

Catalog Description: Solve applied problems involving formulas, functions, summation and iteration using Excel and MATLAB. Use built-in functions and graphing capabilities of MATLAB and Excel. Do vector and matrix calculations and write function files using MATLAB. Write and execute macros in Excel.

Course Objectives: After completing this course, students will be able to

1. Perform computations and program in Matlab.
2. Use Excell for mathematical computations.

Learning Outcomes and Performance Criteria

1. Matlab performance criteria.

Core Criteria:

- (a) Evaluate a numerical expression involving any of addition, subtraction, multiplication, division, exponentiation and common functions.
- (b) Use the MATLAB help feature.
- (c) Assign values to variables or parameters without echoing.
- (d) Evaluate an expression using assigned values of variables or parameters.
- (e) Write an M-file that
 - ◇ prompts for values of parameters or variables needed to evaluate a formula for the value of a dependent variable
 - ◇ computes the value of the dependent variable its value with appropriate annotation
 - ◇ contains comment lines explaining what the M-file is doing
 - ◇ returns correctly formatted output
- (f) Save an M-file to a desired location, and name an M-file according to the class standard.
- (g) Determine what operations are possible with vectors and matrices, and under what conditions, both by hand and in Matlab.
- (h) Create a vector in MATLAB; add vectors or multiply a vector by a scalar in MATLAB.
- (i) Augment a vector with another vector in MATLAB.
- (j) Given a vector x , determine x_n and use the MATLAB equivalent to pick out a component of a vector in MATLAB, or to define a vector in MATLAB.
- (k) Use the `length` and `size` command in MATLAB.
 - (l) Use the colon operator and `linspace` command to create a vector with given first and last component and given increment between components *without entering each component individually*.
- (m) Use a for loop to generate a sequence explicitly or recursively.
- (n) Use a for loop to generate values of a dependent variable for given initial value, final value and increment of the independent variable.

- (o) Graph a function of one variable.
- (p) Enter a matrix in MATLAB.
- (q) Give the dimensions of a matrix. Give the a_{ij} entry of a matrix A or tell which entry a given value in a matrix represents.
- (r) Use MATLAB to single out a given entry, row or column of a matrix.
- (s) Use the meshgrid command to create a matrix whose entries are values of a function of two variables.
- (t) Use the (dot) operator works with matrices, in conjunction with multiplication and exponentiation.
- (u) Use the (dot) operator to create values of a dependent variable from a vector of independent variable values.
- (v) Solve a matrix equation of the form $AX = B$ or $XA = B$ for X using the appropriate division.
- (w) Write a system of linear equations in matrix-times-vector form.
- (x) Write an M-file that uses a while loop to create a sequence of values until a predetermined condition is met.
- (y) Write an M-file that uses if-else commands.
- (z) Create a function file.

Additional Criteria:

- (a) Use a function file as a subroutine. [NOT CORE]
- (b) Generate sequences explicitly or recursively “by hand” from a formula. [NOT CORE]

Excel Performance Criteria

- (a) Enter numbers in cells and format the number of decimal places shown.
- (b) Enter and copy a formula that uses relative referencing.
- (c) Enter and copy a formula that uses mixed referencing.
- (d) Enter and copy a formula that uses absolute referencing.
- (e) Use the sum, average and count features.
- (f) Use built-in mathematical functions.
- (g) Use the Excel regression data analysis tool to find the equation of a regression line.