

Bil	Maklumat Terperinci Setiap Mata Pelajaran			
1.	Nama Mata pelajaran : Introduction to Scientific Computing			
2.	Kod: UECM1703			
3.	Taraf : Teras Major			
4.	Jam Kredit : 3			
	3 mewakili kuliah, tutorial dan self learning (Kuliah = 23 jam kontak; tutorial = 10 jam kontak; Practical = 10 jam; Self Learning = 74 jam)			
5.	Semester dan tahun diajar : Level 1			
6.	Prasyarat (sekiranya ada) : None			
7.	Kaedah penyampaian / pengendalian : Kuliah dan Tutorial			
8.	Sistem penilaian dan pecahan markah :			
	Kerja Kursus	50%		
	Peperiksaan Akhir	50%		
9.	Guru yang mengajar: Dr. Goh Yong Kheng			
10.	Objektif mata pelajaran : This unit introduces to mathematical computing software package.			
11.	Sinopsis mata pelajaran : This unit put the computing skills students have learned into the context of mathematics applications. The unit first introduces common mathematics software and it basic features. Then, follows by discussions on creating, manipulating arrays, program scripting, and generating graphics. Finally, specific examples of the applications of mathematics software in linear algebra, curve fitting and symbolic computation will be discussed.			
12.	Learning Outcome : After completing this unit, students will be able to: 1. Carrying out vector and matrix operation using computer software 2. Plot graphs, curves, surfaces and contours using computer software 3. Write program scripts for mathematical software 4. Use computer software to solve system of linear equations, eigenvalue problems, or matrix factorization problems 5. Use computer software to perform curve fitting on a set of data 6. Use mathematical software to calculate or simplify mathematical expression.			
13.	Assessment :			
	No	Method of Assessment	T	SL
	1.	Coursework		
		a) Practical	10	10
	b) Practical Assignment	-	6	
	c) Test	2	12	
2.	Final Examination	2	8	10

14. Tajuk mata pelajaran dan nilai jam kontak :

Topic	Content	L	T	SL	TSL
1. Introduction to Mathematical Computing <Preparation for subsequence topics>	<ul style="list-style-type: none"> • Mathematical software • Online help, input-output, file types, general commands • Numbers: Double, Float, Integer, Complex • Arithmetic operations • Formatting numbers • Characters, strings, texts • Variables • Elementary built-in functions 	4	1	4 1.5	10.5
2. Arrays Manipulation [1]*	<ul style="list-style-type: none"> • Creating vectors and matrices • sub-arrays and indexing • size, reshape, transpose • Matrix arithmetic • "Dot" operations • Special matrices: Identity matrix, diagonal matrices, sparse matrices • Relational operations, logical operations • Matrix functions • inline functions, anonymous functions • loading and saving data 	4	2	4 3	13
3. Scripting and Programming [3]*	<ul style="list-style-type: none"> • M-files: Script files and function files • Running a script • Compiled functions • Loops • If-else-then statements • Multiple inputs and outputs • Variable arguments • Comment and documentations 	5	2	5 3	15
4. Graphics [2]*	<ul style="list-style-type: none"> • 2-D plots • Plotting a set of data • Plotting a function • Plotting parametric curves • Line styles, markers and colours • Labels, title, legends • Axis control • Overlay plots and subplots • Specialized 2-D plots • 3-D plots • Curve plot, contour, surface, mesh • Colour bar and colour shading • Plotting vector fields 	4	2	4 3	13

