MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	Advanced Mathematics		**Module Delivery**
Module Type	S		• ☒ **Theory** • ☐ **Lecture** • ☐ **Lab** • ☐ **Tutorial** • ☐ **Practical** • ☐ **Seminar**
Module Code	UOMU021034		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	**Semester of Delivery**	3
Administering Department	Power Mechanical Engineering Technology	**College**	Engineering and Engineering Technology
Module Leader	Hussein K. Halwas	**e-mail**	hussein.kadhim@uomus.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date		**Version Number**	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	UOMU021011	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aims of this module are: 1- To introduce students to the mathematical concepts and

	techniques that They will encounter in the various engineering. 2- To develop an awareness of the role of mathematics in the solution of Engineering problems. 3- Solve problems involving differentiation and integration. 4- Solve system of linear equations using matrix method. 5- Apply vector methods to the solution of geometric problems. 6- Uses differential equations in problems of heat transfer and other Engineering systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Apply basic operation in vector algebra (cartesian and geometric representation) to represent lines and planes, calculate the gradient of a scalar field using partial derivatives. 2- Apply the basic rules and techniques of **differential** calculus and its application in engineering. 3- Apply the basic rules and techniques of **integral** calculus and its application in engineering. 4- Demonstrate the basics, rules and techniques for differential equation and partial differentiation. 5- Demonstrate the basics, rules and techniques of complex number algebra and its application in engineering. 6- Use basic operations of matrix algebra, determinants and their application in solving systems of linear equations. 7- Use of software packages for matrix calculations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Differential and integral calculus of functions of two or more variables and Their applications. Vectors in 3D and their applications, line and surface Integrals, infinite and power series, matrices , functions of complex variables.

Learning and Teaching Strategies **استراتيجيات التعلم والتعليم**	
Strategies	Class activities , homework, quizzes, online testing , written exam.

Student Workload (SWL) **الحمل الدراسي للطالب**			
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	48	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	4	15% (15)	3,6,9,12	
	Assignments	3	15% (15)	4,8,12	
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam	3 hr	20% (20)	7	
	Final Exam	3 hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) **المنهاج الاسبوعي النظري**	
	Material Covered
Week 1	Overview of differentiation and integration.
Week 2	Vectors in 3D, triple product of vectors (dot and cross), equations of line and plane in space.
Week 3	Complex numbers, De moiver's theory, power and roots of complex numbers, Euler formula, complex functions, Cauchy- Riemann equations.
Week 4	Functions of two or more variables, dependent and independent variables, limits, continuity, partial derivatives.
Week 5	Applications of partial derivatives, tangent plane to surface, normal line to surface, tangent line to curve, normal plane to curve, relative maximum and minimum points, directional derivative.
Week 6	Polar coordinate, polar functions, graph polar function, relations between polar and cartesian, cylindrical and spherical coordinate.
Week 7	Processes using two phase system, processes on P-V diagram, Irreversible processes closed system, Second law of thermodynamics, heat engine, heat pump.
Week 8	Applications of double integration.
Week 9	Triple integration, cylindrical and spherical coordinate in triple integration, applications.
Week 10	Line integrals, green theory.
Week 11	Sequences and series, finite and infinite series.
Week 12	Types of series, methods test diverge and converge of series.
Week 13	Power series, expansion of functions in power series (Taylor and Maclaurin).
Week 14	Ordinary differential equations, first and second O.D.E .
Week 15	Solving of first and second O.D.E , applications of O.D.E .
Week 16	Exam

Learning and Teaching Resources **مصادر التعلم والتدريس**		
	Text	**Available in the Library?**
Required Texts	1- Mu Murray R.Spiegel "Advanced calculus " schaum's outline series, McGraw-Hill company	

	1974. 2- G. Stephenson, " Mathematical methods for science students " Longman house, 1981. 3- G. Thomas and R. Finney " calculus and analytical geometry " sixth edition,2000. 4- J. Hass, C. Heil and M. D. Weir " Thomas calculus " fourteenth edition, 2018.	
Recommended Texts		
Websites		

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.