Ministry of Higher Education and Scientific Research
Supervision and Scientific Evaluation Authority
Department of Quality Assurance and Academic Accreditation

Academic Program Description Form for Colleges and Institutes Academic Year

University: Shatt Al-Arab
College/Institute: Engineering
Scientific Department: Civil
Date of Form Completion: 01/09/2024

Signature   **Signature**
Name of Head of Department:

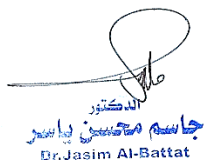Asst. Lecturer Nabeel Najm Abdullah   **Name of Scientific Assistant:** Dr. Jawad Kadhim

Reviewed by:
Quality Assurance and University Performance Division
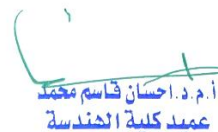**Name of Division Director:** Dr. Jasem Mohsen Yasser

Signature:

الدكتور
جاسم محسن ياسر
Dr.Jasim Al-Battat

أ.م.د.احسان قاسم محمد
عميد كلية الهندسة

Dean's Approval

MODULE DESCRIPTION FORM

Module Information		
معلومات المادة الدراسية		
Module Title	**Applied mathematics**	**Module Delivery**
Module Type	**Basic**	x **Theory**
Module Code	**E212**	x **Lecture**
ECTS Credits	**8**	☐ **Lab**
		x **Tutorial**
SWL (hr/sem)	**120**	☐ **Practical**
		x **Seminar**

Module Level	2	**Semester of Delivery**	1
Administering Department	Type Dept. Code	**College**	Type College Code
Module Leader	Nabil Najm	**e-mail**	
Module Leader's Acad. Title	Ass. Lecturer	**Module Leader's Qualification**	M.Sc.
Module Tutor	Shahid Mohammed	**e-mail**	
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/09/2024	**Version Number**	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The course aims to; 1- Presenting polar coordinates and their applications in engineering 2- Presenting vectors and their applications in engineering 3- Presenting series and their applications in engineering 4- Presenting partial derivatives and their applications in engineering 5- Presenting multiple integral and their applications in engineering 6- Presenting complex numbers and their applications in engineering
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Knowledge and Understanding 1- Understanding polar coordinates and their relation to Cartesian coordinates and their applications. 2- Studying vectors and use them to study the analytic geometry of space with their important applications in engineering. 3- Studying different types of series and their applications in solving different engineering and mathematical problems 4- Using partial differentiation in deriving different surface equations, rate of change, optimization problem and estimation of change. 5- Studying and using multiple integral and their applications in civil engineering such as determining areas, volumes, center of masses and moments of inertia. 6- Studying complex numbers and their relations in solving different mathematical problems.
Indicative Contents المحتويات الإرشادية	– Graphing in Polar coordinates, calculating areas and lengths of curves using polar coordinates. - Study the analytic geometry of space using vectors. Vectors provide simple ways to define equations for lines, planes, curves, and surfaces in space with their many important applications in science, engineering. - study partial derivatives for the functions of two or multiple variables, chain rules, directional derivatives and critical points. - Study the multiple integrals in Cartesian and polar coordinates and area, volume, centroid and moment of inertia calculations using multiple integrals.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	Scientific and research skills are developed through teaching and learning activities. Analysis and problem solving skills are further developed by means of a set of problems prepared by the lecturers in small study groups and all assignments and report work submitted is evaluated and responded to.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO # 1, 2, 4, 5
	Assignments	2	10% (10)	4, 9	LO # 1, 2, 4, 5
	Report	1	10% (10)	13	LO # 3, 6
Summative assessment	Midterm Exam	2 hr	20% (20)	7	LO # 1,2,3
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Definition of Polar Coordinates, Polar Equations and Graphs, Relating Polar and Cartesian Coordinates, Graphing Polar Coordinate Equations
Week 2	Areas and Lengths in Polar Coordinates
Week 3	Vectors and the Geometry of Space, Component Form and Vector Algebra Operations
Week 4	Unit Vectors, Midpoint of a Line Segment, Navigation, forces action on a single object
Week 5	The Dot Product, Angle Between Vectors, orthogonal Vectors, work and Vector Projections
Week 6	The Cross Product, Calculating the Cross Product as a determinant, Area of a Parallelogram and Torque, Lines and Planes in Space
Week 7	Infinite Sequences and Series, Infinite Series, Taylor and Maclaurin Series,
Week 8	Power Series, The Binomial Series and Applications of Taylor Series
Week 9	Partial Derivatives, Limits and Continuity in Higher Dimensions, Partial Derivatives of a Function of Two and Three Variables Second-Order and higher Partial Derivatives.
Week 10	The Chain Rule, Directional Derivatives and Gradient Vectors, Tangent Planes and Differentials, Estimating Change in a Specific Direction
Week 11	Extreme Values and Saddle Points, optimization
Week 12	Double Integrals in Cartesian and Polar Form, Area by Double Integration
Week 13	Triple Integrals, Area, volume, centroid and moment of inertia
Week 14	Triple Integrals in Cylindrical and Spherical Coordinates
Week 15	Complex Numbers, Argand Diagrams, Euler's Formula, Operations on complex number
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Thomas' Calculus, George B. Thomas	Yes
Recommended Texts	Calculus , STANLEY I. CROSSMAN	No
Websites		

Grading Scheme

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.