

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mathematic		Module Delivery
Module Type	BASIC		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	CERMAT1		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester (s) offered	
Administering Department	Biomedical engineering	College	College of Engineering
Module Leader	m.sc kadhim abdulhasan	e-mail	Kathem6@alayen.edu.iq
Module Leader's Acad. Title	Lecture	Module Leader's Qualification	
Module Tutor	m.sc kadhim abdulhasan	e-mail	Kathem6@alayen.edu.iq
Peer Reviewer Name		e-mail	
Review Committee Approval		Version Number	1.0



Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	This module aims to provide students with a comprehensive understanding and high level of competence in the use of essential mathematical techniques specifically tailored to the solution of diverse engineering problems. By covering fundamental concepts from basic functions and limits to advanced applications of derivatives and optimization over a sixteen-week period, the course establishes a firm foundation for students to develop effective solutions for the wider and deeper range of technical challenges they will encounter throughout their undergraduate engineering program. Furthermore, the curriculum is designed to bridge the gap between theoretical mathematical principles and practical engineering analysis, ensuring that students can confidently apply tools such as differentiation rules, trigonometric functions, and transcendental models to model and analyze physical systems with precision and analytical rigor.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Knowledge	A2	A2.1: Understanding fundamental mathematical concepts essential for Laser Engineering, including Cartesian and polar coordinates, functions and their graphs, limits, continuity, and basic trigonometric and exponential functions. A2.2: Solving different types of functions and mathematical models, including algebraic, transcendental, trigonometric, hyperbolic, exponential, logarithmic, and inverse functions, along with their graphical behavior. A2.3: Apply the principles of differential calculus and advanced mathematical tools such as complex numbers and their geometric representations, with an emphasis on their mathematical properties in an engineering context.



			A2.4: Explain the application of derivatives in solving engineering-related problems such as rates of change, optimization, curve sketching, and system modeling specifically relevant
	Skills	B1	B1.1 Function efficiently as an individual B1.2 Function as a member of multidisciplinary and multicultural teams
		B2	B2.1 Communicate effectively – graphically with a range of audiences using contemporary tools. B2.2 Communicate verbally and in writing with a range of audiences using contemporary tools.
	Ethics	C2	C2.1 Recognize professional and ethical responsibility. C2.2 Adhere and respect diversity.
Indicative Contents المحتويات الإرشادية		The topics listed under the indicative content below are the underpinning areas of knowledge and understanding that will be obtained from successful completion of the module. The mathematical topics are illustrated in the context of relevant engineering scenarios.	



	• Preliminaries Cartesian coordinates, polar coordinates, slope of lines, angle of inclination. • Functions, types of functions, graph of the functions, domain and range of function • Review of trigonometric function: graph of trigonometric function, range and domain of trigonometric functions, identities. • Limits and Continuity: Properties, limits involving infinity, continuity. • Transcendental functions: Inverse function, graph of inverse function, Logarithmic and exponential functions, inverse trigonometric functions, hyperbolic functions, inverse hyperbolic functions. • Derivatives: Definition, rules of derivative, Implicit differentiation, L hospital's rule, derivative of inverse functions • Applications of derivatives: rate of change problems, Relative maximum and relative minimum, Curve sketching with 1st and 2nd derivative, Linearization, Mean value theorem, Initial value problem,. • Complex numbers: Basic definitions. The geometric representations of the complex numbers, argand diagram, Basic operations with complex numbers, Euler's Formula
Course Description	lays the foundation for a robust understanding of mathematical concepts that underpin the various disciplines within engineering by covering a breadth of topics ranging from coordinate systems, slopes of lines, and angles of inclination to the introduction of two- and three-dimensional coordinate systems. A significant focus is placed on the understanding and manipulation of functions, including the precise determination of domain and range as well as the mechanics of function composition. Throughout the sixteen-week program, the course incorporates a substantial overview of trigonometry, limits, and continuity, leading into a deep exploration of derivatives and their diverse applications in real-world engineering contexts. Furthermore, the curriculum integrates the study of complex numbers and their mathematical representations to ensure a comprehensive analytical toolkit. By the conclusion of the module, students will have developed a sound understanding of these fundamental principles, effectively preparing them for more advanced engineering courses and technical challenges in their respective fields.



Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	• Presentation • Interactive learning • Discussions • Brainstorming • Group Solving Problems • Problem-Based Learning - Self-learning
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Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	5 and 10	A2
	Interaction within the class	All	10% (10)	All	A2
	Assignments	2	10% (10)	2, 4, 6, 8, 10 and 12	A2, B1
	Home Work	6	10% (10)	2, 5, 7, 9, 11, 13	A2, B1, C2
Summative assessment	Midterm Exam	1	10% (10)	7	A2, B1
	Final Exam	3	50% (50)	15	A2
Total assessment			100% (100 Marks)		



Delivery Plan (Weekly Lab. Syllabus)		
	Material Covered	LOs
Week 1	Functions: Vertical line test, Increasing and decreasing functions, Common functions.	A2, B1, B2, C1
Week 2	Inequalities, Absolute Value, Combining Functions; Shifting and Scaling Graphs.	A2, B1, B2, C2
Week 3	Trigonometric Functions, Graphing with Software.	A2, B1, B2, C1
Week 4	Inverse Functions and Logarithms, Inverse Functions.	A2, B1, B2, C1
Week 5	Logarithms, Limits / Rates of Change and Tangents to Curves.	A2, B1, B2, C1
Week 6	Limits / The Precise Definition of a Limit, Limits / One-Sided Limits.	A2, B1, B2, C2
Week 7	Limits Involving Infinity; Asymptotes of Graphs.	A2, B1, B2, C1
Week 8,9	MID EXAM, Derivatives, Tangents and the Derivative at a Point, Differentiation Rules, The Chain Rule. Implicit Differentiation, Derivatives of Inverse Functions and Logarithms.	A2, B1, B2, C1
Week 10	Inverse Trigonometric Functions, Related Rates.	A2, B1, B2, C1
Week 11,12	Applications of Derivatives: Extreme Values of Functions. Monotonic Functions and the First Derivative Test, Concavity and Curve Sketching.	A2, B1, B2, C1
Week 13,14	Indeterminate Forms and L'Hôpital's Rule. Applied Optimization, Antiderivatives.	A2, B1, B2, C1
Week 15	Preparatory week before the final Exam	A2



Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	George B. Thomas and Ross L. Finney, "Calculus and Analytic Geometry, Addison- Wesley	No
Recommended Texts	Thomas Calculus, by George B. Thomas, Jr, Eleventh Edition Media Upgrade 2008 Calculus Early Transcendental (Sixth Edition) James Stewart	No
Websites	https://eng.alayen.edu.iq/colleges/e/42	

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	راسب (قيد المعالجة)	(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.

