Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	College of Erbil Technical Engineering	
Department	Department of Information System Engineering	
Module Name	Calculus II	
Module Code	CAL301	
Degree	Technical Diploma ☐ Bachelor ■ High Diploma ☐ Master ☐ PhD ☐	
Semester	3	
Qualification	Master	
Scientific Title	Assistant Lecturer	
ECTS (Credits)	7	
Module type	Prerequisite ■ Core ☐ Assist. ☐	
Weekly hours		
Weekly hours (Theory)	(3)hr Class	(108) Total hrs Workload
Weekly hours (Practical)	(2)hr Class	(48) Total hrs Workload
Number of Weeks	16	
Lecturer (Theory)	Swar Ahmed	
E-Mail & Mobile NO.	swar.ahmed@su.edu.krd	
Lecturer (Tutorial)	Ali Hussein Yousif	
E-Mail & Mobile NO.	ali.yousif@epu.edu.iq,	
Websites		

Course Book

Course Description	Calculus for Information System Engineering Students: Fundamentals, Real Problems, and Computers insists that mathematics cannot be separated from chemistry, mechanics, electricity, electronics, automation, and other disciplines. It emphasizes interdisciplinary problems as a way to show the importance of calculus in engineering tasks and problems. While concentrating on actual problems instead of theory, the book uses Thomas Calculus to help students incorporate lessons into their own studies. Assuming a working familiarity with calculus concepts, the book provides a hands-on opportunity for students to increase their calculus and mathematics skills while also learning about engineering applications.			
Course objectives	1. The student will be able to recognize the problem type, select an appropriate solution strategy and apply rules and procedures for solving the problem. 2. The student will begin to be able to apply theorems and major concepts of calculus to solve real-world problems. 3. The student will understand and appreciate the applicability of calculus to nature, business, science, etc.			
Student's obligation	The student is responsible for all material assigned or discussed in class. Attendance will be taken, and may be used along with class effort (as measured by participation - asking questions, answering other students' questions, group work, etc.) to resolve borderline grades.			
Required Learning Materials	1. White board 2. Projector (Data Show)			
Evaluation	**Task**	**Weight (Marks)**	**Due Week**	**Relevant Learning Outcome**
	Paper Review			

	Assignments	Homework	10	5	
		Class Activity			
		Report	32	10	
		Seminar			
		Essay			
		Project			
	Quiz		10	12	
	Lab.				
	Midterm Exam		24	13	
	Final Exam		24	16	
	Total				

Specific learning outcome:	1. To familiarize the students with the concept of differentiation, and especially the partial derivative. 2. To familiarize the students with complex numbers. 3. To increase the skill set of integration techniques that students know, including double and triple integration. 4. To familiarize the students with the calculating the Area and Volume in the plane and space using double and triple integration. 5. To strengthen the notation and concept of summation (especially adding up an infinite number of terms in a sequence -- e.g. a limit, a series). 6. To introduce basic ideas of parametric equations, most especially polar coordinates and functions of polar coordinates.
Course References:	**Thomas Calculus 14th edition**

Course topics (Theory) and (Tutorial)	**Week**	**Learning Outcome**
Review of derivative and Integrals	1	Compute definite and indefinite integrals of

		algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, and piece-wise defined functions; Solve problems in a range of mathematical applications using the derivative or the integral;
Complex Number: Complex number, Polar form, Argand diagrams. Euler formula, De Moiver's theorem, Root and power of complex number. Complex function, Cauchy Ryman equation ,the fundamental theorem of algebra	2 and 3	1. represent complex numbers algebraically and geometrically; 2. Define and analyze limits and continuity for complex functions as well as consequences of continuity; 3. Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra
Partial derivatives: Function with two or more variable, Interior and boundary points (open, closed),	4 and 5	1) Evaluate a function of several variables at a specific point.

Boundary and unboundary region in the plane. Contours of function with two variables, function of three variables, Interior and boundary points for space regions. Partial derivative, Partial derivative of a function of two Variables, functions of more than two variables, Partial Derivatives and Continuity Second-order Partial Derivatives, the mixed Derivative theorem , Partial Derivatives of still higher order ,Minimum and maximum values of two variable		2) Find first partial derivatives of multivariable functions 3) Find first partial derivatives at a specific point 4) Find the second partial derivatives of multivariable functions.
Double integration, Properties of double integration	6	1. Recognize when a function of two variables is integrable over a rectangular region. 2. Recognize and use some of the properties of double integrals. 3. Evaluate a double integral over a rectangular region by writing it as an iterated integral.
Areas of a bounded region in the plane,	7	Use a double integral to calculate the area of a region, volume under a surface, or average value of a function

		over a plane region.
Sequences and series, Series of numbers, limit series, infinite series.	8	1. Use the definitions of convergence as they apply to sequences, series, and functions, 2. Analyze sequences and series of analytic functions and types of convergence,
The integral test, Comparison test. The ration and root tests, Alternative series.	9 and 10	Use the integral test, comparison test, ration test, root test and alternative series to test a series for convergence.
Absolute and conditional convergence power series	11	Illustrate the convergence properties of power series.
Taylor and Maclaurin series, Convergence of Taylor Series.	12	1. Describe the procedure for finding a Taylor polynomial of a given order for a function. 2. Explain the meaning and significance of Taylor's theorem with remainder. 3. Estimate the remainder for a Taylor series approximation of a given function.
Applications of power series	13	Introduces the binomial series for estimating

		powers and roots and shows how series are sometimes used to approximate the solution of an initial value problem, to evaluate nonelementary integrals, and to evaluate limits that lead to indeterminate forms.
Fourier series, matrices, matrices and application	14	1. Appreciate that the Fourier series are the mathematical form for periodic physical phenomena. 2. Learn to use Fourier series to represent periodical physical phenomena in engineering analysis. 3. Learn the required conditions for deriving Fourier series. 4. Appreciate the principle of using Fourier series derived from the function for one period to apply the same Fourier series for other periods.
Triple integration, Properties of triple integration	15	1. Recognize when a function of three

		variables is integrable over a rectangular box. 2. Evaluate a triple integral by expressing it as an iterated integral. 3. Recognize when a function of three variables is integrable over a closed and bounded region.
Volume of a region in the space, Polar Coordinate, Integral in Polar Coordinate	16	The integral ideas of the functions defined including line, surface and volume integrals - both derivation and calculation in rectangular, cylindrical and spherical coordinate systems and understand the proofs of each instance of the fundamental theorem of calculus
Questions Example Design **Which of the sequences converge, and which diverge? Find the limit of each convergent sequence.**		

$a_n = \left(\frac{n+1}{2n}\right)\left(1 - \frac{1}{n}\right)$ $a_n = \left(2 - \frac{1}{2^n}\right)\left(3 + \frac{1}{2^n}\right)$ $a_n = \frac{(-1)^{n+1}}{2n-1}$ $a_n = \left(-\frac{1}{2}\right)^n$		
Extra notes:		
External Evaluator I confirm that the syllabus and content of this course book is sufficient and fulfilment for the lesson of "Calculus II" for the 3rd semester students in the department of "Information System Engineering". The course book covers the requirements of students to have enough knowledge in this field. **Signature** **Lec. Farah Sami Khoshaba**		