5. Computational Linear Algebra [4]*	<ul style="list-style-type: none"> Solving a linear system Gaussian elimination Eigenvalue problems Matrix factorizations 	2	1	2 1.5	6.5
6. Curve Fitting and Interpolation [5]*	<ul style="list-style-type: none"> Polynomial curve fitting Least square curve fitting General nonlinear fit Interpolation 	2	1	2 1.5	6.5
7. Symbolic Computation [6]*	<ul style="list-style-type: none"> Introduction to symbolic computation Calculus Algebraic simplification Graphs of symbolic functions Symbolic matrix operations Solving algebraic equations 	2	1	2 1.5	6.5
Assessment			14	36	50
Total		23	24	74	121
Jam Kredit			3		
Sumber rujukan utama :					
<ol style="list-style-type: none"> Pratap, R. (2006). <u>Getting Started with Matlab 7: A Quick Introduction for Scientists and Engineers</u>. New York: Oxford University Press. Davis, T. A., & Sigmon, K. (2004) <u>MATLAB Primer</u>. (7th ed.) US: Chapman & Hall/CRC 					
Sumber rujukan tambahan :					
<ol style="list-style-type: none"> Higham, D., & Higham, A. (2008). <u>MATLAB Guide</u>. (2nd ed.). New York: SIAM Herniter, M. E. (2001) <u>Programming in MATLAB</u>. New York: Thomson/BrooksCole Chen, K., Giblin, P. J., & Irving, A. (1999). <u>Mathematical Explorations with MATLAB</u>. Cambridge: Cambridge U. Press 					

Remark: [K]* refer to learning outcome numbered K.

****Maklumat tentang Latihan Amali**

Lab	Activity	Contact Hours	SL
1	<p>Topic : Software Environment</p> <p>Task : Getting familiar with input/output, scripting, number and string representations and arithmetic.</p> <p>Resources: Computer, Matlab/Octave/SciPy, Printer.</p>	1	1
2	<p>Topic : Arrays and Built-in Functions</p> <p>Task : Getting familiar with arrays, matrices, and built-in functions such as sine, cosine, exp, log, rand and basic plotting utilities.</p> <p>Resources: Computer, Matlab/Octave/SciPy, Printer.</p>	1	1
3	<p>Topic : Advanced Array and Matrix</p> <p>Task : Use mathematical software to perform array, vector and matrix operations and functions such as size, subarray, transpose, power, etc.</p> <p>Resources: Computer, Matlab/Octave/SciPy, Printer.</p>	1	1
4	<p>Topic : Programming with Scripts</p> <p>Task : Loops, if-else statements, functions with arguments, comments and compiled functions.</p> <p>Resources: Computer, Matlab/Octave/SciPy, Printer.</p>	1	1
5	<p>Topic : Application of Array and Matrix in Basic Statistics</p> <p>Task : Writing scripts to calculate basic statistical data such as mean, mode, median and find least square equation in simple linear regression.</p> <p>Resources: Computer, Matlab/Octave/SciPy, Printer.</p>	1	1
6	<p>Topic : Using 2D Plotting Functions</p> <p>Task : Applying 2D plotting functions to investigate single variable calculus, e.g. parametric curves and its tangent. Learn to save 2D plot and use it in MS Word.</p> <p>Resources: Computer, Matlab/Octave/SciPy, Printer.</p>	1	1
7	<p>Topic : Using 3D Plotting Functions</p> <p>Task : Applying 3D plotting functions to investigate</p>	1	1

	multiple variable calculus, e.g. 3D curves, contour, surface, mesh, etc. Learn to save 3D plot and use it in MS Word. Resources: Computer, Matlab/Octave/SciPy, Printer.		
8	Topic : Computational Linear Algebra Task : Explore how to solve linear system and factorise matrix using Gaussian elimination Resources: Computer, Matlab/Octave/SciPy, Printer.	1	1
9	Topic : Curve Fitting and Interpolation Task : Explore various curve fitting techniques such as polynomial curve fitting, least square curve and interpolation Resources: Computer, Matlab/Octave/SciPy, Printer.	1	1
10	Topic : Symbolic Computations Task : Apply symbolic computation such as algebraic simplification, solving algebraic equations, differentiation to handle transfer functions. Resources: Computer, Matlab/Octave/SciPy, Printer.	1	1
	Jumlah Jam Kontak	10	10