



Ministry of Higher Education and  
Scientific Research - Iraq  
University of Technology  
Chemical Engineering Department



## MODULE DESCRIPTOR FORM

### نموذج وصف المادة الدراسية

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>Differentiation and Integration</b>		<b>Module Delivery</b>
<b>Module Type</b>	<b>Basic</b>		<b>Theory Lecture Tutorial</b>
<b>Module Code</b>	<b>UOMU0102021</b>		
<b>ECTS Credits</b>	<b>6</b>		
<b>SWL (hr/sem)</b>	<b>150</b>		
<b>Module Level</b>	1	<b>Semester of Delivery</b>	2
<b>Administering Department</b>	Chemical Engineering & Petroleum Industries	<b>College</b>	Engineering
<b>Module Leader</b>	Saif Salam Saud	<b>e-mail</b>	saif.salam.saud@uomus.edu.iq
<b>Module Leader's Acad. Title</b>	Assistant Lecture	<b>Module Leader's Qualification</b>	MSc
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>	None	<b>e-mail</b>	None
<b>Review Committee Approval</b>	01/06/2023	<b>Version Number</b>	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	GEMA112	<b>Semester</b>	1
<b>Co-requisites module</b>	None	<b>Semester</b>	
<b>Module Aims, Learning Outcomes and Indicative Contents</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. To develop an understanding with the concepts of calculus and analytic geometry and the applications of these concepts to the solution of engineering problems.</li> <li>2. Introduction to functions, limits, derivatives and their applications.</li> <li>3. Provide practice at developing critical thinking skills, solving open ended problems and to work in teams.</li> </ol>		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Develop a deep understanding of issues related to the basic principles of calculus, and how to solve problems in chemical engineering.</li> <li>2. The ability to understand and analysis problems related to specific field.</li> <li>3. Understanding the necessary of all subject of mathematics in other sciences .</li> <li>4. Understanding the necessary of integration and its application in other sciences .</li> <li>5. An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems.</li> <li>6. Characterization and analyses the performance of any problems in any object of chemical engineering.</li> </ol>		
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <p><b>Integration</b> Indefinite integrals , Rules for indefinite integrals , Integration by substitution , Definite integrals , Rules for definite integrals , Mean (average) value , One-to-one functions , Inverse functions , Derivatives of inverse of differentiable functions ,The derivative &amp; integral of natural logarithms functions, Exponential functions, Logarithms functions, <math>a^x</math> functions, Trigonometric functions, Inverse trigonometric functions, Hyperbolic functions, &amp; Inverse hyperbolic functions. [12 hrs]</p> <p>Techniques of integration Integration by parts , Integration of rational functions by partial fractions , Trigonometric integrals , Trigonometric substitutions , Integration of rational functions of sine &amp; cosine. [9 hrs]</p> <p>Applications of definite integrals Area between the graph &amp; the x-axis , Area between curves , Volume by slicing &amp; rotation about an axis , The disk method , The washer method , The shell method , Length of plane curves , Length of a parametric curves , Length of curve <math>y=f(x)</math> , Length of curve <math>x=g(y)</math> , Area of surfaces of revolution , Surface area for revolution</p>		

	<p>about the x-axis , Surface area for revolution about the y-axis , Surface area of revolution for parameterized curves. [12 hrs]</p> <p>Partial derivatives          Partial derivatives with respect to x , Partial derivatives with respect to y , Functions of more than two variables , Second order partial derivatives , The mixed derivative theorem , partial derivatives of still higher order , The chain rule , Implicit differentiation. [6 hrs]</p> <p>Polar coordinates          Definition , Polar equation &amp; graphs , Relating polar &amp; Cartesian coordinates , Polar equation , Graphing in polar coordinates. [6 hrs]</p>
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive and tutorials.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	48	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	6.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	4,8,12	LO #2, 3, 4 and 5
	<b>Discussion</b>	1	5% (5)	Continuous	
	<b>Report</b>	1	5% (5)	14	LO # 1 and 6
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	10	LO # 2, 3, 4 and 5
	<b>Final Exam</b>	2hr	70% (70)	16	All

<b>Total assessment</b>	100% (100 Marks)		
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### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	<b>Material Covered</b>
<b>Week 1</b>	Indefinite integrals , Rules for indefinite integrals , Integration by substitution
<b>Week 2</b>	Definite integrals , Rules for definite integrals , Mean (average) value , One-to-one functions , Inverse functions , Derivatives of inverse of differentiable functions
<b>Week 3</b>	The derivative & integral of natural logarithms functions, exponential functions, logarithms functions, & $a^x$ functions
<b>Week 4</b>	The derivative & integral of trigonometric functions, inverse trigonometric functions , hyperbolic functions, & inverse hyperbolic functions
<b>Week 5</b>	Integration by parts
<b>Week 6</b>	Integration of rational functions by partial fractions
<b>Week 7</b>	Trigonometric integrals , trigonometric substitutions , integration of rational functions of sine & cosine
<b>Week 8</b>	Area between the graph & the x-axis , area between curves
<b>Week 9</b>	Volume by slicing & rotation about an axis , the disk method , the washer method , the shell method
<b>Week 10</b>	Length of plane curves , length of a parametric curves , length of curve $y=f(x)$ , length of curve $x=g(y)$
<b>Week 11</b>	Area of surfaces of revolution , surface area for revolution about the x-axis , surface area for revolution about the y-axis , surface area of revolution for parameterized curves
<b>Week 12</b>	Partial derivatives with respect to x , partial derivatives with respect to y , functions of more than two variables , second order partial derivatives
<b>Week 13</b>	The mixed derivative theorem , partial derivatives of still higher order , the chain rule , implicit differentiation
<b>Week 14</b>	Definition , polar equation & graphs , relating polar & cartesian coordinates , polar equation
<b>Week 15</b>	Graphing in polar coordinates
<b>Week 16</b>	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	"Thomas' Calculus Early Transcendentals", George B.Thomas, Jr. , Twelfth Edition, Addison-Wesley, 2010	Yes
Recommended Texts	“Mathematical Methods in Chemical Engineering”, Jenson. V.J. and Jeffereys, G.V, 2nd Edition, Academic Press New York, 1977	Yes
Websites		

**APPENDIX:**

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

**Note:**

NB 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.

