COURSE OUTLINE

Department & Faculty: Dept. of Computer Graphics and Multimedia, Faculty of Computer Science & Information Systems	**Page : 1 of 5**
Course Code: SCV3213 **Course Name : Fundamental of Image Processing** **Total Contact Hours: 56 hours** **Course Pre-requisite: Fundamental of Computer Graphics (SCV2213)**	**Semester: I** **Academic Session: 2010/2011**

Lecturer	:	**Professor Dr Dzulkifli bin Mohamad**
Room No.	:	**206-04**
Telephone No.	:	**07 - 5532317**
E-mail	:	**dzulkifli@utm.my**
Synopsis	:	This course is designed to expose to students about techniques of digital image processing. It includes how digital images; starting from reading the image file and then convert the image format to another type are processed. The images will be manipulated and further enhanced to improve the quality. Different types of manipulation and enhancement techniques will be covered. At the end of the course, students are expected to implement concepts of image processing, generate and manipulate images.

LEARNING OUTCOMES

By the end of the course, students should be able to:

No.	Course Learning Outcome	Programme Learning Outcome(s) Addressed	Assessment Methods
1	Describe and explain fundamental knowledge and understanding of digital image construction by digital computer.	PO1 (C2, P2, A1)	A, Q, L, E, F
2	Investigate and demonstrate the manipulation of digital image in various image processing operations and construct programs that read and save various digital image data file	PO2 (C3, P4, A2)	A, Q, L, E, F
3	Analyze the components of a digital image processing system to construct and present medium-scale to complex image processing application using the techniques and algorithms learned.	PO3 (C4, P4, A2) PO5 (CTPS1, CTPS2, CTPS3)	PR, Pr, L

Prepared by: **Name:** **Signature:** **Date:**	**Certified by: (Course Panel Head)** **Name:** **Signature:** **Date:**

COURSE OUTLINE

			(A – Assignment; Q – Quiz; PR – Project; Pr – Presentation; E – Exam; F- Final Exam; L – Lab)

STUDENT LEARNING TIME

Teaching and Learning Activities			Student Learning Time (hours)	
Face to face Learning	• Lecturer Centered	Lecture	28	
	• Student Centered	- Practical/Lab/Tutorial	24	
		- Student Centered Activity	4	
		- Others		
	• Others			
	Sub Total			56
Self Learning	• Non Face to face or Student Centered Learning (SCL)	- Manual		
		- Assignment	17	
		- Module		
		- Project	4	
		- Group Discussion	2	
		- Others		
	• Revision		20	
	• Assessment Preparation		12	
	• Others			
	Sub Total			55
Formal Assessment	• Continuous Assessment	- Quiz	1.5	
		- Exam	2.5	
		- Presentation	2	
	• Final Examination		3	
	• Others			
	Sub Total			9
TOTAL SLT				**120**

TEACHING METHODOLOGY

Lecture, Lab and Active Learning (Discussion)

COURSE OUTLINE

Department & Faculty: Dept. of Computer Graphics and Multimedia, Faculty of Computer Science & Information Systems	**Page : 3 of 5**
Course Code: SCV3213 **Course Name : Fundamental of Image Processing** **Total Contact Hours: 56 hours** **Course Pre-requisite: Fundamental of Computer Graphics (SCV2213)**	**Semester: 1** **Academic Session: 2010/2011**

WEEKLY SCHEDULE

			Activities/hours
Week 1	:	**1.0 Introduction to Image Processing** 1.1 What is digital image Processing? 1.2 Application areas of Image Processing 1.3 Fundamental steps in Digital Image Processing 1.4 Components of an Image Processing System	Lecture: 4 Lab/Tutorial: 2 Assessment: nil
Week 2	:	**2.0 Image sensing, Acquisition, Image Sampling and Quantization** 2.1 Introduction to image sensing devices, how it works. 2.2 Image acquisition process 2.3 Image sampling and quantization 2.3.1 Basic concept in Sampling and Quantization 2.3.2 Representing digital image 2.3.3 Spatial and intensity resolution 2.4 An introduction to the mathematical Tools used in Digital Image Processing 2.4.1 Arithmetic operations 2.4.2 Vector and Matrix operations 2.4.3 Image transformation	Lecture: 2 Lab/Tutorial: 2 Assessment: 0.5
Weeks 3	:	**3.0 Programming With Image data file** 3.1 3.1 Introduction to various image data file format 3.1.1 Image file data structure, for example tiff 3.2 Writing a program to read and write image data file	Lecture: 2 Lab/Tutorial: 2 Assessment: nil
Week 4-6	:	**4.0 Image Enhancement in Spatial Domain** 4.1 Introduction to Image Enhancement 4.2 Point Processing 4.3 Histogram Processing 4.3.1 Histogram stretching 4.3.2 Histogram sliding 4.3.3 Histogram shrinking 4.3.4 Histogram equalization 4.4 Fundamental of spatial filtering 4.4.1 Spatial correlation and convolution 4.4.2 Linear filtering 4.4.3 Generating spatial filter mask 4.5 Smoothing Spatial Filter 4.5.1 Smoothing linear filter 4.5.2 Order-statistic(nonlinear) filters 4.6 Sharpening Spatial Filters 4.6.1 The laplacian filter 4.6.2 Unsharp masking and highboost filtering	Lecture: 6 Lab/Tutorial: 4 Assessment: 0.5

