اعتماد
NCAAA

T4

2020

Course Specifications

Course Title:	Differential Geometry
Course Code:	443 Math
Program:	B. Sc. in Mathematics
Department:	Mathematics
College:	Science
Institution:	Jazan University

Table of Contents

A. Course Identification

1. **Credit hours:**	03

2. Course type

a. University ☐ College ☐ Department ✔ Others ☐
b. Required ✔ Elective ☐

3. Level/year at which this course is offered: Level 8/Year 4

4. Pre-requisites for this course (if any)**: Math 331**

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	45	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	42
2	Laboratory/Studio	
3	Tutorial	3
4	Others (specify)	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to provide students with

- **Curves Theory**: Basic definitions, curvature and torsion of regular curves, Frenet-Serret apparatus, Frenet-Serret theorem, the fundamental theorem of curves.
- **Surfaces Theory**: Basic definitions, 1st fundamental form and 2nd fundamental form, normal curvature, Geodesic curvature, Gaussian and mean curvatures, asymptotic lines and lines of curvature.

2. Course Main Objective

After finishing the course, the student is expected to be familiar with the following:

- Curvature and the torsion of curves.
- Demonstration of the surface area using the coefficients of the 1st fundamental form.
- Classification of the points of surfaces using the coefficients of the 2nd fundamental form.
- Normal and Gaussian torsion of curves.
- Asymptotic lines and main lines of surface.
- Mean torsion of surface.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Distinguish mathematical concepts relevant to curvature and torsion of a curve.	K1
1.2	Identify structures and features of Mathematics problems in curves and the theory of surfaces.	K2
1.3	Explain required notations and concepts in Differential Geometry.	K3
2	**Skills :**	
2.1	Apply aspects relevant to the first fundamental form and the second fundamental form in Differential Geometry.	S1
2.2	Compute rates/quantities and Approximate Solutions in regular curves and its principal tangent, normal and binormal unit vectors.	S2
2.3	Apply various math rules, techniques and theorems in proving a Geometric mathematical problem.	S3
2.4	Solve mathematical problems using critical thinking and problem solving in proving a Geometric mathematical problem.	S4
3	**Values:**	
3.1	Cultivate a mathematical attitude and nurture the interest.	V1
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	V2
3.3	Inculcating values and ethics in thought, expression and deed.	V3

C. Course Content

No	List of Topics	Contact Hours
1	Vectors, Plane curves, Space curves.	9
2	Curvature of a space curve, Principal coordinate plane equations of a curve.	9
3	Torsion of a space curve, Frenet Apparatus, Normal unit vector of a surface.	9
4	First and Second Fundamental forms.	9
5	Gaussian, Normal and Mean curvatures of a curve.	9
	Total	**45**

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	Distinguish mathematical concepts relevant to curvature and torsion of a curve.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.2	Identify structures and features of Mathematics problems in curves and the theory of surfaces.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.3	Explain required notations and concepts in Differential Geometry.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.0	**Skills**		
2.1	Apply aspects relevant to the first fundamental form and the second fundamental form in Differential Geometry.	Lectures, problem solving, web based work.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
2.2	Compute rates/quantities and Approximate Solutions in regular curves and its principal tangent, normal and binormal unit vectors.	Lectures, problem solving, web based work.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
2.3	Apply various math rules, techniques and theorems in proving a Geometric mathematical problem.	Lectures, problem solving, web based work.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
2.4	Solve mathematical problems using critical thinking and problem solving in proving a Geometric mathematical problem.	Lectures, problem solving, web based work.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
3.0	**Values**		
3.1	Cultivate a mathematical attitude and nurture the interest.	Group work, problem solving, web based work	Assignments
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	Group work, problem solving, web based work	Assignments
3.3	Inculcating values and ethics in thought, expression and deed.	Group work, problem solving, web based work	Assignments

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework	3	5%
2	First exam.	6	20%
3	Second exam.	12	20%
4	Homework	14	5%
5	Final exam.	16	50%

*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 :
Each group of students assigned to a member of staff who will be available for help and academic guidance office hours at specific hours on daily basis. At least be available 8 hours per week.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- Richard, S. Millman, George, D. Parker, Elements of differential geometry, HALL. INC © 1977.
Essential References Materials	**1-** M. Docarmo, Differentiable curves and surfaces, Princeton Hall, New Jersey, (1976). **2-** Schaum outlines of theory and problems of differential geometry Martin M. Lipchitz, ph.D.
Electronic Materials	Web sites dedicated to Differential Geometry.
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom, Computer lab.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show; Smart Board, Mathematics software.
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, Peer and program leader	Indirect (Course Evaluation Survey)- Indirect peer evaluation
Assessment	Students, Program assessment committee	Direct/ Indirect
Extent of achievement of course learning outcomes	Instructor	Direct/Indirect
Quality of learning resources	Students, Faculty members	Indirect

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	**Board Of Mathematics Department**
Reference No.	**12th Meeting Of The Board Of Mathematics Department 1441-1442**
Date	**14/6/1442 A. H.; 27/1/2021 A. D.**