MULTIMEDIA UNIVERSITY®

SUMMARY OF INFORMATION ON EACH COURSE

1.	Name of Course	Information Theory	
2.	Course Code	TIT 3131	
3.	Status of Course [Applies to (cohort)]	Specialisation Core for B.IT Security Technology	
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 Degree – MQF Level 6	
5.	Version (State the date of the Senate approval – history of previous and current approval date)	Date of previous version: June 2012 Date of current version: June 2014	
6.	Pre-Requisite	TDC1231 Data Communication and Networking	
7.	Name(s) of academic/teaching staff	Teo Chuan Chin	
8.	Semester and Year offered	Trimester 1, Year 3	
9.	Objective of the course in the programme : This subject introduces information theory which covers channel capacity and coding, linear block and cyclic error, and convolution coding.		
10.	Justification for including the course in the programme : The knowledge of this subject is essential for Security Technology students. The aims of this course are to introduce the basic theoretical techniques of information theory. The course will study how information is measured in terms of probability and entropy, and the relationships among conditional and joint entropies and how these are used to calculate the capacity of a communication channel. Furthermore the various parts of a Shannon communications system are examined, including coding and decoding with or without the presence of noise, coding schemes and error correcting codes.		
11.	Course Learning Outcomes :	Domain	Level
	LO1 Define information source coding and channel capacity using Shannon's Theorems.	Cognitive	1

	LO2 Design efficient codes for information source by using various lossless compression techniques.	Cognitive	5
	LO3 Describe the relationship between entropy, conditional entropy, mutual information, and channel capacity of the communication channel	Cognitive	1
	LO4 Compute a priori and posterior entropies, conditional entropies and mutual information of the communication system	Cognitive	3
	LO5 Apply block code coding and convolutional coding techniques and construct reliable codes for data on noisy communication channels.	Cognitive	3

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								
LO4							X		
LO5								X	

13. Assessment Methods and Types :

Method and Type	Description/Details	Percentage
Test	Written Test	20%
Quizzes	5 Quizzes for each topic	20%
Final Exam	Written Exam	60%

14. Mapping of assessment components to learning outcomes (LOs)

Assessment Components	LO1	LO2	LO3	LO4	LO5
Test		20		20	20
Quizzes		20		20	20
Final Exam	100	60	100	60	60

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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	Tutorial
	1. Information Sources and Sources Coding Logarithmic measure for information, self and average information. Entropy, information rate, discrete sources, extensions of a discrete source, Shannon's source coding theorem. Markov source. Joint and conditional entropy. Source coding theorem and algorithms. Kraft inequality, Huffman code, prefixes code, Lempel-Ziv code, rate distortion theory. Scalar and vector quantization, waveform coding.	6	3
	2. Channel Capacity and Coding Discrete channels, a priori and a posterior entropies, equivocation, mutual information, noiseless channel, deterministic channel, channel capacity, Shannon's channel coding theorem, bandwidth-S/N trade-off. Channel capacity theorem. Continuous information source, maximum relative entropy.	6	3

	3. Linear Block and Cyclic Error-Correction Coding Model of digital communication system employing coding. Algebraic coding theory. Definition of terms: redundancy, code efficiency, systematic codes, Hamming distance, Hamming weight, Hamming bound. Types of codes: parity check codes, Hamming codes, BCH codes, maximum-length or pseudo-random codes, Reed-Solomon codes, concatenated codes. Linear block codes, generator and parity check matrix, syndrome decoding. Cyclic codes, generation and detection. Coding for reliable communication, coding gain, bandwith expansion ratio. Comparison of coded and uncoded systems.	8	4
	4. Convolutional Codes Burst error detecting and correcting codes. Convolutional codes, time domain and frequency domain approaches. Code tree, Trellis and state diagram. Decoding of convolutional codes, Veterbi's algorithm, sequential decoding. Transfer function and distance properties of convolutional codes. Bound on the bit error rate. Coding gain.	6	3
	5. Applications of Coding Coding for bandwith constrained channels: combined coding and modulation, Trellis coded modulation (TCM), decoding of TCM codes. Coding for white Gaussian noise channel. Coding for compound-error channels, coding for error control in data storage.	2	1

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	Total		**28**	**14**
	Total Student Learning Time (SLT)	Face to Face / Guided Learning		Independent Learning
	Lecture	28		28
	Tutorials	14		14
	Laboratory/Practical	0		0
	Presentation	0		0
	Assignment	0		0
	Mid Term Test	2		10
	Final Exam	2		17
	Quizzes	5 times		5
	Sub Total	46		74
	Total SLT	**120**		
16.	Credit Value	**120/40 = 3**		
17.	Reading Materials :			
	Textbooks			
	1.Simon Haykin, (2013). Digital Communication Systems, Wiley, ISBN 978-0-471647355. 2.Simon Haykin, (2009). Communication Systems, Wiley, 5th Edition, ISBN 978-0-471-69790-9.			
	Reference Material (including 'Statutes' for Law)			
	1.S. Lin, D. J. Costello, (2004). Error Control Coding, 2nd Edition, ISBN 978-0130426727.			

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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 0utcomes)	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