	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al-Anbiyaa College of Advanced Technologies Department of Electrical Engineering Techniques	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	Differential Mathematics	**Module Delivery**	
Module Type	Support	☒Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	EET1104		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	**Semester of Delivery**	1
Administering Department	Electrical Engineering Techniques	**College**	Advanced Technologies
Module Leader	Ali Mohammmed Hussein Mohsen	**e-mail**	ali.mohsen@uowa.edu.iq
Module Leader's Acad. Title	Assistant. Prof. Dr.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Assistant. Prof. Dr. Ali Mohammmed Hussein Mohsen	**e-mail**	ali.mohsen@uowa.edu.iq
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date		**Version Number**	1.0

Relation with other Modules		
العلاقة مع المواد الدراسية الأخرى		
Prerequisite module	NA	**Semester**
Co-requisites module	NA	**Semester**

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	The module aims for the Differential Mathematics course are as follows: 1. To develop a solid understanding of the fundamental concepts and techniques of differential calculus and their relevance in engineering contexts. 2. To apply differentiation techniques effectively in solving engineering problems, including optimization, motion analysis, and cost and revenue optimization. 3. To demonstrate proficiency in working with transcendental functions, such as exponential, logarithmic, and inverse trigonometric functions, and their application in engineering. 4. To introduce the basics of differential equations and their importance in modeling and analyzing engineering systems, including growth and decay phenomena and electrical circuits. 5. To enhance problem-solving skills by applying differential calculus concepts to real-world engineering scenarios, fostering critical thinking and analytical abilities.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a comprehensive understanding of the fundamental concepts and techniques of differential calculus, including limits, derivatives, and their applications in engineering contexts. 2. Apply differentiation techniques proficiently to solve a wide range of engineering problems, such as optimization, motion analysis, and cost and revenue optimization. 3. Utilize transcendental functions effectively in engineering applications, demonstrating competence in working with exponential, logarithmic, and inverse trigonometric functions. 4. Apply the principles of differential equations to model and analyze engineering systems, including growth and decay phenomena and electrical circuits. 5. Employ critical thinking and analytical skills to tackle real-world engineering scenarios, utilizing differential calculus concepts to develop innovative solutions.
Indicative Contents المحتويات الإرشادية	1. Introduction to Differential Calculus [14 hrs.] • Definition of limits and continuity • Basic differentiation rules: power rule, product rule, quotient rule • Applications of derivatives in engineering contexts

2. Optimization Problems in Engineering [14 hrs.]

- Local and global extrema of functions
- Optimization with constraints
- Applications of optimization in engineering design and resource allocation

3. Motion Analysis and Engineering Applications [14 hrs.]

- Derivatives of position, velocity, and acceleration functions
- Applications of motion analysis in engineering, such as kinematics and dynamics problems

4. Transcendental Functions in Engineering 14 hrs.]

- Derivatives of exponential, logarithmic, and trigonometric functions
- Applications of transcendental functions in engineering, such as exponential growth/decay and harmonic oscillations

5. Introduction to Differential Equations in Engineering [14 hrs.]

- Basic concepts and classifications of differential equations
- First-order linear and separable differential equations
- Applications of differential equations in engineering, such as modeling growth, decay, and circuit analysis.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The module on Differential Mathematics with a focus on engineering applications implements a range of effective learning and teaching strategies to foster student understanding and engagement. • Lectures introduce key concepts and problem-solving techniques, while interactive discussions facilitate student participation and real-world examples. Problem-solving sessions encourage active learning and collaboration, allowing students to apply differential calculus to engineering problems. • Practical applications are emphasized through case studies and simulations, highlighting the relevance of differential mathematics in an engineering context. Computer-based tools, tutorials, and workshops provide additional support, while assessments and independent study promote feedback and deeper exploration. • Guest speakers and practical projects bridge theory and practice, inspiring students and developing critical thinking skills. • By integrating these strategies, the module cultivates a comprehensive understanding of differential mathematics in engineering and equips students with the skills needed for success in their engineering careers.

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
تقييم المادة الدراسية					
		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10 % (10)	5, 10	LO # 1, 3
	Assignments	2	10 % (10)	2, 12	LO # 2, 4
	Projects				
	Report	1	10 % (10)	8	LO # 5
Summative assessment	Midterm Exam	2 hr.	20 % (20)	9	LO # 1, 2
	Final Exam	3 hr.	50% (50)	15	LO # 1, 2, 3 ,4
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	• Introduction to Differential Calculus. • Limits and Continuity. • Differentiation Rules: Power Rule, Product Rule, Quotient Rule, Chain Rule.
Week 2	• Derivatives of Trigonometric and Exponential Functions • Derivatives of Logarithmic and Inverse Trigonometric Functions • Implicit Differentiation
Week 3	• Related Rates • Optimization Problems in Engineering • Curve Sketching: Critical Points, Inflection Points, Concavity
Week 4	• L'Hôpital's Rule and Indeterminate Forms • Linear Approximation and Differentials

Week 5	• Applications of Differentiation in Engineering: Rates of Change, Velocity, Acceleration • Motion Problems: Position, Velocity, and Acceleration Functions
Week 6	• Optimization of Engineering Systems: Maximum and Minimum Problems • Optimization with Constraints
Week 7	• Applications of Differentiation in Engineering: Marginal Analysis, Cost and Revenue • Linearization and Error Analysis
Week 8	• Implicit Differentiation and Higher Derivatives • Related Rates with Engineering Applications
Week 9	• Transcendental Functions: Derivatives of Exponential and Logarithmic Functions • Applications of Transcendental Functions in Engineering
Week 10	• Review of Differentiation Techniques • Higher Derivatives and Acceleration in Engineering
Week 11	• Taylor Series Expansion and Applications • Linear Approximation and Estimation in Engineering
Week 12	• Introduction to Differential Equations • First-Order Differential Equations: Separable Equations, Linear Equations
Week 13	• Applications of Differential Equations in Engineering: Growth and Decay, RC Circuits
Week 14	• Higher-Order Differential Equations and Engineering Applications • Spring-Mass Systems: Modeling and Analysis
Week 15	• Systems of Differential Equations in Engineering: Electrical Circuits, Control Systems • Phase Plane Analysis: Stability and Classification • Review and Exam Preparation
Week 16	• Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts **Recommended Texts** **Website**	K.A. Stroud and Dexter J. Booth, "Engineering Mathematics," 7th edition, Palgrave Macmillan, 2013. E. Kreyszig, "Advanced Engineering Mathematics," 10th edition, Wiley, 2011. https://www.coursera.org/browse/physical-science-and-engineering	No

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

Grading Scheme
مخطط الدرجات

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.

استاذ المادة

أ.م.د. علي محمد حسين محسن

التاريخ: 22 / 1 / 2026

رئيس القسم

التاريخ :