ENGR1121 Course Outline: Topics in MATLAB

This table outlines the resources for the topics covered in ENGR1121 using MATLAB Marina (www.matlabmarina.com)

Class session	Topics	Modules on MATLAB Marina	Primers	Tutorials	Sample code	Exercises (# of problems)
	Using this VLE	Using this VLE	What is the best way to use this VLE?			
1	Introduction to MATLAB	Introduction to MATLAB	Introduction to MATLAB Primer Introduction to MATLAB scripts Primer Introduction to MATLAB help Primer	Overview of the MATLAB IDE Using MATLAB's command window Using MATLAB's help Writing and executing a MATLAB program Using the input command for user input Using the disp command for displaying outputs	usingscriptfiles.m hypotenuse.m	4
1	Variables (covered with Introduction to MATLAB)	Variables	Variables Primer	Using simple variables and commands such as clear, clc, who and whos	None	3
2	Arrays: 1D Arrays & Vectors* *(split into 2 sessions)	1D Arrays & Vectors	Creating and Modifying Arrays Primer Operations on Arrays Primer* Applying Arrays Primer*	Creating vectors Vector arithmetic operations Vector logical operations Elements and indices Inserting an element Deleting an element Replacing an element	None	12*
2	Logic Expressions (covered with 1D Arrays)	Logic Expressions	Logic Expressions Primer	Using the logic operations ==, <=, etc. Using the logic operations & and |	None	8
3	Arrays: 1D Arrays & Vectors* *(split into 2 sessions)	1D Arrays & Vectors	Operations on Arrays Primer* Applying Arrays Primer*	Using find Evaluating and plotting a function over a given range Evaluating and plotting a piecewise function over given ranges Inserting a set of elements Deleting a set of elements Replacing a set of elements Useful commands: length, sum, etc.	None	12*
	File I/O* *(not covered in a separate session)	File Input/Output		Reading from an Excel file using xlsread (covered with curvefitting) *Writing to an Excel file using xlswrite** Using the save/load functions to save/load variables in the workspace (covered with 1D Arrays) *Using the dlmread/dlmwrite functions to read/write delimited ASCII files** ** not covered in ENGR1121*	None	7
4	Plotting: 2D Plotting	2D Plotting	2D Plotting Primer 2D Plotting Examples	Plot a simple sine curve Plot multiple sine curves on one figure Plot multiple sine curves on multiple figures (using subplot)	plotting_sinecurve.m plotting_sinecurves1.m Plotting_sinecurves2.m plotting_sinecurves3.m	7
5	Arrays: 2D Arrays & Matrices	2D Arrays & Matrices	2D Arrays Primer	Creating matrices Matrix arithmetic operations Matrices: indices & elements part I & part II Using find	None	8

				Useful commands: size, length, etc.		
5	Linear Algebraic Equations (works well as a homework lab)	Linear Algebraic Equations	Linear Algebraic Equations Primer	Solve for 3 unknowns x,y & z Solve for currents in a circuit Solve for the acceleration and tensions for 3 falling parachutists	linear1.m & linear2.m linear_electricalcircuits.m linear_3parachutists.m	3
6	Plotting: 3D Plotting	3D Plotting	Plotting 3D Primer Plotting Surface Primer	Plot a 3D helix Using meshgrid Plot a 3D surface plot	plotting3d_helix.m plotting3d_mesh.m	3
7	Conditional Structures: If-Else Statements (one class session for both if-else and switch-case)	If-Else Statements	If-Else Statements Primer If-Else Statements Examples	Compute area of a circle if given radius is positive Convert % grade to letter grade Determine the hurricane category and storm surge based on given wind speed.	areaofcircle.m percent_to_letter_grade.m hurricane_category.m	7
7	Conditional Structures: Switch-Case Statements	Switch-case Statements	Switch-Case Statements Primer Switch-Case Statements Examples	Determine the corresponding semester of a given month Create a menu to convert given length in meters to feet or yards	semestersoftheyear.m menulengthunitconversion.m dlglengthunitconversion.m	4
8	Iteration: For Loops	for Loops		Write a statement N times Display numbers from start to end Build a vector Compute cos(x) using the Taylor series Compute the sum of all integers from 1 to N Convert percent grades to letter grades	forloop_writeNtimes.m forloopdisplaycount.m forloop_buildvector1.m forloop_cosxtaylorseries.m runningsum1toN.m classpercent_to_letter_grade.m	13
9	Iteration: While Loops	while Loops		Write a statement N times Write a statement till a given condition is satisfied Display numbers from a Start Count to an End Count (specified by the user) Build a vector Compute a running sum	whileloop_writeNtimes.m whileloop_writestatement.m whileloopdisplaycount.m whileloop_buildvector1.m running sum1toTotal.m	8
10	Functions	Functions		Overview of functions A function cylinder.m used to compute the area and volume of a cylinder, given radius and height A function circuit.m used to compute the power, current, and total resistance of a circuit in series.	cylinder.m & cylindertest.m Circuit.m & circuittes	31
11	Characters & Strings	Characters & Strings		Creating and manipulating strings *Using the int8 and char commands* Using logical operations and the strcmp function Creating formatting inputs using the input command Creating formatted outputs using the disp command (using the num2str function) Creating formatted outputs using the fprintf command (using three examples)	None	9
12	Interpolation (often covered together with Curve Fitting)	Interpolation		Given the data (x,y) use the interp1 function to predict the interpolated values using linear, cubic and spline interpolation Given the data (x,y), use the interp1 function to find and plot the interpolated curves: linear, cubic and spline	interpolation1.m interpolation2.m	4

12	Curve fitting	Curvefitting		Given the data (t,y), use the polyfit and polyval functions to find the best-fit 1st and 2nd order polynomials. Given the data (t,y), use the polyfit and polyval functions to find and plot the best fit polynomials of orders 1, 2 and 3.	curvefitting2.m curvefitting1.m	3
	Topics that may be covered if time permits					
	Differentiation	Differentiation		Using the diff command and the difference formulae Evaluate and plot the derivative of a simple sine function Evaluate velocity and acceleration from given distance vs. time data	differentiationofsine.m velocityaccnusingdiff.m	3
	Integration	Integration		Using trapz and cumtrapz example I Using trapz and cumtrapz example II	distanceusingtrapz.m	4
	Structures	Structures		Overview of structures Creating structure arrays Creating structure arrays using a function Accessing and using information from a structure array Read data from an excel file to create a structure array	structures1.m structures2.m structures3.m & makeengr1234.m structures4.m	8