جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Programming with Matlab and Mathematica - AMCS 107

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	AMCS 107
Course Title	Programming with Matlab and Mathematica
Academic Semester	Spring
Academic Year	2018/2019
Semester Start Date	01/27/2019
Semester End Date	05/23/2019
Class Schedule (Days & Time)	01:00 PM - 02:30 PM | Sun Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Maria Alexandra Gomes	Alexandra.Gomes@KAUST.EDU.SA	+966128080652		Every time I am in my office (building 1, room 4330, 4th floor, library side) or email for appoitment.

Teaching Assistant(s)

Name	Email
TBA	TBA

Course Information

Comprehensive Course Description	Both Mathematica and Matlab are powerful coding languages in science and engineering computing. This course is an application-oriented introduction to the two languages. The student will be exposed to simple math computations, modeling and simulation problems, data analysis and processing, as well as visualization techniques. For the Mathematica module: 1. Introduction to Mathematica and to the Wolfram Language (knowledge-based language, built-in support for real-world entities, Wolfram Alpha and the Wolfram Demonstrations Project). 2. Typesetting and presenting your work and data (2D typesetting and LaTeX output, 2D/3D charts, deploying interactive documents, supported file formats for import and export). 3. Numerical and symbolic computations (arbitrary-precision arithmetic and automatic precision tracking, dynamic interactivity). 4. Lists, strings, rules, patterns and pattern matching. 5. Different programming paradigms (procedural, functional and rule-based). 6. Graphics and image manipulation (members of the plot family, pixels and voxels, the built-in image editor). For the Matlab module: 1. Starting with Matlab: arithmetic operations with scalars, display formats, elementary built-in functions, scalar variables. 2. Creating, manipulating and operating arrays. 3. Creating and running script files. Global variables. Input and output. 4. Two-dimensional plots. 5. Functions and function files. Local and global variables. 6. Programming in Matlab: relational and logical operators, conditional statements, loops and nested loops. Applications include linear and polynomial algebra, integration, exact and numerical optimization, differential equations (analytic and numerical solutions of ODEs and PDEs), plane and solid geometry, and probability and statistics.
Course Description from Program Guide	This course gives an introduction to MATLAB and Mathematica. It is designed to give students fluency in these two (2) mathematical software. The course consists of interactive lectures with students doing sample programming problems in real time.
Goals and Objectives	The goal of AMCS107 is to introduce students to the fundamental commands and structure of Mathematica and Matlab. The course covers the basic syntax and semantics of the two languages, including basic data types, variables, control structures and functions or similar concepts, and visualization of results and processed data. The course is oriented towards scientific applications, with special emphasis on engineering. At the end of the course, the student is expected to 1. understand the fundaments of procedural and functional programming; 2. understand both Mathematica and Matlab data types and structures; 3. be able to set up simple engineering problems such that they can be solved and visualized using basic codes in both languages; 4. be ready to use advanced coding in Mathematica and Matlab in their subsequent studies.
Required Knowledge	Undergraduate Calculus.
Reference Texts	For the Mathematica module: https://www.wolfram.com/language/elementary-introduction/ For the Matlab module: Essential MATLAB for Engineers and Scientists, 6th Edition, Brian Hahn; Daniel T. Valentine, Academic Press, Web ISBN-13: 978-0-12-805271-6, available through KAUST library.
Method of evaluation	**20.00**% - Others - Please specify **40.00**% - Homework /Assignments **40.00**% - Course Project(s)

Nature of the assignments	The final grade is given in a Satisfactory(S)/Unsatisfactory(U) system. To pass the course with a Satisfactory grade (S), the student should obtain at least 70%. Each of the two modules contributes equally to the final grade. During each module, there will be homework for the students to work on by themselves or in group. Together the homework sets are worth 40% of the final grade. Each homework must be turned in individually by email by the due date. The email must containt the source files with the code corresponding to each problem. At the end of the modules, each student will create a Mathematica project (for 20%) and a MATLAB project (for 20%), which they will present in the last class of the module. The remaining 20% of the final grade comes from in-class exercices. These exercices are pratice for material just taught or warm-up problems to review material taught in previous leatures.
Course Policies	Grades will be posted on the course Blackboard page. If you dispute your grade on any assessment, you may request a re-grade only within 48 hours of receiving the graded evaluation. Students that do not show up for a class (and fail to do the in-class exercices), do not submit a homework or a project should expect a zero in that assessment. Homework or projects submitted after the due date and time will not be graded except for exceptional cases (such as sick leave or other university/advisor approved activities).
Additional Information	Class notices and course related information will be posted periodically on the AMCS107 e-mail list and website. Please check regularly for important information. Also, there may be important email communications, therefore the student should monitor their email account on a daily basis.

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Sun 01/27/2019 Thu 01/31/2019	Introduction to Mathematica and to the Wolfram Language.
2	Sun 02/03/2019 Thu 02/07/2019	Typesetting and LaTeX output, 2D/3D charts, deploying interactive documents, supported file formats for import and export.
3	Sun 02/10/2019 Thu 02/14/2019	Numerical and symbolic computations: arbitrary-precision arithmetic and automatic precision tracking, dynamic interactivity.
4	Sun 02/17/2019 Thu 02/21/2019	Lists, strings, rules, patterns and pattern matching.
5	Sun 02/24/2019 Thu 02/28/2019	Different programming paradigms: procedural, functional and rule-based.
6	Sun 03/03/2019 Thu 03/07/2019	Graphics and image manipulation.
7	Sun 03/10/2019 Thu 03/14/2019	Presentation of the Mathematica projects.
8	Sun 03/17/2019 Thu 03/21/2019	Starting with Matlab: arithmetic operations with scalars, display formats, elementary built-in functions, scalar variables.
9	Sun 03/24/2019 Thu 03/28/2019	Spring Break
10	Sun 03/31/2019 Thu 04/04/2019	Creating, manipulating and operating arrays.
11	Sun 04/07/2019 Thu 04/11/2019	Creating and running script files. Global variables. Input and output.
12	Sun 04/14/2019 Thu 04/18/2019	Two-dimensional plots.
13	Sun 04/21/2019 Thu 04/25/2019	Functions and function files. Local and global variables.
14	Sun 04/28/2019 Thu 05/02/2019	Relational and logical operators, conditional statements, loops and nested loops.
15	Sun 05/05/2019 Thu 05/09/2019	Programming in Matlab.
16	Sun 05/12/2019 Thu 05/16/2019	Presentation of the Matlab projects.
17	Sun 05/19/2019 Thu 05/23/2019	Final Exam Week

Note

The instructor reserves the right to make changes to this syllabus as necessary.