Course Specifications

Course Title:	**Automatic Control**
Course Code:	**ME 344**
Program:	**Mechanical Engineering (UG)**
Department:	**Mechanical & Industrial Engineering**
College:	**College of Engineering**
Institution:	**Majmaah University**

Table of Contents

A. Course Identification

1. Credit hours:02(2-1-0)
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: 08
4. Pre-requisites for this course (if any)**: ME 343 and ME 353**
5. Co-requisites for this course (if any)**: None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	80
2	**Blended**	05	10
3	**E-learning**	05	10
4	**Correspondence**	0	0
5	**Other**	0	0

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	0
3	**Tutorial**	15
4	**Others** (specify)	0
	Total	45
Other Learning Hours*		
1	**Study**	30
2	**Assignments**	10
3	**Library**	10
4	**Projects/Research Essays/Theses**	05
5	**Others** (specify)	--
	Total	55

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction. Laplace transforms. Transfer function. Block diagrams. Mathematical modeling of dynamic systems Industrial automatic controllers: basic control actions. Pneumatic and hydraulic controllers. Transient response analysis: First and second order systems. Root locus analysis. Frequency response. Application of computer programs.

2. Course Main Objective	
1.	Provide an overview of the modeling and analysis of classical control systems.
2.	An understanding of block diagrams, state space equations of control systems, and Transfer function.
3.	Ability to construct Mathematical modeling of dynamic systems: Mechanical, electrical, electro-mechanical, liquid-level, thermal and pressure systems.
4.	Become familiar with types of industrial automatic controllers.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Recognize and understand fundamentals of (feedback) control systems.	a
1.2	Outline and describe transient and steady-state response of dynamic systems	
1.3	Evaluate and solve system equations and analyze transient, steady-state, and frequency response of linear dynamic systems	
1.4	Mathematically reproduce stability of control systems in for various engineering disciplines.	k
1.5	Memorize basic control compensation using time and frequency domain techniques.	k
2	**Skills :**	
2.1	Use physical systems to differentiate basic control systems	e
2.2	Explain and apply the concepts in solving problems	
3	**Competence:**	
3.1	Demonstrate share solving stability of control systems	k
3.2	Judge systems and its performance through root locus techniques	

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Control Systems	03
2	The Laplace Transformation	03
3	Mathematical Modeling of Dynamic Systems	03
4	Block Diagram Representation	06
5	Transient and Steady-State Response Analyses	06
6	Root-Locus Analysis	03
7	Method Control Systems Design by the Routh's and Root-Locus	06
8	Frequency-Response Analysis, Nyquist plot	06
9	Control Systems Design by Frequency Response	06
10	PID Controls	03
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Recognize and understand fundamentals of (feedback) control systems.	Formal face to face lectures to focus on control systems basics open and closed feedback systems	Mid Term/Final Exam
1.2	Outline and describe transient and steady-state response of dynamic systems	Tutorials to develop problems solving skills through practice and hands on practice to solve problems.	Mid Term/Quiz/Final Exam
1.3	Evaluate and solve system equations and analyze transient, steady-state, and frequency response of linear dynamic systems	Focus on core analytical material in the course, together with qualitative, alternative explanations to develop understanding dynamic systems	Mid Term/Final Exam
1.4	Mathematically reproduce stability of control systems in for various engineering disciplines.	Exercising problem solving and allow to resolve problems in understanding of lecture material	Mid Term/Quiz/Final Exam
1.5	Memorize basic control compensation using time and frequency domain techniques.	Class room teaching to design control system using basic principles.	Home work/Assignment
2.0	**Skills**		
2.1	Use physical systems to differentiate basic control systems	Allowing students to think to solve the problems in groups to exchange their thought and reinforce the correct.	Mid Term/Final Exam
2.2	Explain and apply the concepts in solving problems	Asking them the formulae, equations used and how can they apply the knowledge for a specific type of problem and mending the mistakes with explanation	Mid Term/Quiz/Final Exam
3.0	**Competence**		
3.1	Demonstrate share solving stability of control systems	Making teaching learning two way communication. Getting students involved to solve problems and asking students did they understand the stability concept clearly.	Group assignment
3.2	Judge systems and its performance through root locus techniques	A seminar component related to topic may be considered. Consultations with the lecturer outside of class	

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		hours, according to the scheduled time	

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1	03	05
2	Assignment/Homework	05	05
3	Mid Term 1	07	20
4	Quiz 2	10	05
5	Mid Term2	11	20
6	Assignment/Home work	12	05
7	Final Exam	15	40
			100

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Lecture hours as given in Time Tables : Thursday 1pm -2:50 pm
Tutorial Wednesday 2 pm 2:50 pm
(Class Rooms E 1 and E 3)

Office hours : :Every day from 10 AM -11 AM
(Office location 044-02-17)

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Katsuhiko Ogata, Modern Control Engineering, Pearson international edition, 2012
Essential References Materials	R L. Narasimhan, Analysis of Linear Control System, I K international, 5th edition 2013.
Electronic Materials	---
Other Learning Materials	Course related material is provided in Black Board

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Class Rooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart board is provided
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	-----

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	Students	Indirect Assessment
CLOs achievement	Faculty	Direct/Indirect Assessments
Learning Resources	Students	Indirect Assessment
Course Contents	Students	Indirect Assessment

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Department Council
Reference No.	**1/34/9767**
Date	**25/02/1432 H**