The University of Jordan
School of Engineering

Department	Course Name	Course Number	Semester
Mechanical Engineering	Computer Programming for Engineers	0914202	

2019 Course Catalog Description

This course introduces students to technical computing environment (MATLAB) software that is used extensively in solving real life problems in different fields of engineering. The class focuses on the specific features of MATLAB that are useful for engineering applications. Solve nonlinear implicit equations including systematic development of programming via flowcharts and pseudo. Solution of nonlinear and linear systems of equations. Interpolation, approximation and curve fitting and statistics tool boxes. Numerical differentiation and integration. Solution of ordinary differential equations. Applied examples, Simulink and Symbolic modules, and simmechanics.

Instructors

Name	E-mail	Sec	Office Hours		Lecture Time	

Text Books

	Text book 1	Text book 2
Title	"Introduction to Matlab for Engineers"	Handouts
Author(s)	C William J. Palm III	-
Publisher, Year, Edition	McGraw Hill, 2005, 3rd	

References

Books	1. S. J. Chapman. MATLAB Programming for Engineers. Thomson, 2004. 2. C. B. Moler. Numerical Computing with MATLAB. Siam, 2004. 3. D. J. Higham and N. J. Higham. MATLAB Guide. Siam, 2nd edition, 2005. 4. K. R. Coombes, B. R. Hunt, R. L. Lipsman, J. E. Osborn, and G. J. Stuck. Differential Equations with MATLAB. John Wiley and Sons, 2000.
Journals	
Internet links	

Prerequisites

Prerequisites by topic	Computer Skills + Calculus
Prerequisites by course	Computer Skills for Engineers 0907101+ Engineering Math I 0301202
Co-requisites by course	-
Prerequisite for	-

Topics Covered

Week	Topics	Chapter in Text	Sections
1-2	Introduction to programming: Computers and MATLAB, programming methods, software, and flow charts. • Algorithm Design • Opening MATLAB screen and understanding the layout of MATLAB. • MATLAB Environment: Commands, programming windows and menus, creating and managing variables.		

3	Matrices, arrays, and mathematical operations with vectors & matrices and determination of Zeros of functions. Solving a system of linear equations.		
4	Built-in functions and user-defined functions. In this week you will learn: Work with MATLAB built-in functions. Generate your own "user-defined function" that you can read and execute in MATLAB. Call/handle a function in MATLAB. Work in M. file environment, save work as you progress.		
5	Write simple programs using MATLAB. In this week, you are expected to master the following techniques: 1- IF statement. 2- FOR loops. 3- WHILE loops. 4- Engineering algorithms and programming methodology. 5-Export and import data files/Excel files from/to MATLAB		
6	Write simple programs using MATLAB. In this week, you are expected to master the following techniques: 1- IF statement. 2- FOR loops. 3- WHILE loops. 4-Engineering algorithms and programming methodology. 5-Export and import data files/Excel files from/to MATLAB		
7	Numerical differentiation and integration. Use MATLAB to integrate and differentiate numerically. Learn how to compute the derivative of specified functions, and how to find the integral (area under the curve) of a given function and data points. Compare the results obtained using MATLAB (numerically) to analytical solution. Use MATLAB built-in functions to solve a set of ordinary differential equations (ODEs) numerically.		
8	Engineering applications: Practice what we learned in MATLAB so far in solving different problems. Examples: heat transfer, dynamics, vibration, and thermodynamics.		
9	Use MATLAB to study powerful techniques to deal with discrete data. This is widely used in engineering. Examples include Thermodynamic Tables properties. Two important techniques we will cover today are curve fitting and interpolation. Learn how to do curve fitting with MATLAB.		
10	Perform statistical analysis using MATLAB		
11	Symbolic processing in MATLAB. Learn to use symbolic toolbox in MATLAB. Learning how to create symbolic expressions and manipulate them algebraically, obtain symbolic solutions to algebraic and differential equations, perform symbolic differentiation and integration, evaluate limits and series symbolically, obtain symbolic solutions to ordinary differential equations, obtain Laplace transforms, and perform symbolic linear algebra operations, including obtaining expressions for determinants, and matrix inverses.		
12	Focus on using Simulink toolbox in MATLAB. Use Simulink to model, analyze and simulate dynamic systems using block diagrams.		

Mapping of Course Outcomes to ABET Student Outcomes

SOs	Course Outcomes
7	1. Find solution for systems of linear algebraic equations using MATLAB. Matrices, arrays, and mathematical operations with vectors & matrices and determination of Zeroes of functions. 2. Use MATLAB built-in functions and techniques generate histograms and other Statistical analysis. 3. Numerical differentiation and integration. Use MATLAB to integrate and differentiate numerically. Learn how to compute the derivative of specified functions, and how to find the integral (area under the curve) of a given function and data points. Compare the results obtained using MATLAB (numerically) to analytical solution. Use MATLAB built-in functions to solve a set of ordinary differential equations (ODEs) numerically. 4. Use MATLAB to solve mathematical problems. Find root of nonlinear algebraic equations in single variable using MATLAB built-in functions. 5. Use Simulink to model, analyze and simulate dynamic systems using block diagrams. 6. Write and read from Excel sheets using MATLAB built-in functions. 7. Visualize data using MATLAB plot functions. Learn simple and advanced plotting techniques. 8. Simple programs using MATLAB FOR/IF/WHILE loops. Calling functions in MATLAB. 9. Use MATLAB built-in functions and techniques to do statistical analysis on given data. 10. Use MATLAB to study powerful techniques to deal with discrete data. Learn MATLAB functions to perform both curve fitting and interpolation.

Evaluation

Assessment Tools	Expected Due Date	Weight
Project		10%
Quizzes		10%
Midterm Exam		30%
Final Exam		50%

Contribution of Course to Meet the Professional Components

Students will be required to use MATLAB software during lab time and exams.

Relationship to Student Outcomes

SOs	1	2	3	4	5	6	7
Availability							X

Relationship to Mechanical Engineering Program Objectives (MEPOs)

MEPO1	MEPO2	MEPO3	MEPO4	MEPO5

ABET Student Outcomes (SOs)

1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Updated by ABET Committee, 2020