Philadelphia University

Faculty of Engineering and Technology,
Department of Mechatronics Engineering.
Course Syllabus, Second Semester, 2018/2019

Course Details:

Title: Modeling and Simulation (0640327).

Prerequisite: Dynamics and Vibration (640233) + Instruments and Transducers (640242).

Credit Hours: 3-credit hours (16 weeks per semester, approximately 45 contact hours).

Textbook: *"System Dynamics"*, Katsuhiko Ogata, 4th Edition, Pearson Prentice Hall, 2004.

References: "*Modeling and Analysis of Dynamic Systems*", Ramin S. Esfandiari, Bei Lu- 3rd Edition-CRC Press, 2018
"*System Dynamics*", Palm III, William, 2nd Edition, McGraw-Hill Science, 2009.

description: Modeling definition. Modeling of different physical systems (mechanical, fluid, thermal and electrical). Differential and Laplace equations. State-space representation. Computer simulation techniques (applications using MATLAB Program). System response and analysis.

Website: **http://www.philadelphia.edu.jo/academics/malkhawaldeh/**

Instructor: Dr. Mustafa Awwad Al-Khawaldeh
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Office hours: *Sunday, Tuesday, and Thursday:11:10-12:00* ,
Monday, Wednesday: *10:00-11:000*

Course Outlines:

Week	Topic	Assignments
1	Introduction to system dynamics	
2	The Laplace Transform, Inverse Laplace Transformation	
3	Solving Linear, Time-Invariant Differential Equations	
4	Modeling of Mechanical Systems: Introduction to Mechanical Elements,	Assignment .1
5	Rotational motion, Translational-rotational motion.	
6	Modeling of Electrical Systems.	
7	Mathematical Modeling of Electromechanical Systems, dc servomotors	
8	Mathematical Modeling of Operational-Amplifier Systems	
9	Mechanical-Electrical Analogies	
10	Mathematical Modeling of Liquid-Level Systems	
11	Modeling of Pneumatic Systems	
12	Modeling of Thermal Systems	

13	Linearization of Nonlinear Systems	
14	State-Space Approach to Modeling Dynamic Systems	Assignment .4
15	Time-Domain Analysis of Dynamic Systems	
16	Transient-Response Analysis of Second-Order Systems	

Course Learning Outcomes with reference to ABET Student Outcomes:

Upon successful completion of this course, student should:

1.	Understand fundamentals of system dynamics.	[1]
2.	Study the Laplace, inverse Laplace transformation.	[1 , 2]
3.	Obtain a mathematical Model of different physical systems (mechanical, fluid, thermal and electrical).	[1 , 5]
4.	Analyze the transient-response of second-order systems applying Matrix Laboratory (MATLAB).	[1 , 2, 6]

Assessment Guidance:

Evaluation of the student performance during the semester (total final mark) will be conducted according to the following activities:

Sub-Exams: The students will be subjected to two scheduled written exams, first exam and second exam during the semester. Each exam will cover materials given in lectures in the previous 3-4 weeks.

Quizzes: 3-quizzes of 10-minutes will be conducted during the semester. The materials of the quizzes are set by the instructor.

Homework and projects: Tutorials sheets will be handed out to the students and homework should be solved individually and submitted before or on a set due date. Student may be assigned to present project(s).

Final Exam: The students will undergo a scheduled final exam at the end of the semester covering the whole materials taught in the course.

Grading policy:

First Exam	20%
Second Exam	20%
Quizzes, projects and Homework	20%
Final Exam	40%
Total:	100%

Attendance policy:

The semester has in total 45 credit hours. Total absence hours from classes and tutorials must not exceed 15% of the total credit hours. Exceeding this limit without a medical or

emergency excuse approved by the deanship will prohibit the student from sitting the final exam and a zero mark will be recorded for the course.