

School of Engineering and Natural Sciences / Biomedical Engineering (English)

2024 - 2025 Academic Year

PROGRAMMING with MATLAB

Syllabus

Course Description					
Name	Code	Semester	T+A Hour	Credit	ECTS
PROGRAMMING with MATLAB	BME3149090	Fall Semester	2+2	3	6
Prerequisites Courses					
Recommended Elective Courses					
Language of Instruction	English				
Course Level	First Cycle (Bachelor's Degree)				
Course Type	Elective				
Course Coordinator	Assoc.Prof. Atakan MANGIR				
Name of Lecturer(s)	Res.Assist. Recep Akif TAŞCI, Prof.Dr. Mehmet Kemal ÖZDEMİR				
Assistant(s)					
Aim	Equipping the ability to perform data analysis, numerical computing, algorithm development, and modelling and simulation of complex systems. Solving engineering problems, automating tasks, and applying advanced techniques through specialized toolboxes, preparing individuals for real-world technical challenges for academia and industry.				
Course Content	This course contains; Basics of getting, installing, and running Matlab, introducing MATLAB Environment (IDE), some important commands, pre-defined variables, special characters, mathematical operators, input and output, creating, saving and running scripts.,Arrays, array-related MATLAB built-in functions, adding and removing elements from an array, finding specific elements in an array, array operations, mathematical operations on arrays, plotting arrays.,Matrices, matrix-related MATLAB built-in functions, adding and removing elements, rows and columns, finding specific elements in a matrix, matrix operations, mathematical operations on matrices, concatenation of matrices, plotting matrices.,Some important MATLAB built-in functions.,Strings, string arrays, basic string operations, concatenation, indexing, string functions, differences between strings and character arrays.,Plotting, plot customization (color, line style, markers), multiple plots, 3D Plotting, saving plots in different formats, figure properties.,General overview.,If-Else Statement, multiple conditions, logical conditions, relational operators, logical operators, nested If statements, If with vectors and matrices. Switch-Case Statement, multiple cases, the otherwise block evaluating expressions in case.,For-While Loops, looping over arrays and matrices, nested for loops, preallocating arrays in loops, infinite loops, breaking out of loops, using continue in loops, looping until a condition is met, efficient looping with vectorization.,Functions, defining inputs and outputs, calling a function, function handle, anonymous functions, variable number of inputs and outputs, local and global variables, recursion, using built-in functions.,Installing and Using Toolboxes, Symbolic Math Toolbox, creating symbolic variables, symbolic expressions, basic operations.,Using Live Editor with Symbolic Math Toolbox, differentiation, integration, solving equations, simplifying expressions, substitution, numerical evaluation, plotting symbolic expressions.,Optimization Toolbox and Fuzzy System Toolbox.General overview..				
Course Learning Outcomes			Teaching Methods	Assessment Methods	
Distinct MATLAB basics.			1, 10, 11, 12, 13, 14, 16, 17, 21, 3, 37, 4, 5, 6, 9	A, B, C, E, G, R	
Model an engineering problem in MATLAB.			1, 10, 11, 12, 13, 14, 16, 17, 21, 3, 37, 4, 5, 6, 9	A, B, C, E, G, R	
Solve the modeled problem, using special toolkits for this.			1, 10, 11, 12, 13, 14, 16, 17, 21, 3, 37, 4, 5, 6, 9	A, B, C, E, G, R	
Perform modeling and simulation.			1, 10, 11, 12, 13, 14, 16, 17, 21, 3, 37, 4, 5, 6, 9	A, B, C, E, G, R	
Perform data analysis and visualization.			1, 10, 11, 12, 13, 14, 16, 17, 21, 3, 37, 4, 5, 6, 9	A, B, C, E, G, R	
Teaching Methods	1: Mastery Learning, 10: Discussion Method, 11: Demonstration Method, 12: Problem Solving Method, 13: Case Study Method, 14: Self Study Method, 16: Question - Answer Technique, 17: Experimental Technique, 21: Simulation Technique, 3: Problem Based Learning Model, 37: Computer-Internet Supported Instruction, 4: Inquiry-Based Learning, 5: Cooperative Learning, 6: Experiential Learning, 9: Lecture Method				
Assessment Methods	A: Traditional Written Exam, B: Short Answer Exam, C: Multiple-Choice Exam, E: Homework, G: Quiz, R: Simulation-Based Evaluation				
Lecture Schedule					
Sequence	Topics	Preliminary Preparation			
1	Basics of getting, installing, and running Matlab, introducing MATLAB Environment (IDE), some important commands, pre-defined variables, special characters, mathematical operators, input and output, creating, saving and running scripts.	Previewing book and lecture notes			
2	Arrays, array-related MATLAB built-in functions, adding and removing elements from an array, finding specific elements in an array, array operations, mathematical operations on arrays, plotting arrays.	Previewing book and lecture notes			
3	Matrices, matrix-related MATLAB built-in functions, adding and removing elements, rows and columns, finding specific elements in a matrix, matrix operations, mathematical operations on matrices, concatenation of matrices, plotting matrices.	Previewing book and lecture notes			
4	Some important MATLAB built-in functions.	Previewing book and lecture notes			
5	Strings, string arrays, basic string operations, concatenation, indexing, string functions, differences between strings and character arrays.	Previewing book and lecture notes			
6	Plotting, plot customization (color, line style, markers), multiple plots, 3D Plotting, saving plots in different formats, figure properties.	Previewing book and lecture notes			
7	General overview.	Previewing book and lecture notes			
8	If-Else Statement, multiple conditions, logical conditions, relational operators, logical operators, nested If statements, If with vectors and matrices. Switch-Case Statement, multiple cases, the otherwise block evaluating expressions in case.	Previewing book and lecture notes			

Lecture Schedule		
Sequence	Topics	Preliminary Preparation
9	For-While Loops, looping over arrays and matrices, nested for loops, preallocating arrays in loops, infinite loops, breaking out of loops, using continue in loops, looping until a condition is met, efficient looping with vectorization.	Previewing book and lecture notes
10	Functions, defining inputs and outputs, calling a function, function handle, anonymous functions, variable number of inputs and outputs, local and global variables, recursion, using built-in functions.	Previewing book and lecture notes
11	Installing and Using Toolboxes, Symbolic Math Toolbox, creating symbolic variables, symbolic expressions, basic operations.	Previewing book and lecture notes
12	Using Live Editor with Symbolic Math Toolbox, differentiation, integration, solving equations, simplifying expressions, substitution, numerical evaluation, plotting symbolic expressions.	Previewing book and lecture notes
13	Optimization Toolbox and Fuzzy System Toolbox	Previewing book and lecture notes
14	General overview.	Previewing book and lecture notes
Evaluation Methods		Weight(%)
Midterm Exam		30
General Exam		70

Resources
William J. Palm, 2005, Introduction to Matlab 7 for Engineers, Mc Graw Hill. Brian H. Hahn, Daniel T. Valentine, 2017, Essential MATLAB for Engineers and Scientists, Academic Press Brian H. Hahn, Daniel T. Valentine, 2017, Essential MATLAB for Engineers and Scientists, Academic Press