1.	Name of Course/Module	Mathematical Techniques II
2.	Course Code	TMT1181
3.	Status of Subject	Core for B.IT Security Technology
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	TMT1171 Mathematical Techniques I
7.	Name(s) of academic/teaching staff	Nazrul Muhaimin B Ahmad Pang Ying Han Tan Shing Chiang
8.	Semester and Year offered	Trimester 2 (Beta Level)

9.	Objective of the course/module in the programme :	
	To introduce advanced mathematical techniques and numerical methods for problem-solving.	
10.	Learning Outcomes :	
	At the completion of the subject, students should be able to: LO1: Identify the types of differential equations. (Cognitive, Level 1). LO2: Solve the differential equations.(Cognitive, Level 3). LO3: Apply the concepts of differential equations and its solution methodology to various day-to-day problems (Cognitive, Level 3). LO4: Know the basics and necessity of Laplace and Fourier transforms and its application. (Cognitive, Level 1). LO5: Use numerical methods when analytical solutions are hard to find. (Cognitive, Level 3).	
11.	Synopsis:	
	The major areas of study include: analytical geometry in two and three dimensions, parametric equation, ordinary differential equations and its application, Laplace and Fourier transform with Parsevals theorem, interpolation and extrapolation with Taylor series and Lagrange approximation, Newton polynomial, numerical solution of equations and finally numerical solution of ordinary differential equation with Euler, Taylor series and Runge-Kutta method.	
	Bidang pengajian meliputi: analisis geometry dalam dua dan tiga dimensi, persamaan berparameter, persamaan pembezaan biasa dan kegunaannya, penjelmaan Laplace dan Fourier dengan teorem Parsevals, intepolasi dan ekstrapolasi dengan siri Taylor dan penghampiran Lagrange, polinomial Newton, persamaan penyelesaian berangka dan akhir sekali penyelesaian berangka bagi persamaan pembezaan biasa dengan kaedah siri Euler, Taylor dan Runge-Kutta.	
12.	Mapping of Subject to Programme Outcomes :	
	Programme Outcomes	**% of Contribution**
	PO1: Apply soft skills in work and career related activities	29

	PO2: Demonstrate knowledge and understanding of fundamental concepts, principles and best practices	71

13. Assessment Methods and Types :

Method and Type	Description/Details	Percentage
Test		30%
Quiz	Problem-based Questions	20%
Final Exam		50%

14. Details of Subject

Topics	Mode of Delivery	
	Lecture	Tutorial
1. Analytical Geometry Coordinate systems in two and three dimensions, Equations of lines and planes, Direction cosines, Computation of intersection points between lines and planes, Surface normal direction, Parametric equations, etc.	5	2
2. Ordinary Differential Equations Linear and non-linear equations, Degree and order, First order equations, Separable variables. Equations reducible to separable form, Exact equations, Linear equations with constant coefficients, Integrating factors, Initial-value problems, Higher-order equations, Solutions by Laplace transforms, Applications of differential equations	8	4
3. Laplace and Fourier Transforms Laplace transforms of elementary functions, Inverse Laplace transforms, Periodic Functions, Fourier transform, Fourier coefficients, Parsevals Theorem.	5	2
4. Interpolation and Polynomial Approximation Interpolation and extrapolation, Taylor series approximation, Lagrange approximation, Newton polynomials.	3	2
5. Numerical Solution of Equations Solution of equations of one variable – Bisection method, Newton-Raphson Method, Error analysis, Numerical solution of linear systems, Gaussian elimination and pivoting, Iterative methods.	4	2
6. Numerical Solution of Ordinary Differential Equations Euler's and Taylor Series methods, Finite difference methods, Systems of differential equations, Runge-Kutta methods, Convergence and stability.	3	2
Total	**28**	**14**

15. Tutorials

- Analytical Geometry
- First Order Differential Equations
- Second Order Linear Differential Equations
- Laplace and Fourier Transforms
- Interpolation and Polynomial Approximation
- Numerical Solution of Equations
- Numerical Solution of Ordinary Differential Equations

16.

Total Student Learning Time (SLT)	Face to Face (Hour)	Total Guided and Independent Learning
Lecture	28	28

	Tutorials	14	14
	Laboratory/Practical	-	-
	Presentation	-	-
	Assignment	-	-
	Mid Term Test	2	10
	Final Exam	2	20
	Quizzes	-	4
	Sub Total	46	76
	Total SLT	122/40 = 3.05 => 3	
17.	Credit Value	3	
18.	Reading Materials :		
	Textbook	Reference Materials	
	1. E. Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons. 10/E, 2010.	1. J.C. Butcher, “Numerical Methods for Ordinary Differential Equations”, Wiley, 2005. 2. P.P.G. Dyke, “An Introduction to Laplace Transforms and Fourier Series”, Springer, 2000.	
19.	Appendix (to be compiled when submitting the complete syllabus for the programme) : 1. Mission and Vision of the University and Faculty 2. Mapping of Programme Objectives to Vision and Mission of Faculty and University 3. Mapping of Programme Outcome to Programme Objectives 4. Programme Objective and Outcomes (Measurement and Descriptions)		