جامعة الإسراء
ISRA UNIVERSITY

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Control Systems

Course Number: 04084151 (04024161)

General Course Information:

Course title	**Control Systems**
Course number	**04024161 (04084151)**
Credit hours	**3 Hrs Theory**
Education type	**Face-to-Face**
Prerequisites/corequisites	**Systems and Signals 04024161**
Academic Program	**Communications and Electronics (Renewable Energy Engineering)**
Program code	**EE (REE)**
Faculty	**Engineering**
Department	**Communications and Electronics Engineering Department**
Level of course	**Fourth Year**
Academic year /semester	**First 2022/2023**
Awarded qualification	**Bachelor**
Other department(s) involved in teaching the course	**----**
Language of instruction	**English**
Date of production/revision	**September 2022**

Course Coordinator:

Coordinator's name	**Prof. Walid Emar**
Office No	**Department Head Office**
Office Phone extension number	**2470**
Office Hours	**As attached**
Email	**Walid.emar@iu.edu.jo**

Other Instructors:

Instructor name	**---**
Office No	**----**
Office Phone extension number	**----**
Office Hours	**----**
Email	**-----**

Course Description *(English/Arabic)*:

English	Introduction to Feedback System. Review of System Equations. Block Diagram and Signal Flow Graph. Time Response of Systems and Closed Loop Performance. Routh Stability Criterion. Root Locus Method. Frequency Response Method and Compensation Techniques
Arabic	مقدمة إلى أنظمة التغذية الراجعة، مراجعة معادلات النظام، المخططات الكتلية وأشكال سريان الإشارة، الإستجابة الزمنية للأنظمة وأداء الإطار المغلق، قاعدة روث للإستقرار، طريقة المحل الهندسي للجذور، طرق الإستجابة الترددية وتقنيات المعادلة.

Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

R.C. Dorf and R.H. Bishop, Modern Control Systems, Latest edition, Prentice-Hall.
https://www.pearson.com/uk/educators/higher-education-educators/program/Dorf-Modern-Control-Systems-11th-Edition/PGM817344.html

References: *Author(s), Title, Publisher, Edition, Year, Book website.*

1. Joseph J. and Allen R., *Feedback and Control Systems*, 2nd edition, Prentice-Hall, 2002.
2. N.S. Nise, *Control Systems Engineering*, 8th edition, Wiley, 2003.
3. K. Ogata, *Modern Control Engineering*, 4th edition, Prentice-Hall, 2002.

Course Educational Objectives (CEOs):

1.	**Understand the behavior of open and closed loop systems.**
2.	**Learn to apply the fundamental laws for linear system analysis.**
3.	**Learn to model and simplify linear systems.**
4.	**Introduce the analysis of complete system responses in first-order, second order and higher order linear systems.**
5.	**To study system stability by applying RH, RL, and frequency-domain methods.**

Intended Learning Outcomes (ILO's):

	Subject Intended learning outcomes (ILOs) describe what students are expected to know and be able to do at the end of the course. These outcomes are related to the knowledge, skill and competence that students acquire:	**Relationship to CEOs**	**Contribution to PLOs**	**Bloom Taxonomy Levels***	**Descriptors****
A	**Knowledge and Understanding:**				
A1	**Apply appropriate physical laws to obtain lumped-parameter models of physical systems.**	**1, 2**	**1**	**1**	**k**
A2	**Represent a linear time invariant dynamic system using ordinary differential equations, transfer functions, frequency response, and state-space methods.**	**1, 2**	**1**	**1**	**k**
B	**Intellectual skills:**				
B1	**Test stability of feedback control systems using R-H, Root Locus, and frequency response methods.**	**1, 2, 5**	**1, 2**	**4**	**c**
B2	**Analyze and design feedback control systems using R-H, Root Locus, and frequency response methods.**	**3, 4**	**1**	**4**	**c**
C	**Subject specific skills:**				
C2					
D	**Transferable skills:**				
D1					

