

SUMMARY OF INFORMATION ON EACH COURSE

1.	Name of Course	Computational Intelligence	
2.	Course Code	TCI3121	
3.	Status of Course [Applies to (cohort)]	Specialisation Core for B.IT (Hons) Artificial Intelligence	
4.	MQF Level/Stage Note : Certificate – MQF Level 3 Diploma – MQF Level 4 Bachelor – MQF Level 6 Masters – MQF Level 7 Doctoral – MQF Level 8	Bachelor – MQF Level 6	
5.	Version (State the date of the Senate approval – history of previous and current approval date)	Date of previous version :	May 2015
		Date of current version :	May 2016
6.	Pre-Requisite	TCP1121 Computer Programming	
7.	Name(s) of academic/teaching staff	Tan Shing Chiang, Lim Kian Ming	
8.	Semester and Year offered	Trimester 1, Year 3	
9.	Objective of the course in the programme :	<p>This subject elaborates on computational intelligence that comprises fuzzy reasoning methods, artificial neural network technology and genetic algorithms. The subject trains students to understand and apply the concepts of fuzzy logic, artificial neural networks and genetic algorithms, and use them in the areas of uncertain reasoning, pattern recognition and optimisation. By using software tools, such as MATLAB, students can implement the techniques of computational intelligence and thus, gain hands on experience through the development of the models and algorithms. This course is intended to provide the foundations of computational intelligence.</p>	
10.	Justification for including the course in the programme :	<p>Computational intelligence provides technological paradigms that are based on natural/biological systems to solve complex problems. It becomes one of the main streams of artificial intelligence. This subject provides knowledge, concepts and theories related to computational intelligence. Students will learn to apply the principle and knowledge of the technological paradigms to design and develop a computing solution for a problem.</p>	
11.	Course Learning Outcomes :	Domain	Level
	LO1 Explain the basic concept of computational intelligence.	Cognitive	Level 2
	LO2 Compute and solve the problems of computational intelligence.	Cognitive	Level 3
	LO3 Apply the various techniques of computational intelligence.	Cognitive	Level 3
	LO4 Develop a computational intelligence system for real-world applications.	Cognitive	Level 5

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12.	Mapping of Learning Outcomes to Programme Outcomes :									
	Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
	LO1							X		
	LO2							X		
	LO3	X						X	X	
LO4	X						X	X		
13.	Assessment Methods and Types :									
	Method and Type	Description/Details							Percentage	
	Quiz	Written quiz							10%	
	Mid Test	Written test							20%	
	Assignment	Report							30%	
Final Exam	Written examination							40%		
14.	Mapping of assessment components to learning outcomes (LOs)									
	Assessment Components	%	LO1	LO2	LO3	LO4				
	Quiz	10%	14	10						
	Mid Test	20%	29	20						
	Assignment	30%		30	100	100				
	Final Exam	40%	57	40						
	Total	100%	100	100	100	100	100			
15.	Details of Course									
	Topics							Mode of Delivery (eg : Lecture, Tutorial, Workshop, Seminar, etc.) Indicate allocation of SLT (lecture, tutorial, lab) for each subtopic		
								Lecture	Lab	
	1. Introduction to Computational Intelligence Computational intelligence paradigms and characteristics.							2	2	
	2. Introduction to Artificial Neural Networks Biological neurons and artificial neurons, Calculating the net input signal, activation function, neuron models, network architectures, single and multilayer neural networks							4	4	
	3. Supervised Learning Neural Networks Feedforward neural network, simple recurrent neural networks, perceptron, multilayer perceptrons and back-propagation, linear separability, radial basis function networks							4	4	
4. Unsupervised Learning Neural Networks Self-organising feature maps, autoencoder							2	2		

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5. Introduction to Fuzzy Sets Uncertainty and imprecision, classical sets, operations on classical sets, fuzzy sets and properties, fuzzy set operations, properties of fuzzy sets		2	2
6. Fuzzy Relations Fuzzy relations, fuzzy Cartesian product and composition		2	2
7. Fuzzy Logic Membership functions, features of the membership function, fuzzification, defuzzification		2	2
8. Fuzzy Rule Based Systems Fuzzy rule based systems, decomposition of compound rules, aggregation of fuzzy rules and inference methods		2	2
9. Genetic Algorithms Genetic evolutionary algorithm, the chromosome, initial population, fitness function, selection, crossover, mutation		2	2
10. Applications Application of artificial neural networks, fuzzy logic and genetic algorithms		2	2
Total		24	24
Total Student Learning Time (SLT)	Face to Face	Total Guided and Independent Learning	
Lecture	24	24	
Tutorials	-	-	
Laboratory/Practical	24	12	
Quizzes (x 5 times)	-	5	
Presentation			
Assignment	-	10	
Mid Term Test	1	3	
Final Exam	2	15	
Sub Total	51	69	
Total SLT		120	
16. Credit Value		3	
17. Reading Materials :			
Textbooks			
1.	Kruise, R., Borgelt, C., Klawonn, F., Moewes, C., Steinbrecher, M., & Held, P. (2013). Computational Intelligence: A Methodological Introduction. Springer Science & Business Media.		
2.	Siddique, N., & Adeli, H. (2013). Computational Intelligence: Synergies of Fuzzy Logic, Neural Networks and Evolutionary computing. John Wiley & Sons."		
Reference Material			
1.	Ke-Lin, D., & Swamy, M. N. S. (2013). Neural Networks and Statistical Learning. Springer.		
2.	Trillas, E., & Eciolaza, L. (2015). Fuzzy Logic: An Introductory Course for Engineering Students. Springer.		
3.	Simon, D. (2013). Evolutionary optimization algorithms. John Wiley & Sons.		

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Appendix (to be compiled when submitting the complete syllabus for the programme) :

1. Mission and Vision of the University and Faculty
2. Programme Objectives or Programme Educational Objectives
3. Programme Outcomes (POs)
4. Mapping of POs to the 8 MQF domain
5. Summary of the Bloom's Taxonomy's Domain Coverage in all the Los in the format below :

Subject	Learning Outcomes (please state the learning Outcomes)	Bloom's Taxonomy Domain		
		Affective	Cognitive	Psychomotor
ABC1234	Learning Outcome 1			
	Learning Outcome 2			
	Learning Outcome 3			
	Learning Outcome 4			
DEF5678	Learning Outcome 1			
	Learning Outcome 2			
	Learning Outcome 3			
	Learning Outcome 4			

6. Summary of LO to PO measurement
7. Measurement and Tabulation of result for LO achievement
8. Measurement Tabulation of result for PO achievement