FUTURE UNIVERSITY IN EGYPT جامعة المستقبل

Faculty of Engineering & Technology

Modeling and Simulation

Information :

Course Code :	MAN 380	**Level :**	Undergraduate	**Course Hours :**	2.00- Hours

Department : Department of Mechanical Engineering

Instructor Information :

Title	Name	Office hours
Professor	Hassan Ahmed Ahmed Mohamed Metered	2
Professor	Hassan Ahmed Ahmed Mohamed Metered	2
Assistant Lecturer	Rana Mohamed Abdel Rahman Saleh	4
Assistant Lecturer	Rana Mohamed Abdel Rahman Saleh	4

Area Of Study :

The overall aims of this course are:
ÅEnrich the students' basic theoretical knowledge about the modeling of physical systems and their governing differential equations.
ÅEnrich the students' basic knowledge of dynamics response of physical systems.
ÅEnrich the students' basic knowledge of Matlab toolbox of modeling and identifications.

Description :

Mathematical models for mechanical, pneumatic, electrical, hydraulic, and mechatronic systems in the time domain for single and multivariable systems; Laplace
and state space formulation Continuous, discrete, and combined system models;
Hardware-in-the-loop simulation and rapid prototyping of real-time electromechanical systems; Mat Lab, SimMechanics, Simulink, etc. are used to build models and
virtual prototypes.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Identify different types of control systems.
2 -	Identify the type of physical system; mechanical, electrical, hydraulic, pneumatic, electric and electronic.
3 -	Describe time response of first and second order differential equations.
b.Intellectual Skills: :	
1 -	Deduce the differential equations of physical systems.
2 -	Apply Laplace transformation to change functions from time domain to s-domain and vice versa.
3 -	Transform differential equations to transfer function.
4 -	Solve the differential equations of physical systems.

c.Professional and Practical Skills: :	
1 -	Use of MATLAB software to get inverse Laplace transform for certain transfer function.
2 -	Solve first and second order transfer functions using SIMULINK.
d.General and Transferable Skills: :	
1 -	Work coherently and successfully as a part of a team in assignments.
2 -	Write reports in accordance with the standard scientific guidelines.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction to control systems	1	1	
Classification of physical systems	2	2	
Modeling of mechanical systems: linear and rotational	6	4	2
Modeling of hydraulic systems	6	4	2
Modeling of pneumatic systems	3	2	1
Modeling of electrical systems	2	4	2
Modeling of electronic systems: Operational amplifiers	5	3	2
Laplace Transform : definition, transformation of various functions from time domain to s-domain	5	4	1
Inverse Laplace Transform and partial fraction method. The use of MATLAB software.	8	4	4
Solution of first and second order differential equations using Laplace transform and transfer function approach. Use of SIMULINK software	3	2	1

Teaching And Learning Methodologies :

Interactive Lecturing

Problem solving

Experiential learning

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
1st Midterm	20.00		
2nd Midterm	20.00		
Assignments, Participation	10.00		
Final Exam	40.00	16	
Quizzes	10.00		

Course Notes :

Lecture notes
Handouts.

Recommended books :
Bolton, W; ñMechatronics: Electronic Control Systems in Mechanical and Electrical Engineeringò, Pearson; 6 edition, 2016.