MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2" align="center">Signals and Systems</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2" align="center">Core</td><td rowspan="4">☒Theory
☐Lecture
☒Lab
☐Tutorial
☐Practical
☐Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2" align="center">UOMU024054</td></tr>
<tr><td>ECTS Credits</td><td colspan="2" align="center">5</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2" align="center">125</td></tr>
<tr><td>Module Level</td><td align="center">UGIII</td><td>Semester of Delivery</td><td align="center">5</td></tr>
<tr><td>Administering Department</td><td align="center">MIET</td><td>College</td><td align="center">EETC</td></tr>
<tr><td>Module Leader</td><td></td><td>e-mail</td><td align="center">aws_basil@mtu.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Lecturer</td><td>Module Leader's Qualification</td><td align="center">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td></td></tr>
<tr><td>Peer Reviewer Name</td><td align="center">Zaiad taha yasien</td><td>e-mail</td><td>ghaidaakhalid@mtu.edu.iq</td></tr>
<tr><td>Scientific Committee Approval Date</td><td align="center">8/11/2023</td><td>Version Number</td><td align="center">1.0</td></tr>
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<tr><td colspan="4" align="center">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td align="center">Engineering Mathematics</td><td>Semester</td><td>UGII-S3</td></tr>
<tr><td>Co-requisites module</td><td align="center">None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	

Module Aims أهداف المادة الدراسية	✓ Understand and classify signals based on their characteristics and properties. ✓ Study basic continuous-time and discrete-time signals to establish a foundation for signal analysis. ✓ Analyze systems and classify them according to their characteristics and behavior. ✓ Investigate the response of continuous-time LTI systems using convolution integral and understand its implications for signal processing. ✓ Explore the properties and behaviors of LTI systems described by differential equations or difference equations to model and analyze real-world systems. ✓ Learn the Laplace Transform and its applications in analyzing continuous-time signals and systems. ✓ Understand the concept of the system function in the Laplace domain and its role in analyzing continuous-time LTI systems. ✓ Study the Z-Transform and its applications in analyzing discrete-time signals and systems. ✓ Understand and represent periodic signals using Fourier series. ✓ Analyze continuous-time signals using the Fourier transform. ✓ Explore properties of the continuous-time Fourier transform. ✓ Study the frequency response of continuous-time LTI systems, including filtering and bandwidth. ✓ Investigate Fourier analysis of discrete-time signals and systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: ✓ Demonstrate a comprehensive understanding of signal types. ✓ Demonstrate a systematic knowledge of the classification of signals. ✓ Gain the ability to analyze basic continuous-time and discrete-time signals effectively. ✓ Demonstrate an understanding of the principles of LTI system. ✓ Learn how to use the Laplace transform for signal and system analysis in the frequency domain. ✓ Demonstrate an understanding of time analysis of signals and systems. ✓ Demonstrate an understanding of frequency analysis of signals and systems. ✓ Critically evaluate the LTI system response. ✓ Ability to transform signal and systemZ domain -. ✓ Demonstrate the techniques of synthesize signals using Fourier series .
Indicative Contents المحتويات الإرشادية	Signals and classification of signals, basic continuous-time signals, basic discrete-time signals [7 hrs] Systems and classification of systems, response of a continuous-time LTI system and the convolution integral, properties of continuous-time LTI systems, eigenfunctions of continuous-time LTI systems, systems described by differential equations , response of a discrete-time LTI system and convolution sum, properties and eigenfunctions of discrete-time LTI systems [10 hrs] The Laplace transforms, Laplace transform of some common signals, properties of the Laplace transform, the inverse Laplace transform, the system function, the unilateral Laplace transform. The z-transform, z-transform of some common sequences, properties of the z-transform, the inverse z-transform, the system function of discrete-time LTI systems, the unilateral z-transform [14 hrs]. Fourier Analysis of Continuous-Time Signals and Systems, Fourier series representation of periodic signals the Fourier transform, properties of the continuous-time Fourier transform. The

frequency response of continuous-time LTI systems. Fourier Analysis of Discrete-Time Signals and Systems, discrete Fourier series, the Fourier transform and its properties. System response to sampled continuous-time sinusoids [17 hrs].