COURSE OUTLINE

Department & Faculty: Dept. of Computer Graphics and Multimedia, Faculty of Computer Science & Information Systems	**Page : 4 of 5**
Course Code: SCV3213 **Course Name : Fundamental of Image Processing** **Total Contact Hours: 56 hours** **Course Pre-requisite: Fundamental of Computer Graphics (SCV2213)**	**Semester: 1** **Academic Session: 2010/2011**

Week 7	:	**5.0 Image Enhancement in Frequency Domain** 5.1 Introduction to Fourier Series 5.2 Some properties of the 2-D Discrete Fourier Transformation 5.2.1 Translation and rotation 5.2.2 Symmetry properties 5.2.3 Fourier spectrum and phase angle 5.3 The 2-D convolution theorem	Lecture: 2 Lab/Tutorial: 2 Assessment: nil Student Centred Activity: 2 Exam : 2.5
		SEMESTER BREAK	
Week 8-9	:	**6.0 Image Segmentation** 6.1 Fundamentals 6.2 Point, Line, and edge detection 6.2.1 Background 6.2.2 Detection of isolated point 6.2.3 Line detection 6.2.4 Edge models 6.2.5 edge detection 6.3 Thresholding 6.3.1 Foundation 6.3.2 Basic global thresholding 6.3.3 Multiple thresholding 6.4 Region-based segmentation 6.4.1 Region growing 6.4.2 Region splitting and merging	Lecture: 4 Lab/Tutorial: 4 Assessment: nil
Week 10-11	:	**7.0 Morphological Image Processing** 7.1 Preliminaries 7.2 Erosion and Dilation 7.2.1 Applications of erosion and dilation 7.3 Opening and Closing 7.3.1 Applications of closing and opening 7.4 Some basic morphological algorithms 7.4.1 Boundary extraction 7.4.2 Hole filling 7.4.3 Thinning 7.4.4 Skeletonization 7.4.5 Pruning	Lecture: 4 Lab/Tutorial: 4 Assessment: nil Student Centred Activity: 2
Week 12-13	:	**8.0 Image Representation and Description** 8.1 Representation 8.1.1 Boundary(border) following 8.1.2 Chain codes 8.1.3 Signatures 8.1.4 Boundary segments	Lecture: 4 Lab/Tutorial: 4 Assessment: 0.5

COURSE OUTLINE

Department & Faculty: Dept. of Computer Graphics and Multimedia, Faculty of Computer Science & Information Systems	Page : 5 of 5
Course Code: SCV3213 Course Name : Fundamental of Image Processing Total Contact Hours: 56 hours Course Pre-requisite: Fundamental of Computer Graphics (SCV2213)	Semester: 1 Academic Session: 2010/2011

8.1.5 Skeleton
8.2 Boundary Descriptors
8.2.1 Some simple descriptors
8.2.2 Fourier descriptors
8.2.3 Statistical moments
8.3 Regional Descriptors
8.3.1 Some simple descriptors
8.3.2 Texture
8.3.3 Moment invariants
8.4 Use of Principal Component for Description

Weeks 14 : Mini Project Presentation

Lecture: nil
Lab/Tutorial: nil
Presentation: 2
Assessment: nil

REFERENCES :

1. Gonzalez R.C. and Woods R.E., Digital Image Processing, 3rd Edition 2008. Pearson Addison-Wesley.
2. Pratt W.K., Digital Image Processing. John Wiley & Sons,1991
3. Jain A.K., Fundamentals of Digital Image Processing. Prentice Hall, 1988
4. Russ J.C., The Image Processing Handbook. Springer-Verlag Berlin and Heidelberg, 1998

Journals

1. IEEE Transactions on Pattern Analysis and Machine Intelligence
2. Computer Vision, Graphics and Image Processing
3. IEEE Transactions on Image Processing
4. Journal of Visual Communication and Image Representation

GRADING

No.	Assessment	Number	% each	% total	Dates
1	Assignments	5	3%	15	
2	Project	1	10%	10	
3	Quizzes	3	3.33%	10	
4	Presentation	1	5%	5	
5	Test 1	1	10%	10	
6	Final Exam	1	50%	50	
	Overall Total			**100**	