MULTIMEDIA UNIVERSITY®

COURSE INFORMATION

1 .	**Name of Course**	Computational Methods
2 .	**Course Code**	TMA1301
3 .	**Type of Course** (e.g. : Core, major, elective etc.)	Core
4 .	**Synopsis**	The course aims to provide and equip students with general computational methods knowledge and problem solving skills using software.
5 .	**Version** (State the date of theSenate's approval - previous and the current approval date)	Current: January 2018 Previous: June 2016
6 .	**Name(s) of Academic Staff**	Khor Chia Ying Tong Hau Lee Lim Siew Ling Tong Gee Kok
7 .	**Semester and Year Offered**	Trimester 2 (Beta)
8 .	**Credit Value**	4 credit hours
9 .	**Pre-Requisite**	TMA1101 Calculus

10 . **Objective of the course in the programme:**

To equip students with knowledge of computational methods and ability to manipulate software in solving mathematical problems.

11 . **Justification for including the course in the programme:**

To provide students with general computational methods knowledge and problem solving skills using software.

12 . **Course Learning Outcomes (CLO)**

		Domain	Level
CLO1:	Describe types of computational errors and techniques for reducing them.	Cognitive	1
CLO2:	Use algorithms to find roots of equations and numerical integration.	Cognitive	3
CLO3:	Solve systems of linear equations and approximation problems.	Cognitive	3
CLO4:	Solve computational problems using simulation.	Cognitive	3

13 . **Mapping of the Course Learning Outcomes to the Programme Learning Outcomes, Teaching Methods and Assessment:**

Course Learning Outcomes (CLO) (Must tally with CLOs in item 12)	Programme Learning Outcomes (PLO)												Teaching Methods	Assessment Method
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12		
CLO1		✓											Lecture/Tutorial	Test/Final Exam/Quiz
CLO2		✓											Lecture/Tutorial	Test/Final Exam/Quiz
CLO3		✓											Lecture/Tutorial	Test/Final Exam/Quiz
CLO4	✓												Lecture/Tutorial	Assignment/Quiz
Total	**1**	**3**											*Indicate the relevancy between the CLO and PLO by ticking "✓" the appropriate relevant box (This description must be read together with standards 2.1.2, 2.2.1, and 2.2.2 in Area 2 – pages 16 & 18 of COPPA 2.0)*	

14 . **Transferable Skills:**

Problem solving skill
Time management

15 . **Distribution of Student Learning Time (SLT)**

	Course Content Outline	**CLO	Teaching and Learning Activities – Guided Learning (F2F)* *L	*T	*P	*O	Guided Learning (NF2F)*	Independent Learning (NF2F)*	Total SLT
1	**Introduction** Nested multiplication; absolute and relative errors, rounding and chopping; number representations and errors, loss of significance; introduction to software**.**	**1**	2	2				4	8
2	**Locating Roots of Equations** Bisection method; Newton`s method; secant method; convergence analysis.	**2**	4	2	2			8	16
3	**Numerical Integration** Definite integral; trapezoidal rule; error analysis; Romberg algorithm.	**2**	4	2	2			8	16
4	**Matrices and Systems of Linear Equations** Linear algebra concepts: vectors, matrices, subspaces, linear independence, bases, linear transformation, eigenvalues and eigenvectors, singular value decomposition; Naïve Gauss elimination; condition number and ill-conditioning; residual and error vectors; Gauss elimination with scaled partial pivoting; LU factorization; iterative solution of linear systems; Jacobi and Gauss-Seidel methods; convergence analysis.	**3**	10	8	4		4	22	48

	5	**Monte Carlo Methods and Simulation** Random numbers and pseudo-random numbers; estimation of areas and volumes by Monte Carlo techniques; examples of simulation.	**4**	2		2			4	8
	6	**Least Square Problems, Interpolation and Polynomial Approximation** Least squares approximation. Interpolation and extrapolation, Taylor polynomials, Lagrange polynomials, Newton's divided-difference polynomials.	**3**	2	2			8	4	16
									Total SLT	**112**

SUMMATIVE ASSESSMENT

1. Continuous Assessment	**Percentage %**	**Total SLT**
Quiz	20%	10
Test	20%	6
Assignment	20%	12
Total SLT for Continuous Assessment		**28**

2. Final Assessment	**Percentage %**	**Total SLT**	
		F2F	**ILT**
Final Exam	40%	2	18
Total SLT for Final Assessment (F2F + NF2F)		**20**	
Grand Total	**100%**	**160**	

****Indicate the CLO based on the CLO's numbering in Item 12.**
***L= Lecture, *T= Tutorial, *P= Practical, *O= Others, F2F*= Face to Face, NF2F*= Non Face to Face**

16 . **Identify Special Requirement to Deliver the Course (e.g., software, nursery, computer lab, simulation room):**
FreeMat, Computer Lab

17 . **Main References:**
Cheney, E. W., &Kincaid, D. R. (2012).Numerical Mathematics and Computing (7thed.). CA, 94002:Cengage Learning.

18 . **Additional References:**
1. David C. Lay. (2012).Linear Algebra and Its Applications(4th ed.). Pearson.
2. Sauer, T. D. (2012).Numerical Analysis (2nd ed.).Pearson.

Note:
Cells shaded light grey contain formulas / fixed values. Edit these formulas only if needed.