The University of Jordan
School of Engineering
Department of Electrical Engineering
2nd Semester – A.Y. 2016/2017

Course: Computer Applications – 0903201 (1 Cr. – Core Course)

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Office Hours: will be posted soon

Course Website: http://www.hawa.work/201/

Catalog Data: Computer packages for mathematical and symbolic manipulations (MATLAB, Mathematica). Windows environment. Graphics packages. INTERNET and its use in literature survey and information acquisition. Library search via computer. Engineering packages for computation. Data processing and statistical packages. Standard computer libraries.

Prerequisites by Course: **EE 1901102 – Computer Skills 2 (C++) (pre-requisite)**

Prerequisites By Topic: Students are assumed to have a background in the following topics:
- Basic computer and software skills.
- Basic programming language skills, such as C/C++.
- Basic mathematics, calculus and linear algebra.
- Basic scalar, array, vector and matrix operations.
- Solution of ordinary differential equations.
- Basic electric circuit analysis.

Textbook: **Introduction to MATLAB for Engineers by William J. Palm III, McGraw-Hill, 3rd Edition, 2011.**

References:
- *Essential MATLAB for Engineers and Scientists* by Brian Hahn and Daniel Valentine, Academic Press, 5th Edition, 2013.
- *MATLAB for Engineers* by Holly Moore, Prentice Hall, 3rd Edition, 2011.
- *Getting Started with MATLAB 7: A Quick Introduction for Scientists and Engineers* by Rudra Pratap, Oxford University Press, 1st Edition, 2005.
- *MATLAB Programming with Applications for Engineers* by Stephen J. Chapman, CL-Engineering, 1st Edition, 2012.
- *An Engineers Guide to MATLAB* by Edward B. Magrab, et. al., Prentice Hall, 3rd Edition, 2010.
- *Mastering MATLAB* by Duane C. Hanselman and Bruce L. Littlefield, Prentice Hall, 1st Edition, 2011.
- *Modeling and Simulation in SIMULINK for Engineers and Scientists* by Mohammad Nuruzzaman, AuthorHouse; 1st Edition, 2005.
- *Mastering Simulink* by James B. Dabney and Thomas L. Harman, Prentice Hall, 1st Edition, 2003.

Schedule & Duration: 16 Weeks, 45 lectures (50 minutes each) plus exams.

Minimum Student Material: Textbook, class handouts, scientific calculator, and an access to a personal computer.

Minimum College Facilities: Classroom with whiteboard and projection display facilities, library, computational facilities with the MATLAB program.

Course Objectives: The overall objective is to introduce the student to solving engineering problems using computers and scientific programming packages.

Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should:

1. Use MATLAB to solve computational problems and generate publishable graphics [e, k]
2. Use complex arithmetic and complex functions to describe applied problems. Describe complex numbers and functions in rectangular and exponential forms. Graph the magnitude and phase of complex functions [a]
3. Use matrix forms to describe and solve linear systems of equations and systems of differential equations [e]
4. Determine the system of linear equations required to find the coefficients that define an interpolating function that matches a set of data samples. [a, e]
5. Solve first and second order linear differential equations with constant coefficients both analytically and numerically. Use the MATLAB routine ODE23 to solve differential equations numerically. [a, k]
6. Define the Fourier series for a periodic signal. Define the Fourier transform of an aperiodic signal. [a, k]
7. Compute the Fourier series and transform from their definition as integrals. [a, k]
8. Use the properties of linearity, time-shifting and time-scaling to compute the Fourier series/transform of complex functions from the Fourier series/transforms of simple functions. [a, k]
9. Use the Simulink simulation package to simulate some electric and electronic circuits [k]

Course Topics:

	Topic Description	Hrs
1	Introduction to MATLAB and its use cases. Using the workspace to explore MATLAB features regarding ease of use and versatility. Entering commands. Using MATLAB help.	2
2	General number formatting. Variables, Vectors and Matrices. Built-in MATLAB engineering functions. Matrix-related functions. Operator precedence. Matrix indexing: row and column versus linear versus logical indexing. Matrix versus element-by-elemtn operations.	3
3	Solving a system of linear equations. The concept of vectorization and its use in speeding computations.	2
4	Euclidean Vectors and their operations. Complex numbers. Polynomials. Cells arrays. Structures.	2
5	Script Files. Header comments. User Input/Output commands. The concept of functions in MATLAB and how to build user defined functions. Local vs. global variables. Subfunctions. Inline functions and function handles. Importing data: text, Excel, images, audio, etc.	3
6	Writing general-purpose programs in MATLAB. Flowchart versus pseudocode. Relational operators and conditional statements. Flow control structures and loops. Practical exercises.	4
7	**Midterm Exam**	1
8	Plotting. The different plot types available. Figure annotations. Three dimensional plots.	3
9	Using MATLAB buil-in functions to obtain numerical solutions for various calculus problems: differentiation, integration, ordinary differential equations, etc.	2
10	MATLAB symbolic engine. Using symbolic notation to define and plot functions. Using symbolic capapilities for liner algebra, calcuals and other problems. Introduction to MuPAD.	2
11	Introduction to Simulink and its libraries. Simulating some engineering systems and finding solutions. Linking Simulink with the MATLAB workspace.	2

Ground Rules:

Attendance is required and highly encouraged. To that end, attendance will be taken every lecture. All exams (including the final exam) should be considered **cumulative**. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

Assessments:

Exams, Quizzes, Projects, and Assignments.

Grading policy:

Assignments, projects, quizzes	**20 %**
Midterm Exam	**30 %**
Final Exam	**50 %**
Total	**100%**

Last Updated:

January 2017