Faculty: Engineering Technology	
Department: Energy	**Program: Bachelor Degree**
Academic year: 2024-2025	**Semester: 1^{st} (Fall)**

Course Plan

First: Course Information

Course No. 0906370	***Course Title:* Simulation and Prediction**	***Credit Hours:3***
Prerequisite: 1501119	***Section No.:* 2**	***Lecture Time: 10-11Sun , Tue , The***
Type Of Course:	☐ ***Obligatory Faculty Requirement Elective*** ☐ ***University Requirement*** ☐ ***ObligatoryUniversity Requirement*** ☐ ***FacultyRequirement*** ☐ ***Course Elective SpecialtyRequirementObligatorySpecialization requirement***	
Type of Learning:	☒ ***Face-to-Face Learning*** ☐ ***BlendedLearning(2 Face-to-Face + 1Asynchronous)*** ☐ ***Online Learning (2 Synchronous+1 Asynchronous)***	

Second: Instructor's Information

***Name:* PhD.** Walid Emar		***Academic Rank:*** Professor			
Office Number:		***Ext. Number:***		***E-mail:*** **wemar@zu.edu.jo**	
Office Hours:	***Sunday 10-11***	***Monday 1-2***	***Tuesday 10-11***	***Wednesday 1-2***	***Thursday 10-11***

Third: Course Description

System types and properties (continuous, discrete, linear etc.), Mathematical model building and representation. Modeling Mechanical Systems, Modeling Electrical and Electromechanical Systems, Modeling Fluid and Thermal Systems. Standard Models for Dynamic Systems, transfer function, and state-space representation. Numerical Simulation of Dynamic Systems. Analytical Solution of Linear Dynamic Systems. Simulink. Intermediate Numerical Integration. Simulation Tools. Advanced Numerical Integration.

Fourth: Learning Source

Main Reference:	Modeling, Programming and Simulations Using LabVIEW™ Software", Pascal Cantot, Dominique Luzeaux	
Author: John Wiley	***Issue No.:***	***Publication Year:*** March 2013.
Additional Sources&Websites:	https://www.ni.com/pdf/manuals/371013a.pdf • •	
Teaching Type:	☒ ***Classroom*** ☐ ***Laboratory*** ☐ ***Workshop*** ☐ ***MS Teams*** ☐ ***Moodle***	

Fifth: Learning Outcomes

Course Code	***Course IntendedLearning Outcomes (CILOs)***	***Connection To Program ILOs Code***
Knowledge		
**K1	**Define** the basic concepts of dynamic systems and fundamental techniques used for deriving their mathematical models.	*PK1
K2	**Determine** the dynamic system time response with an emphasis on first- and second-order systems.	PK2
Skills		
***S1	**Optimize** the performance of dynamic systems that change internally at unpredictable times due to the influence of random events.	PS1
S2	**Apply** numerical simulation methods for obtaining the dynamic response of continuous-time systems.	PS2
Competencies		
****C1	**Create** a software program for describing the dynamic behaviour of linear systems using software technology (MATLAB commands etc.).	PC1

*** P: Program, **K: knowledge, ***S: skills, ****C: competencies.**

Sixth: Course Structure

Lecture Date	Intended Teaching Outcomes(ILOs)	Topics	Teaching Procedures*	TeachingMethods***	References***
13/10/2024	A	System types and properties (Continuous-Time Systems, discrete-time systems, linear time systems etc.), Mathematical model building and representation.	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
15/10/2024	A-B	System types and properties (Continuous-Time Systems, discrete-time systems, linear time systems etc.), Mathematical model building and representation.	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
17/10/2024	B	System types and properties (Continuous-Time Systems, discrete-time systems, linear time systems etc.), Mathematical model building and representation.	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
20/10/2024	A	Standard mathematical Models for Dynamic Systems (Mechanical Systems, Electrical and Electromechanical Systems)	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
22/10/2024	A-B	Standard mathematical Models for Dynamic Systems (Mechanical Systems, Electrical and Electromechanical Systems)	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
24/10/2024	B	Standard mathematical Models for Dynamic Systems (Mechanical Systems, Electrical and Electromechanical Systems)	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
27/10/2024	A	Standard mathematical Models for Dynamic Systems (Modeling Fluid and Thermal Systems).	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face

29/10/2024	A-B	Standard mathematical Models for Dynamic Systems (Modeling Fluid and Thermal Systems).	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
31/10/2024	B	Standard mathematical Models for Dynamic Systems (Modeling Fluid and Thermal Systems).	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
3/11/2024	A	Continuous-Time Systems, First-Order Systems, Second-Order Systems, Higher-Order Systems, State Variables.	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
5/11/2024	A-B	Continuous-Time Systems, First-Order Systems, Second-Order Systems, Higher-Order Systems, State Variables.	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
7/11/2024	B	Continuous-Time Systems, First-Order Systems, Second-Order Systems, Higher-Order Systems, State Variables.	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
10/11/2024	A	Simulation Diagrams, Systems of Equations, Higher-Order Systems, State Variables	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
12/11/2024	A-B	Simulation Diagrams, Systems of Equations, Higher-Order Systems, State Variables	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
14/11/2024	B	Simulation Diagrams, Systems of Equations, Higher-Order Systems, State Variables	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
17/11/2024	A	Nonlinear Systems, Friction, Dead Zone and Saturation, Backlash, Hysteresis, Quantization	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
19/11/2024	A-B	Nonlinear Systems, Friction, Dead Zone and Saturation, Backlash, Hysteresis, Quantization	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
21/11/2024	B	Nonlinear Systems, Friction, Dead Zone and Saturation, Backlash, Hysteresis, Quantization	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
24/11/2024	A	Elementary Numerical Integration, Discrete-Time System	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face