***Bloom Taxonomy Levels**

Level #	1	2	3	4	5	6
Level Name	Knowledge	Comprehension	Application	Analysis	Evaluation	Synthesis

**** Descriptor (National Qualification Framework Descriptors): K : Knowledge, S: Skill, C: Competency.**

Program Learning Outcome (PLOs):

Program Learning Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviours that students acquire as they progress through the program. A graduate of the (_____) program will demonstrate:		Descriptors**		
		K	S	C
1.	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	✓		
2.	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors			✓
3.	An ability to communicate effectively with a range of audiences		✓	
4.	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts			✓
5.	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives		✓	
6.	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions		✓	
7.	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	✓		✓

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please chose the type of teaching)*

✓ *(**2 hrs** Face – To - Face **+1 hr** Asynchronous)* **(Hybrid)**

Week	First Hour (*Face – To - Face*)	Second Hour (*Face – To - Face*)	Third Hour (*Asynchronous*)	Ach. ILOs	Ach. PLOs	Descriptors*
1	Course outline, Introduction to control systems	**Differential equations of physical systems**	Differential equations of physical systems	A1, A2	1	K
2	Transfer functions (TF) of linear systems	**Block diagram models**	Block diagram models	A1, A2	1	K
3	Signal flow Graphs (SFG)	**SFG**	SFG	A1, A2	1	K
4	State Variables Models	**SFG State Model**	TF from State Equations.	A1, A2	1	K
5	State Transition Matrix.	**Performance of feedback control systems.**	Performance of feedback control systems.	A2, B1	1, 2	K, C

6	Performance of feedback control systems.	**Performance of feedback control systems.**	Performance of feedback control systems.	B1	1, 2	C
7	Stability of linear feedback systems	**Stability of linear feedback systems**	Stability of linear feedback systems	B1, B2	1, 2	C
8	Root Locus Technique	**Root Locus Technique**	Root Locus Technique	B1, B2	1, 2	C
9	Root Locus Technique	**Root Locus Technique**	Root Locus Technique	B1, B2	1, 2	C
10	Frequency Response Methods	**Frequency Response Methods**	Frequency Response Methods	A2	1	K
11	Frequency Response Methods	**Frequency Response Methods**	Frequency Response Methods	A2	1	K
12	Frequency Response Methods	**Frequency Response Methods**	Frequency Response Methods	A2	1	K
13	Design of Feedback Control Systems	**Design of Feedback Control Systems**	Design of Feedback Control Systems	B2	1	C
14	Design of Feedback Control Systems	**Design of Feedback Control Systems**	Design of Feedback Control Systems	B2	1	C
15	Design of Feedback Control Systems	**Design of Feedback Control Systems**	Design of Feedback Control Systems	B2	1	C
16	Final exam					

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- **(2 hrs. Face – To - Face +1 hr Asynchronous) (Hybrid)**
- **Course Videos**
- **Quizzes and Major Exams**
- **Other Interactive online activates**

Course Policies:

A- Attendance policies:

The maximum allowed absences is 15% of the lectures.

B- Absences from exams and handing in assignments on time:

Midterm exam can be retaken based on approval of excuse by the instructor's discretion.

Not handing assignment on time will incur penalties.

C- Academic Health and safety procedures

D- Honesty policy regarding cheating, plagiarism, and misbehaviour:

Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.

E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **20%**
- Midterm **30 %**
- Final Exam **50 %**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required equipment:

- **PC / Laptop with webcam and mic**
- **Internet Connection**
- **Access to the IU E-Learning Platform at: https://elearn.iu.edu.jo/**
- **E-learning plan**
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

Assessment Tools implemented in the course:

- Final Exam
- Midterm Exam
- Quizzes

Responsible Persons and their Signatures:

Course Coordinator	**Prof. Walid Emar**	**Completed Date**	/ /
		Signature	

Received by (Department Head)	**Prof. Walid Emar**	**Received Date**	/ /
		Signature	