tr><td colspan="2">Reading and Independent Study</td><td colspan="3">120 hours</td></tr>
<tr><td colspan="2">TOTAL</td><td colspan="3">192 hours</td></tr>
<tr><td>Module Requirement</td><td colspan="5">To pass this module, students need to obtain a pass mark in both “Continuous Assessments” and “End of the Semester Examination” components which would result in an overall mark that would qualify for a “C” grade or above</td></tr>
</table>

Primary References	• Gonzalez R. and Woods R., Digital Image Processing, https://www.amazon.com/Digital-Image-Processing-Rafael-Gonzalez/dp/0133356728, 4th Edition., Pearson, 2017 • Bradski G. and Kaehler A., Learning OpenCV: Computer Vision with the OpenCV Library, https://books.google.com/books/about/Learning_Image_Processing_with_OpenCV.html?id=Y_irBwAAQBAJ, 1st edition., Packt, 2015

CONTENTS OF THE MODULE	
• **Introduction to Digital Image Processing** • Introduction to Digital Image processing areas and applications • Digital Image formation process	**LO1**
• **Image enhancements using point processing** • Point Processing techniques • Piecewise-Linear Transformations • Histogram Processing • Enhancement using Arithmetic and Logic operations	**LO2**
• **Spatial Filtering** • Mask processing techniques • Convolution and correlation • Boundary handling • Mean filters • Order-statistics filters • Application of Spatial Filtering	**LO3**
• **Edge Detection** • Image derivatives • Sharpening filters through derivatives • First order edge detectors • Second order edge detectors • Other edge detectors	**LO4**
• **Morphological Operations** • Common Morphological Operations • Hit or Miss transform • Application of Morphological operations	**LO5**

• **Color Image Processing**
  • Color Fundamentals
  • Color models and their usage
  • Transforming between color models
	LO6

GENERIC INFORMATION

Any type of plagiarism is not allowed.

Plagiarism: Academic honesty is crucial to a student's credibility and self-esteem, and ultimately reflects the values and morals of the Institute as whole. A student may work together with one or a group of students discussing assignment content, identifying relevant references, and debating issues relevant to the subject. Plagiarism occurs when the work of another person, or persons, is used and presented as one's own.

----------End of Module Outline----------