



Course Specifications

Course Title:	Advanced Mathematics
Course Code:	202463-3
Program:	Bachelor in Computer Science
Department:	Department of Mathematics
College:	College of Science
Institution:	Taif University

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A. Course Identification

1. Credit hours: 4
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: 13/5
4. Pre-requisites for this course (if any): 202364-3
5. Co-requisites for this course (if any): None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	6	100%
2	Blended	0	0
3	E-learning	0	0
4	Distance learning	0	0
5	Other	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	60
2	Laboratory/Studio	0
3	Tutorial	0
4	Others (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Vectors and the geometry of space: Three-dimensional coordinate system, vectors, the dot product, the cross product, equations of linear and planes, quadric surface, cylindrical and spherical coordinates. Vectors functions: space curves, derivatives and integrals of vector functions, arc length and curvature, motion in space, velocity and acceleration. Partial derivatives: Functions of several variables, limits and continuity, partial derivatives, tangent planes and differentials, the chain rule, directional derivatives and the Gradient vector, maximum and minimum values, critical points, Lagrange multipliers. Multiple integrals: double integrals over rectangles, iterated integrals, double integrals over general regions, double integrals in polar coordinates, applications, surface area, triple integrals in Cartesian, cylindrical and spherical coordinates, change of variables in multiple integrals. Vector calculus: vector fields, line integrals, the fundamental theorem for line integrals, Green's theorem, Curl and divergence, parametric surfaces and their areas, surface integrals the divergence theorem.



2. Course Main Objective

The main objective of this course is to provide comprehensive introduction and overview of the vectors and the geometry of space, study the vectors functions, study the definition of the Partial derivatives and its applications, learn how to solve multiple integrals and its applications and provide comprehensive introduction and overview of the Vector calculus.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Define vectors and its operations.	K1
1.2	Define the vector functions and its operations	K1
1.3	Memorize the partial derivatives and its rules	K1
1.4	Learn the multiple integration and its applications.	K1
1.5	Study the vector calculus and its main theories.	K1
2	Skills :	
2.1	Use the operations of the vectors.	S1
2.2	Solve problems of the vector functions.	S1
2.3	Find the first order partial derivatives and the higher partial derivatives of multivariable functions.	S1
2.4	Find the area of surfaces in the 2 dimension space and the volume of the solids in 3 dimension space.	S1
2.5	Determine the maximum, minimum or saddle points of a multivariable functions.	S1
2.6	Solve problems of the line integrations with green and stokes' theorems.	S1
3	Values:	
3.1	Demonstrate working as group skills.	C3
3.2	Improve oral presentation skills.	C1
3.3	Operate in a scientific writing skill	C2

C. Course Content

No	List of Topics	Contact Hours
1	Introduction and overview of the vectors and the geometry of space.	10
2	Vector functions.	10
3	Partial derivatives and its applications	10
4	Double integral and its applications.	15
5	Triple integrals and applications.	15
Total		60



D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Define vectors and its operations.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
1.2	Define the vector functions and its operations	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
1.3	Memorize the partial derivatives and its rules	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
1.4	Learn the multiple integration and its applications.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
1.5	Study the vector calculus and its main theories.		
2.0	Skills		
2.1	Use the operations of the vectors.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
2.2	Solve problems of the vector functions.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
2.3	Find the first order partial derivatives and the higher partial derivatives of multivariable functions.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
2.4	Find the area of surfaces in the 2 dimension space and the volume of the solids in 3 dimension space.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
2.5	Determine the maximum, minimum or saddle points of a multivariable functions.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
2.6	Solve problems of the line integrations with green and stokes' theorems.		
3.0	Values		
3.1	Demonstrate working as group skills.	Work group	Assignments



Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.2	Improve oral presentation skills.	Lecture Discussion	Oral Presentation
3.3	Operate in a scientific writing skill	Lecture Discussion	Report writing

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	1 st Exam	4 th week	20 marks
2	Interaction during lectures	Continuous	5 marks
3	Reports + homework	Continuous	5 marks
4	2 nd Exam	10 th week	20 marks
5	Final exam	12	50 marks

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Academic advising and counseling of students is an important component of teaching; student academic advising is a mandatory requirement of College of Computers and Information Technology (CCIT). Appropriate student advising provides support needed for the student during times of difficulty. In addition, it helps the student to build a close relationship with his/her advisor and to provide student motivation and involvement with the institution.

In addition, since faculty are usually the first to recognize that a student is having difficulty, faculty members play a key role in developing solutions for the students or referring them to appropriate services. Faculty members also participate in the formal student-mentoring program.

Additional counseling is provided by course directors, who provide students with academic reinforcement and assistance and refer “at risk” students to the Vice Dean for Academic Affairs and the Vice Dean for female section.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Calculus; International Metric Edition, 7 th Edition James Stewart Brooks/Cole, Cengage Learning, 2012.
Essential References Materials	Calculus; International Metric Edition, 7 th Edition Authors: James Stewart Brooks/Cole, Cengage Learning, 2012.



Electronic Materials	NON
Other Learning Materials	NON

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> • A Lecture room appropriate for maximum 25 students with a personal computer, a data show and a smart board. • A Lab room appropriate for maximum 15 students with a personal computer, a data show and a smart board.
Technology Resources (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> • NON
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	Students	Students' surveys and Students course evaluation
Improvement of Teaching	Course Coordinator	deficiencies based on the student Evaluation, faculty input, course file, and program assessment
Verifying Standards of Student Achievement	Curriculum Committee	<ul style="list-style-type: none"> • Review CAF (Course assessment file) • Alumni surveys. Periodic exchange and remarking of tests or a sample of assignments with staff at another

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)



H. Specification Approval Data

Council / Committee	CS council
Reference No.	Meeting #12
Date	23-10-1443

