Calculus I

تفاضل وتكامل 1

Module Information معلومات المادة الدراسية					
Module Title	**Calculus I**			**Module Delivery**	
Module Type	Supportive			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	TUCS112				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		1	**Semester of Delivery**		1
Administering Department		Math	**College**	CCSM	
Module Leader	Oqba Salim		**e-mail**	akabasalim4@gmail.com	
Module Leader's Acad. Title		Assistant Lecturer	**Module Leader's Qualification**		Master
Module Tutor			**e-mail**		
Peer Reviewer Name		Zeyad Mohammed Abdullah	**e-mail**		
Scientific Committee Approval Date		07/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Calculus II, Advanced Calculus	**Semester**	3

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The goal of studying differential calculus at university is to enable students to gain a deep understanding of this fundamental element of mathematics and its applications in different fields. By studying differential calculus, students learn how to calculate derivatives and understand the concept of a derivative as the instantaneous rate of change of a function. Students can apply the concepts of calculus to solve practical problems, analyze the behavior of functions, determine critical points, least and largest values of functions, and estimate changes of variable quantities. In addition, the study of differential calculus provides a foundation for the study of other topics in mathematics, science, and engineering, such as integration, calculus in multiple variables, and the solution of differential equations. Learning differential calculus aims to develop students' analytical thinking and mathematical reasoning capabilities and provide them with powerful mathematical tools to deal with complex technical and scientific problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Deep understanding of concepts: Students are expected to gain a deep understanding of basic concepts in differential calculus. Students should be able to understand the concept of a derivative and its meaning as the rate of change of a function, as well as the concept of inverse differential and integration of functions. 2. Numerical and Application Skills: Students should acquire strong skills in calculating and using derivatives in solving applied calculus problems. They should be able to compute the derivative of a variety of functions and apply it in analyzing the behavior of functions, identifying critical points, and estimating absolute values and variable ratios. 3. Analytical Thinking: By studying differential calculus, students are expected to develop abilities in analytical thinking and mathematical reasoning. They should be able to analyze mathematical problems and draw conclusions based on learned mathematical concepts and tools. 4. Applications in Other Fields: Students should have the ability to apply the concepts of differential calculus in other fields such as science, engineering, and economics. They learn how to represent real phenomena by functions and use differential calculus to analyze these phenomena and derive practical results. 5. Use of Technology: Students should have the ability to use appropriate technology such as mathematical calculation programs and
Indicative Contents المحتويات الإرشادية	Indicative content includes the following:

	1. Introduction to calculus: includes the definition of a derivative and the concept of a derivative as the instantaneous rate of change of a function. Students are exposed to the basic rules of calculus and related concepts. 2. The basic rules of differentiation: It includes studying the basic rules of differentiation such as the rule of differentiation rules, the rule of differentiation of constants, the rule of differentiation of forces, and other rules of differentiation of known functions. 3. Higher Derivatives: Students learn how to calculate higher derivatives, how to work with recursive differentiation, and how to use differential rules related to it. 4. Applications in differential calculus: Students explore the practical applications of calculus in different fields such as physics, engineering, and computer science. Practical examples of solving various differential problems are presented. 5. Relative and Total Differential: Students learn the concept of relative differential and total differentiation and how to calculate them. They are exposed to its applications in analyzing the behavior of functions and estimating variable changes. 6. Practical Applications of Calculus: Students are introduced to the use of differential calculus in solving problems in mathematical modeling, economic analysis, statistics, and other fields.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Student interaction: Active participation and interaction between students and the lecturer or teacher is encouraged. Small group discussions or collaborative sessions can be organized to solve various differential problems. Technology, such as online forums or distance learning tools, can be used to encourage communication and collaboration among students. 2. Practical Application and Projects: The course should include practical activities and application projects that allow students to apply differential concepts and skills in real-world contexts. For example, teams can be formed to solve multidimensional differential problems or applications in fields such as engineering and medical science. 3. Use of Technology: Calculus software and mathematical applications can be used to enhance interaction and interactive learning. Students can use graphing software or computer mathematics programs to analyze functions and graph their curves. 4. Provide examples and practical exercises: A wide range of examples and practical exercises covering various differential calculus concepts should be provided. Students can practice solving the exercises

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	77	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	73	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.86
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 , LO# 4 - 5
	Assignments	2	10% (10)	2, 12	LO #1-3 , LO# 4 - 5
	seminar	1	10% (10)	9	LO # 1-5
	Report	1	10% (10)	12	LO #2-5
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to function, domain, range Invers functions, even and odd function
Week 2	. Graph the functions
Week 3	Limits and continuous
Week 4	Exponential Functions , Logarithm Functions, Trigonometric functions.
Week 5	Derivatives, Rules of differentiation, Applications of Derivatives.
Week 6	The mean value theorem
Week 7	**Mid-term exam**
Week 8	The derivative and extrema
Week 9	Derivatives of Exponential Functions , Logarithm Functions
Week 10	Derivatives of Trigonometric functions, Derivatives of inverse functions
Week 11	Integration
Week 12	The mean value theorem for integrals
Week 13	basic application of integration
Week 14	Area , volume
Week 15	Arc length
Week 16	**Preparatory week before the final exam.**

Delivery Plan (Weekly Lab. Syllabus): There is no Lab activities المنهاج الاسبوعي للمختبر:لا توجد فعاليات مختبرية	
	Material Covered
Week 1	

Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Courant, R., John, F., Blank, A. A., & Solomon, A. (1965). *Introduction to calculus and analysis* (Vol. 1). New York: Interscience Publishers. 2. Tall, D. (1996). Functions and calculus. *International handbook of mathematics education*, *1*, 289-325. 3. Tall, D. (1996). Functions and calculus. *International handbook of mathematics education*, *1*, 289-. 4. Marsden, J., & Weinstein, A. (1985). *Calculus I*. Springer Science & Business Media. 5. *Thomas' Calculus*, Early Transcendental, 12th ed. 6. Calculus and Analytic Geometric, Durfee. W.H ,1971 New York (3).	No
Recommended Texts	Grossman, Stanley I. *Calculus*. Academic Press, 2014.	No
Websites	https://books.google.iq/books?hl=ar&lr=&id=0aziBQAAQBAJ&oi=fnd&pg=PP1&dq=calculus+book&ots=a1k4tINdCZ&sig=tmAQQ_yHi9mTDBLcx-qi7hy9uo8&redir_esc=y#v=onepage&q=calculus%20book&f=false	

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.