		Approximation of a Continuous First-Order System, Discrete Approximation of Nonlinear First-Order Systems			
26/11/2024	A	Elementary Numerical Integration, Discrete-Time System Approximation of a Continuous First-Order System, Discrete Approximation of Nonlinear First-Order Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
28/11/2024	A-B	Elementary Numerical Integration, Discrete-Time System Approximation of a Continuous First-Order System, Discrete Approximation of Nonlinear First-Order Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
1/12/2024	B	Linear Systems Analysis, Transfer Function, Frequency Response of LTI Continuous-Time Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
3/12/2024	A	Linear Systems Analysis, Transfer Function, Frequency Response of LTI Continuous-Time Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
5/12/2024	A-B	Linear Systems Analysis, Transfer Function, Frequency Response of LTI Continuous-Time Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
8/12/2024	B	***z***-Transform**,** ***z***-Domain Transfer Function, Frequency Response of Discrete-Time Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
10/12/2024	A	***z***-Transform**,** ***z***-Domain Transfer Function, Frequency Response of Discrete-Time Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
12/12/2024	A-B	***z***-Transform**,** ***z***-Domain Transfer Function, Frequency Response of Discrete-Time Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face

15/12/2024	B	***z***-Transform**,** ***z***-Domain Transfer Function, Frequency Response of Discrete-Time Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
17/12/2024	A	***z***-Transform**,** ***z***-Domain Transfer Function, Frequency Response of Discrete-Time Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
19/12/2024	A-B	***z***-Transform**,** ***z***-Domain Transfer Function, Frequency Response of Discrete-Time Systems	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
22/12/2024	B	Simulink, building a Simulink Model, Running a Simulink Model	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
24/12/2024	A	Discrete-Time Systems (Discrete-Time Integrator, Digital Filters, Discrete-Time Transfer Function)	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
26/12/2024	A-B	Monte Carlo Simulation, Monte Carlo Simulation Requiring Solution of a Mathematical Model, Case Study: Pilot Ejection or Case Study: Kalman Filtering.	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
29/12/2024	B	Monte Carlo Simulation, Monte Carlo Simulation Requiring Solution of a Mathematical Model, Case Study: Pilot Ejection or Case Study: Kalman Filtering.	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
31/12/2024	A	Monte Carlo Simulation, Monte Carlo Simulation Requiring Solution of a Mathematical Model, Case Study: Pilot Ejection or Case Study: Kalman Filtering.	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
5/1/2025	A-B	Intermediate Numerical Integration, Runge–Kutta (RK) (One-Step Methods)., Taylor Series Method, Second-Order Runge–Kutta Method	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
7/1/2025	B	Intermediate Numerical Integration, Runge–Kutta (RK) (One-Step Methods)., Taylor Series Method, Second-Order Runge–Kutta Method	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face

9/1/2025	A	Intermediate Numerical Integration, Runge–Kutta (RK) (One-Step Methods)., Taylor Series Method, Second-Order Runge–Kutta Method	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
12/1/2025	A-B	Intermediate Numerical Integration, Runge–Kutta (RK) (One-Step Methods)., Taylor Series Method, Second-Order Runge–Kutta Method	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
14/1/2025	B	Intermediate Numerical Integration, Runge–Kutta (RK) (One-Step Methods)., Taylor Series Method, Second-Order Runge–Kutta Method	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face
16/1/2025	A	Intermediate Numerical Integration, Runge–Kutta (RK) (One-Step Methods)., Taylor Series Method, Second-Order Runge–Kutta Method	Interactive lectures, using PDF Docs, and digital pen	Discussion, and Problem Solving.	Face to Face

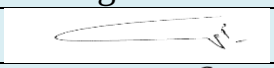
* Learning procedures: (Face-to-Face, synchronous, asynchronous). * * Teaching methods: (Lecture, video…..). ** * Reference: (Pages of the book, recorded lecture, video….).

Seventh: Assessment methods

Methods	Grade	Date	Platform	CLO'S
First Exam	20	Fixed by the Department	Classroom	K،K
Second Exam	20	Fixed by the Department	Classroom	S،S
Assign, Quizzes &Participation	10	During Semester	Classroom+Moodle	All CLO'S
Final Exam	50	Fixed by the Department	Classroom	All CLO'S

Eighth: Course Policies

- All course policies are applied on all teaching patterns (online, blended, and face-to-face Learning) as follows:
  a. Punctuality.
  b. Participation and interaction.
  c. Attendance and exams.
- Academic integrity: (cheating and plagiarism are prohibited).

Approved by:	Name	Date	Signature
Head of Department	Dr. Ayman Amer	21/11/2024	
Faculty Dean	Prof .Taiseer Alghanim	21/11/2024