Course Specifications

Course Title:	Differential Geometry
Course Code:	**433Math-3**
Program:	**Mathematics**
Department:	**Mathematics**
College:	**Science and Arts**
Institution:	**Najran University**

Table of Contents

A. Course Identification

1. Credit hours:3	
2. Course type	
a. University ☐ College ☐ Department √	Others ☐
b. Required √ Elective ☐	
3. Level/year at which this course is offered: 7 / 4	
4. Pre-requisites for this course (if any): **241 Math-3**	
5. Co-requisites for this course (if any): Non	

6. Mode of Instruction (mark all that apply)

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

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	---
3	**Tutorial**	---
4	**Others** (Exams)	3
	Total	48
Other Learning Hours*		
1	**Study**	30
2	**Assignments**	10
3	**Library**	10
4	**Projects/Research Essays/Theses**	---
5	**Office hours**	15
	Total	113

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers curves in the plane and R^3. Reparametrization by arch length, curvature and torsion. Frenet's theorem, osculating plane, normal plane, rectifying plane, involutes, evolutes, Bertrand curves, global properties of curves, local and intrinsic properties, simple closed curves, isoperimetric inequality, four vertex theorem, spherical indicatrix, surfaces in R^3, smooth surfaces, examples of surfaces, the second fundamental form, length of curves on surfaces, surface area, the second fundamental forms, Gaussian formula, the normal and geodesic curvature, principle curvature, mean and Gaussian curvatures, geodesics and spherical image.

2. Course Main Objective

Apply calculus and its applications to the geometry of curves and surfaces in space.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Define curves in plane and space (3D).	
1.2	Describe curvature, torsion and associated curves to a space curve.	
1...		
2	**Skills :**	
2.1	Construct surfaces in space (3D).	
2.2	Perceive first and second fundamental forms.	
2.3		
2...		
3	**Competence:**	
3.1	Explains principle, mean, and Gaussian curvatures.	
3.2	Apply different techniques to learn differential geometry.	
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Curves in the plane and R^3. Reparametrization by arch length, Curvature and torsion.	6
2	Frenet's theorem, Osculating plane, Normal plane, Rectifying plane.	6
3	Involutes, Evolutes, Bertrand curves, Global properties of curves, Local and intrinsic properties, Simple closed curves, Isoperimetric inequality, Four vertex theorem, Spherical indicatrix.	12
4	surfaces in R^3, Smooth surfaces, Examples of surfaces, The second fundamental form, Length of curves on surfaces, surface area.	9
5	The second fundamental forms, Gaussian formula, The normal and geodesic curvature, Principle curvature, Mean and Gaussian curvatures, Geodesics and Spherical image.	12
...		

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**		
1.1	Define curves in plane and space.	- Lecture - Discussions	- Quiz - Written Exam
1.2	Describe curvature, torsion and associated curves to a space curve.	- Lecture - Discussions	- Quiz - Written Exam
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2.0	**Skills**		
2.1	Construct surfaces in space (3D).	- Identify induced subgraphs, and proper subgraphs	- Lecture - Discussions
2.2	Perceive first and second fundamental forms.	- Solve problems involving first and second fundamental forms.	- Lecture - Discussions
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3.0	**Competence**		
3.1	Explains principle, mean, and Gaussian curvatures.	- Lecture - Discussions	- Oral Exam -
3.2	Apply different techniques to learn differential geometry.	- Lecture - Discussions	- Oral Exam - Rubrics
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2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises, Homework& Assignments	Open	10%
2	Oral Exam and Rubrics	14th Week	5%
3	Quizzes	Open	5%
4	Written Test(1)	7th Week	15%
5	Written Test(2)	13th Week	15%
6	Final Exam	End of Semester	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 :

- Introducing the course syllabus, grading scale and the distribution of marks for the course in the first lecture of the course.
- Arrangements for availability of teaching staff for individual student consultations and academic advice (include amount of time teaching staff are expected to be available each week).
- Office hours for a teaching staff for one hour weekly.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- Carmo M. (1977), Differential Geometry of Curves and Surfaces, Prentice Hall. - Millman R. and Parker G. (1977), Elements of Differential Geometry, Prentice Hall.
Essential References Materials	- A Pressely(2012) Elementary Differential Geometry, Undergraduate Mathematics Series, 2nd. Edition, Springer-Verlage.
Electronic Materials	- Willmore (1980), Introduction to Differential Geometry, Oxford.
Other Learning Materials	- http://en.wikipedia.org/wiki/Diffrential_geometry

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture Hall by the number of seats = 30 seat approximately.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Datashow • Smart Board • Wi Fi
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student course evaluation survey at the end of semester.	Students	Questionnaire (Indirect)
Effectiveness of teaching and assessment	Peer Reviewer	Rubrics (Indirect)
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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	
Reference No.	
Date