

Planning and Quality Assurance Affairs

Form (A)

Course Specifications

General Information

Course name	Calculus(3)
Course number	MATH2403
Faculty	
Department	
Course type	Major Needs
Course level	2
Credit hours (theoretical)	4
Credit hours (practical)	0
Course Prerequisites	

Course Objectives

- 1 - Students are expected to have a clear understanding of the ideas of Calculus
- 2 - The primary aims of the course are to help students develop new problem solving
- 3 - prepare the students for further study in mathematics
- 4 - providing the students experience with methods and applications of calculus
- 5 - This course will focus on understanding calculus concepts, analytical reasoning in three dimensions .
- 6 - This course provide students knowledge and the ability to work with the concepts of derivatives and integration is essential for further studies of mathematical subjects, as well as for applications of mathematical techniques in other sciences.

## Intended Learning Outcomes

<b>Knowledge and Understanding</b>	<ul style="list-style-type: none"><li>* sketch and analyze curves of conic sections: parabola, ellipse, hyperbola</li><li>* sketch and analyze curves given parametrically</li><li>* graph curves in polar coordinates</li><li>* compute areas and arc lengths using polar coordinates</li><li>* recognize and apply algebraic and geometric properties of vectors in two and three dimensions</li><li>* compute dot products and cross products and recognize their geometric meaning</li><li>* visualize and sketch surfaces in three-dimensional space</li><li>* compute and interpret partial derivatives of functions of several variables;</li><li>* set up and evaluate double and triple integrals using a variety of coordinate systems, including rectangular, polar;</li></ul>
<b>Intellectual Skills</b>	<ul style="list-style-type: none"><li>* explain the mathematical concepts for each topic in this subject using specialist vocabulary; follow, and explain simple proofs from the lecture notes;</li><li>* apply relevant Theorems to problems in calculus iii .</li><li>* Calculate and understand iterated integrals, double integrals, triple integrals</li><li>* solve extreme value problems by applying various techniques</li></ul>
<b>Professional Skills</b>	<ul style="list-style-type: none"><li>* Work effectively with others to complete homework and class assignments.</li><li>* Apply gained math skills in other scientific branches as physics and chemistry</li><li>* Solve application problems.</li><li>* Use mathematical skills for solving problems in different topics in science</li></ul>
<b>General Skill</b>	<ul style="list-style-type: none"><li>* understand advanced topics in calculus</li><li>* understand double and triple integrals;</li><li>* understand vector functions</li><li>* understand polar coordinates</li></ul>

## Course Contents

<ol style="list-style-type: none"><li>1 - Conic sections , parabola, ellipse, hyperbola</li><li>2 - Plane Curves and Polar Coordinates . Plane Curves, Tangent Lines, Arc Length ,Polar Coordinates , Polar Equations of Conics</li><li>3 - Vectors and Surfaces. Vectors in Two and Three Dimensions . Scalar Product . Vector Product . Lines and Planes . Surfaces</li><li>4 - Functions of several variables, limits, continuity, partial derivatives, differentials chain rules, directional derivatives gradients, tangent planes, normal lines and extrema of functions of two variables</li><li>5 - iterated integrals, double integrals, triple integrals, triple integrals in polar coordinates, and change of variables in multiple integrals</li></ol>
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## Teaching and Learning Methods

<ol style="list-style-type: none"><li>1 - Lectures</li><li>2 - Discussion</li><li>3 - problem-solving exercises</li><li>4 - Contact on office hours</li><li>5 - Homework</li></ol>
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## Teaching and Learning Methods for the Disabled Students

<ol style="list-style-type: none"><li>1 - No</li></ol>
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**Students Assessment**

<u>Assessment Method</u>	<u>TIME</u>	<u>MARKS</u>
first mid term exam	one month after the beginning of the semester	20%
Second med term exam	Two month after the beginning of the semester	20%
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Final exam	after completing the course	50%

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**Books and References**

Essential books	Calculus; Earl W. Swokowski, fifth edition
Recommended books	Calculus by R. COURANT Calculus, 7th edition by James Stewart

## Knowledge and Skills Matrix

Main Course Contents	Study Week	Knowledge and Understanding	Intellectual Skills	Professional Skills	General Skill
Introduction Conic sections Parabola .ellipse hyperbola rotation of axes	1-3	.kinds of conic sections definitions of parabola, ellipse, hyperbola equations of parabola, ellipse, hyperbola Equation of conic when axes are not or parallel to coordinate axes	How to classify the kind of conics sketching the graph of conics how to rotate the axes of conic to find the proper equations	finding the vertices and foci of conics finding the equation of conic that satisfies certain axioms classify and discuss the equation of conics	what are the conic sections how to sketch the graph of conics analysis the equations
Plane curves, tangent lines, Arc length Polar coordinate Integrals in polar coordinates Polar equations of conics	4-7	parametric equations polar equations arc length and area of the surface of revolutions area in polar coordinate polar equations of conic	how to sketch the graph of parametric and polar equations how to find the area of the regions bounded by graphs of polar equations finding the general equations of conics in polar form	sketching the graphs of polar equations find the area of the regions bounded by the graph of polar equations find the equations of conics in polar equations	What are the parametric equations and polar equations what are the polar equations of conics
vectors and surfaces ellipsoids ,paraboloids,hyperboloids	8-10	Vectors in 2 and 3 dimensions dot product and cross products lines and planes in 3 dimensions cylindrical surfaces quadratic surfaces	analysis of vectors what are the equations of lines and planes equations of certain surfaces	Find parametric equations for the line through the points Sketching the graph of the quadric surface Determine whether the two lines intersect, and if so, find the point of intersection	what are the three coordinates system what are the surfaces
Limits, derivatives of functions of several variables Chain rule and directional derivative of function of several variables Tangent planes and extrema	11-13	functions of two variables limit and continuity of functions of several variables partial derivatives directional derivatives tangent lines and normal lines local extrema	what are functions of 2 variables and how to sketch its graph how to study calculus on such functions how to find the derivatives of such functions what is the tangent plane and normal lines	Find equations of the tangent plane and normal line to the graph of equations Find the directional derivative of functions at the point in the direction of vectors	What is partial derivatives what is the directional derivatives

Double integrals Triple integrals	14-15	double integral iterated and area integral double integrals in polar coordinates triple integrals	How to express double integral from area form to iterated form find the area and volume using double integral how to find the area in polar coordinates using double integral	Find the area of the region bounded by the graphs of equations using double integrals Find the volume using triple integrals	what are double integrals what are triple integrals
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