



Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Musayyib Technical College
Department of Electrical Engineering Techniques



MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	CONTROL SYSTEMS ANALYSIS		Module Delivery	
Module Type	CORE		✓ Theory Lecture ✓ Lab Tutorial ✓ Practical ✓ Seminar	
Module Code	ATU23075			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	4	Semester of Delivery	1	
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES		College	
Module Leader			e-mail	
Module Leader's Acad. Title			Module Leader's Qualification	
Module Tutor	None		e-mail	None
Peer Reviewer Name		None	e-mail	None
Review Committee Approval		14/06/2023	Version Number 1.0	

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module		Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	Students will learn the theory and practice of control system engineering with emphasis on the analysis and design of feedback system. Control systems are found in wide of applications form aircrafts to robots and process control system. Students will be able to model , design and analyze electrical systems in frequency and time domain. The purpose of this module is to enable students to develop a knowledge of: 1. steady-state error analysis and design, 2. system performance analysis and measurement, control system design and analysis for continuous systems using classical techniques. 3. system stability 4. Students will attain skills in using software tools to represent, analyze, interpret, and design control system responses.
--	---

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Analysis ,design and Modeling systems in the frequency domain. 2. Analysis ,design and Modeling systems in the time domain. 3. Calculate the Time response. 4. Analyses system Stability 5. Sketch the Root locus for varying system gain.
Indicative Contents المحتويات الإرشادية	Indicative Content and Learning Activities CONTROL SYSTEMS SOFTWARE TOOLS Introduction to software for control systems analysis, simulation, design and evaluation, and the use of appropriate software toolboxes to address the design and analysis needs of the module. FREQUENCY DOMAIN Develop a mathematical model by applying the fundamental physical laws of science and engineering. From these equations we will obtain the relationship between the system's output and input . TIME DOMAIN The time domain approach (also referred to state-space approach) is a unified method for modeling ,analyzing and designing a wide range of systems. The time domain can be used to represent nonlinear systems. It can also handle systems with nonzero initial conditions. TIME RESPONSE After obtaining a mathematical representation of a subsystem . the subsystem is analyzed for its transient and steady state response to see if these characteristics yield the desired behavior. STABILITY Stability is the most important system specification . if a system is unstable , transient response and steady state errors are moot points. An unstable system cannot be designed for a specific transient response or steady state error requirement. for the system to be stable , certain. Requirements must be met. ROOT LOCUS Root locus , a graphical representation of the closed-loop poles as A system parameters is varied, is a powerful method of the analysis and design for stability and transient response.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1-Hands-on Experiments: Engage students in practical experiments to deepen their understanding of control engineering. 2-Simulation Software: Use MATLAB simulation software for virtual control design and analysis. 3-Problem-solving Exercises: Include various problem-solving exercises to apply control techniques. 4-Group Projects: Assign collaborative projects for circuit design and construction. 5-Real-world Applications: Discuss practical applications of control theory in

	different systems. 5-Interactive Discussions: Encourage student participation and critical thinking through open-ended questions. 6-Conceptual Understanding: Focus on intuitive understanding alongside mathematical analysis. 7-Assessment Variety: Use diverse assessment methods to gauge student understanding. 8-Office Hours and Support: Offer individualized assistance through office hours or online support.
--	---

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.133
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	5, 10	LO #2, 4, 10 and 11
	Assignments	6	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	9	10% (10)	Continuous	All
	Report	6	10% (10)	2, 12	LO # 2,3,4,6, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-8
	Final Exam	3 hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري	
	Material Covered
1	Modeling in the frequency domain - Laplace transform review
2	The transfer function
3	Electrical network transfer function
4	Modeling in the time domain- General state space representation
5	Converting a transfer function to state space
6	Converting from state space to transfer function
7	Time response - Poles , zeros, and system representation
8	First order systems
9	Second order systems
10	Stability- Routh-Hurwitz criterion
11	Stability in state space
12	Defining the root locus
13	Properties of the root locus
14	Sketching the root locus
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	material covered
1	LAB 1: OPERATIONAL AMPLIFIER (OP AMPS) INVERTING AND NON-INVERTING
2	LAB 2: OP AMP APPLICATIONS- ADDER CIRCUIT
3	LAB 3: OP AMP APPLICATIONS- SUBTRACTOR CIRCUIT
4	LAB 4: OP AMP APPLICATIONS- DIFFERENTIATOR CIRCUIT
5	LAB 5: OP AMP APPLICATIONS- INTEGRATOR CIRCUIT
6	LAB 6: SEQUENTIAL OPERATION OF ALTERNATING CURRENT MOTORS CONTROL USING (ON-OFF) SWITCHING
7	LAB 7: TWO SINGLE-PHASE INDUCTION MOTOR
8	LAB 8: THREE STEPS CONTROL
9	LAB 9: INTRODUCTION TO PLC, ITS PARTS, TYPES, AND PROGRAM METHODS
10	LAB 10: MANUAL PROGRAMMING OF PLC
11	LAB 11: ALTERNATING CURRENT MOTORS CONTROL USING (ON - OFF) SWITCHING USING PLC
12	LAB 12: CONTROL THE OPERATION OF TWO SINGLE-PHASE INDUCTION MOTOR SEQUENTIALLY USING PLC
13	LAB 13: THREE STEPS CONTROL USING PLC
14	LAB 14: REVIEW

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Norman S. Nise , Control system engineering, 7 th edition , 2015, WILEY	Yes
Recommended Texts	Katsuhiko Ogata, modern control engineering, 5 th edition , 2010 , Pearson.	Yes
Websites	Control system engineering https://www.academia.edu/35425584/Control_System_By_Norman_nise	

APPENDIX:

GRADING SCHEME

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.