

SUMMARY OF INFORMATION ON EACH COURSE

1.	Name of Course	Introduction to Formal Methods	
2.	Course Code	TSE2351	
3.	Status of Course [Applies to (cohort)]	Specialization Elective for Software Engineering, Elective for other Major	
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)	Previous: June 2014 Current: June 2016	
6.	Pre-Requisite	TMA1201 Discrete Structures and Probability	
7.	Name(s) of academic/teaching staff	Ho Chin Kuan	
8.	Semester and Year offered	Trimester 1 (Delta Level)	
9.	Objective of the course in the programme : <ul style="list-style-type: none">To inculcate awareness of formal methods and their relevance to software engineering;To introduce a formal specification language in software engineering;To develop skills in writing model-oriented formal specification;		
10.	Justification for including the course in the programme : Within the field of software engineering, there is an area called <i>formal software engineering</i> . This subject serves to introduce students to basic modelling techniques in formal software engineering.		
11.	Course Learning Outcomes :	Domain	Level
	LO1: Identify the role of formal methods within the software development lifecycle	Cognitive	2
	LO2: Write formal specifications based on a set of requirements	Cognitive	3
	LO3: Apply established techniques to proof formal specifications	Cognitive	3
	LO4: Write algorithms based on formal specifications	Cognitive	3
12.	Mapping of Learning Outcomes to Programme Outcomes :		

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	Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
	LO1							X		
	LO2								X	
	LO3								X	
	LO4									X
13.	Assessment Methods and Types :									
	Method and Type	Description/Details					Percentage			
	Test	Written					15			
	Assignment	Application of formal methods specification					20			
	Quizzes	Written					15			
	Final Exam	Written					50			
14.	Mapping of assessment components to learning outcomes (LOs)									
	Assessment Components	LO1		LO2		LO3		LO4		
	Test	X		X		X				
	Assignment			X		X		X		
	Quizzes	X		X		X				
	Final Exam	X		X		X		X		
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 (Hrs)		Lab (Hrs)		Tutorial (Hrs)		
	1.Overview of Formal Methods Mathematical modelling of software components and systems; importance and roles of formal methods in software engineering; drawbacks of informal notations, overview of available formal specification languages.			2		2		-		

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	2.Basics of the Z Specification Language Fundamental concepts: sets, sequences, bags, functions, relations, free types; the Z schema – state schema, state invariants, operations, pre-conditions, post-conditions; case study	6	6	-
	3.Z Schema operators Basic schema operators: conjunction, disjunction, negation, hiding, composition, hiding; two case studies.	6	6	-
	4.Refinement Modelling sets by sequences; correctness of operation modelling; modelling set union, intersection and difference; relating specification to design; proof methods to determine correctness of design.	8	8	-
	5.Verification Floyd-Hoare logic; deriving a Hoare triple from Z schema; transformation to pseudo-codes; case study.	4	4	-
	6.Application to Real-World Software Development Guidelines for developing formal specifications, software tools for formal specification.	2	2	-
		28	28	-
	Total Student Learning Time (SLT)	Face to Face / Guided Learning		Independent Learning
	Lecture	28		28
	Tutorials			
	Laboratory/Practical	28		28
	Presentation			
	Quizzes	1		4
	Assignment			16
	Mid Term Test	1		4
	Final Exam	2		20

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	Sub Total	60	100	
	Total SLT	160		
16.	Credit Value	4		
17.	Reading Materials :			
	Textbooks			
	Diller, A. <i>An Introduction to Formal Methods</i> , 2 nd ed, John Wiley & Sons, 1994.			
	Reference Material (including 'Statutes' for Law)			
	Hinchey, M.G., Bowen, J.P. <i>Industrial-Strength Formal Methods in Practice</i> , Springer, 2008			
	Woodcock, J. and Davies, J. <i>Using Z: Specification, refinement and Proof</i> . Prentice-Hall, 1996			
	Spivey, J.M. <i>The Z Notation: A Reference Manual</i> , 2 nd ed. Prentice Hall, 1992			
Appendix (to be compiled when submitting the complete syllabus for the programme) :				
<ol style="list-style-type: none"> 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 : 				
	Learning Outcomes (please state the learning Outcomes)	Bloom's Taxonomy Domain		
Subject		Affective	Cognitive	Psychomotor
TSE2351	LO1		2	
	LO2		3	
	LO3		3	
	LO4		3	
<ol style="list-style-type: none"> 6. Summary of LO to PO measurement 7. Measurement and Tabulation of result for LO achievement 8. Measurement Tabulation of result for PO achievement 				