1.	Name of Course/Module	Computer Vision
2.	Course Code	TPV3011
3.	Status of Subject	Major for B.IT Artificial Intelligence
4.	MQF Level/Stage	Bachelor Degree – MQF Level 6
5.	Version (state the date of the last Senate approval)	June 2012
6.	Requirement for Registration	TAI 2371 Artificial Intelligence II
7.	Name(s) of academic/teaching staff	Tee Connie Jin Zhe Lim Kian Ming
8.	Semester and Year offered	Trimester 1 (Delta Level)

9.	Objective of the course/module in the programme :
	To provide a good understanding of concepts, algorithms and their applications in computer vision.
10.	Learning Outcomes :
	At the completion of the subject, students should be able to: LO1: Know the basic concepts in computer vision (Cognitive, Level 1) LO2: Apply the fundamental techniques in image processing (Cognitive, Level 3) LO3: Analyse the concept of the binary vision algorithms (Cognitive, Level 4) LO4: Develop the concept of computer vision in practical applications (Cognitive, Level 5)
11.	Synopsis:
	This course intends to give a comprehensive coverage of basic concepts in computer vision. The fundamental techniques in image processing are introduced, followed by the binary vision algorithms. Image analysis applications for stereo image processing are also included.
	Kursus ini menawarkan konsep-konsep asas tentang komputer visi secara komprehensif. Dalam kursus ini, teknik-teknik asas tentang pemprosesan imej diikuti aturcara visi binari diperkenalkan. Kursus ini turut memperkenalkan aplikasi-aplikasi analisis imej untuk pemprosesan imej stereo.
12.	Mapping of Subject to Programme Outcomes :

Programme Outcomes	**% of Contribution**
PO1: Apply soft skills in work and career related activities	25
PO7: Demonstrate knowledge and understanding of essential facts, concepts, principles, and theories relating to artificial intelligence	25
PO8: Apply principles and knowledge of artificial intelligence in relevant areas	37.50
PO9: Demonstrate the ability in analysing, modelling, designing, developing and evaluating computing solutions	12.50

13.	Assessment Methods and Types :

	Method and Type	Description/Details	Percentage
	Mid Term Test		20%
	Assignment		20%
	Quiz / Attendance		10%
	Final Exam		50%

14. Details of Subject

Topics	Mode of Delivery	
	Lecture	Laboratory
1. Introduction to Computer Vision Image sampling and reconstruction, Mathematical characterization of images, Image quantization, Camera calibration.	2	2
2. Digital Image Fundamentals Image processing overview, Applications, Image Enhancement, Image Restoration, Compression, Morphological Processing, Image Sampling and Reconstruction, Image Quantization	4	4
3. Image Transforms Image superposition and convolution, Discrete transforms, Convolution, Correlation, Image operators.	2	2
4. Image Enhancement Point Processing, Contrast Stretching, Thresholding, Spatial Filtering, Nonlinear Spatial Filtering, Histogram Processing	4	4
5. Image Restoration Noise model, Average Filtering, Median Filter, Weight Median Filter, Wiener Filter	2	2
6. Image Segmentation Region Representation, Hierarchical Representation, Quad Trees, Symbolic Representation, Automatic Thresholding, Edge Detection,	2	2
7. Binary Vision Algorithms Introduction to computer vision, Recursive component labeling, Boundary following algorithm, Thinning algorithms, Binary feature extraction, Region analysis, Spatial moments.	4	4
8. Image Motion Dynamic imagery algorithms, Motion correspondence, Image flow, Shape from motion.	2	2
9. Texture Statistical methods of texture analysis, Model based methods, Shape from texture.	2	2
Total	**24**	**24**

15. Laboratory

<table>
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Image quantization and sampling.
Connected component labelling.
Thinning algorithms
Boundary following and extraction.
Image convolution, DCT.
Edge detection algorithms.
Segmentation.
Pattern recognition.
Texture analysis.

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<tr><td rowspan="11">16.</td><td>Total Student Learning Time (SLT)</td><td>Face to Face (Hour)</td><td>Total Guided and Independent Learning</td></tr>
<tr><td>Lecture</td><td>24</td><td>24</td></tr>
<tr><td>Tutorials</td><td></td><td></td></tr>
<tr><td>Laboratory/Practical</td><td>24</td><td>12</td></tr>
<tr><td>Presentation</td><td></td><td></td></tr>
<tr><td>Assignment</td><td>-</td><td>10</td></tr>
<tr><td>Mid Term Test</td><td>1</td><td>4</td></tr>
<tr><td>Final Exam</td><td>2</td><td>20</td></tr>
<tr><td>Quiz (x 4 times)</td><td></td><td>4</td></tr>
<tr><td>Sub Total</td><td>51</td><td>74</td></tr>
<tr><td></td><td>Total SLT</td><td colspan="2">125/40 = 3.125 => 3</td></tr>
<tr><td>17.</td><td colspan="2">Credit Value</td><td>3</td></tr>
<tr><td rowspan="3">18.</td><td colspan="3">Reading Materials :</td></tr>
<tr><td colspan="2">Textbook</td><td>Reference Materials</td></tr>
<tr><td colspan="2">

D. A. Forsyth and J. Ponce, “Computer Vision: A Modern Approach”, Prentice-Hall, 2nd edition, 2011.
Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing, 3rd edition", Prentice Hall, 2007.

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R. Jain, “Machine Vision”, McGraw-Hill (1995).
James R. Parker, “Algorithms for Image Processing and Computer Vision”, Wiley (1996).
James R. Parker,”Practical Computer Vision using C”, John Wiley (1993).
R. J.Shalkoff, “Digital Image Processing and Computer Vision”, John Wiley (1989).
Gonzalez, Woods, and Eddins, “Digital Image Processing Using MATLAB (DIPUM)” by Prentice

</td></tr>
<tr><td>19.</td><td colspan="3">Appendix (to be compiled when submitting the complete syllabus for the programme) :

Mission and Vision of the University and Faculty
Mapping of Programme Objectives to Vision and Mission of Faculty and University
Mapping of Programme Outcome to Programme Objectives
Progarmme Objective and Outcomes (Measurement and Descriptions)

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