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The major strategy for presenting this module will be to encourage students to participate in the tasks while also polishing and improving their critical thinking skills. This will be accomplished through courses, interactive lectures, and the consideration of small experiments involving various sample tasks that are engaging to the students and help them learn more about the module.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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	2	15%(15)	5 and 10	LO #1 and #9
	Assignments	2	10%(10)	2 and 12	LO #3 and #7
	Projects / Lab.	3	10%(10)	Continuous	All
	Report	2	5%(5)	13	LO #5
Summative assessment	Midterm Exam	2hr	10%(10)	7	LO #1 - #6
	Final Exam	4hr	50%(50)	16	All
Total assessment			100%		

	Delivery Plan (Weekly Syllabus)
	المنهاج الاسبوعي النظري
	Material Covered
Week 1	✓ SIGNALS AND CLASSIFICATION OF SIGNALS
	✓ BASIC CONTINUOUS-TIME SIGNALS
Week 2	✓ BASIC DISCRETE-TIME SIGNALS
Week 3	✓ SYSTEMS AND CLASSIFICATION OF SYSTEMS
	✓ RESPONSE OF A CONTINUOUS-TIME LTI SYSTEM AND THE CONVOLUTION INTEGRAL
	✓ PROPERTIES OF CONTINUOUS-TIME LTI SYSTEMS
Week 4	✓ EIGENFUNCTIONS OF CONTINUOUS-TIME LTI SYSTEMS
	✓ SYSTEMS DESCRIBED BY DIFFERENTIAL EQUATIONS
	✓ RESPONSE OF A DISCRETE-TIME LTI SYSTEM AND CONVOLUTION SUM
Week 5	✓ PROPERTIES OF DISCRETE-TIME LTI SYSTEMS
	✓ EIGENFUNCTIONS OF DISCRETE-TIME LTI SYSTEMS
	✓ SYSTEMS DESCRIBED BY DIFFERENCE EQUATIONS
Week 6	✓ THE LAPLACE TRANSFORM
	✓ LAPLACE TRANSFORM OF SOME COMMON SIGNALS
	✓ PROPERTIES OF THE LAPLACE TRANSFORM
Week 7	✓ Mid Exam
	✓ THE INVERSE LAPLACE TRANSFORM
Week 8	✓ THE SYSTEM FUNCTION
	✓ THE UNILATERAL LAPLACE TRANSFORM
Week 9	✓ THE Z-TRANSFORM
	✓ Z-TRANSFORM OF SOME COMMON SEQUENCES
	✓ PROPERTIES OF THE Z-TRANSFORM
Week 10	✓ THE INVERSE Z-TRANSFORM
	✓ THE SYSTEM FUNCTION OF DISCRETE-TIME LTI SYSTEMS
	✓ THE UNILATERAL Z-TRANSFORM
Week 11	**Fourier Analysis of Continuous-Time Signals and Systems**
	✓ FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS
	✓ THE FOURIER TRANSFORM
	✓ PROPERTIES OF THE CONTINUOUS-TIME FOURIER TRANSFORM
Week 12	✓ THE FREQUENCY RESPONSE OF CONTINUOUS-TIME LTI SYSTEMS
	✓ FILTERING
	✓ BANDWIDTH
Week 13	**Fourier Analysis of Discrete-Time Signals and Systems**
	✓ DISCRETE FOURIER SERIES
	✓ THE FOURIER TRANSFORM
Week 14	✓ PROPERTIES OF THE FOURIER TRANSFORM
	✓ THE FREQUENCY RESPONSE OF DISCRETE-TIME LTI SYSTEMS
Week 15	✓ SYSTEM RESPONSE TO SAMPLED CONTINUOUS-TIME SINUSOIDS
	✓ DIGITAL SIMULATION OF ANALOG SYSTEMS
	Preparing for final exam

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	SIGNAL REPRESENTATIONS
Week 2	RESPONSE OF A DISCRETE-TIME LTI SYSTEM AND CONVOLUTION SUM
Week 3	
Week 4	SYSTEMS DESCRIBED BY DIFFERENCE EQUATIONS
Week 5	
Week 6	PROPERTIES OF THE Z-TRANSFORM
Week 7	
Week 8	FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS
Week 9	
Week 10	DISCRETE FOURIER TRANSFORM
Week 11	
Week 12	THE FREQUENCY RESPONSE OF DISCRETE-TIME LTI SYSTEMS
Week 13	

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts	S. Palani, SIGNALS AND SYSTEMS, Springer International Publishing, 2021	
Websites		

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	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks 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.