



Ministry of Higher Education and
Scientific Research – Iraq
Al-Furat Al-Awsat Technical University
Al-Musaib 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	MODERN CONTROL SYSTEM		Module Delivery		
Module Type	CORE		✓ Theory Lecture ✓ Lab Tutorial ✓ Practical Seminar		
Module Code	EET411				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	4	Semester of Delivery		2	
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES		College	AL-FURAT AL-AWSAT TECHNICAL UNIVERSITY AL-MUSAIB TECHNICAL COLLEGE	
Module Leader			e-mail		
Module Leader's Acad. Title		Professor	Module Leader's Qualification		Master
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	EET404	Semester	1
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	This course is an introductory course on linear control systems based on state-space models. The main goal of the course is to provide students with basic tools in modelling , analysis and design for control and estimation . the analysis includes stability , controllability , observability , realization and minimality of the state space model , while the design methods are divided into pole placement for state feedback and observer design, and optimal methods such as linear quadratic regulator , Kalman filter and linear quadratic Gaussian control . students will also learn how to apply the theory to engineering problems with MATLAB.
Module Learning Outcomes	1. Learn basic tools in modelling , analysis and design for control and estimation. 2. Analyze stability , controllability , observability Solution of state equation. 3. Analyze realization and minimality of the state space model.

مخرجات التعلم للمادة الدراسية	4. Learn pole placement for state feedback and observer design. 5. Learn how to apply the theory to engineering problems with MATLAB.
Indicative Contents المحتويات الإرشادية	This course will give the basic knowledge for advanced control course such as nonlinear control , robust control , optimal control , adaptive control , digital control , sampled data control , hybrid control and system identification control.

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.
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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	3.1
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	4	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	7	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	9	10% (10)	Continuous	All
	Report	8	10% (10)	2, 12	LO # 5, 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
1-2	Introduction, state space model, linearization, discretization
3-4	BIBO stability, internal stability, Lyapunov theorem
5-6	Controllability, observability, Kalman decomposition
7-8	Realization, minimal realization
9-10	State feedback control, observer, observer-based control
11-12	Linear quadratic regulator, Kalman filter
13-14	Project presentation, Course summary
15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	material covered
1-3	STATE SPACE MODEL, LINEARIZATION, DISCRETIZATION
4-6	BIBO STABILITY, INTERNAL STABILITY, LYAPUNOV THEOREM
7-9	CONTROLLABILITY, OBSERVABILITY, KALMAN DECOMPOSITION
10-12	STATE FEEDBACK CONTROL, OBSERVER, OBSERVER-BASED CONTROL
13-14	LINEAR QUADRATIC REGULATOR, KALMAN FILTER

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Linear Systems Theory (2nd Edition) Princeton University Press, 2018, Joao Hespanha	Yes
Recommended Texts	Optimal State Estimation John Wiley & Sons, 2006, Dan Simon	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.