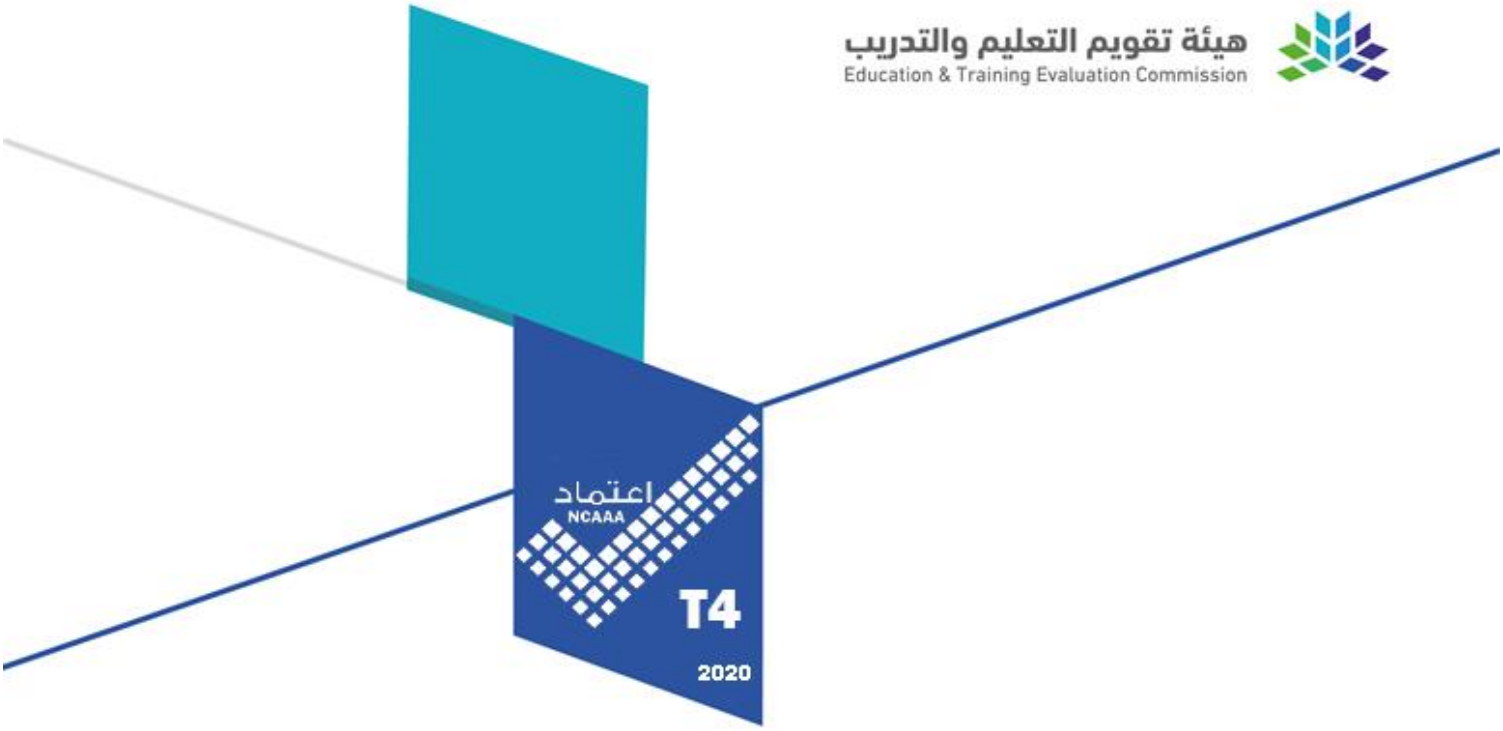
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	DIFFERENTIAL GEOMETRY
Course Code:	MATH 4390
Program:	BACHELOR OF SCIENCE IN MATHEMATICS
Department:	MATHEMATICS
College:	College of Science and Humanities Alkharj
Institution:	PRINCE SATTAM BIN ABDUALZIZ UNIVERSITY

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A. Course Identification

1. Credit hours: 04
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☐ Elective ☑
3. Level/year at which this course is offered: Level 8
4. Pre-requisites for this course (if any)**:** Math 2250, Math 3320, and Math 3330
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**	04 hrs a week	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	48
2	**Laboratory/Studio**	-
3	**Tutorial**	-
4	**Others** (specify)	60
	Total	108

B. Course Objectives and Learning Outcomes

1. Course Description

Geometry of Curves in the Plane – Arc Length – Tangential and Normal Vectors – (signed) Curvature – Reconstruction of a Curve with given Curvature and Arc Length – Evolutes and Involutes – the Isoperimetric Inequality and Hopf's Theorem on the Tangential Degree of an Embedded Closed Curve – Geometry of Curves in the Space – Arc length – Curvature – Torsion – The Frenet– Serret Equations – Reconstruction of a curve with given curvature and torsion – Generalized helices – Evolutes and involutes. Surfaces in Space: The first and second fundamental forms – Area and the Gauss and Codazzi Equations – Gaussian curvature – developable surfaces – principal curvature – Meunier's Theorem – surfaces of constant Gaussian curvature – mean curvature – minimal surfaces – Intrinsic Geometry of Surfaces – Geodesic curvature of curves on surfaces – First variation of arc length – The Gauss– Bonnet Theorem and applications.

2. Course Main Objective

- The Objective is to make the students gain awareness about the concept of Geometry of curves in space, associated theorems and proof and also to acquire skills to understand the concept of Gaussian curvature and solve certain types of equations such as Gauss Codazzi equations.
- To make the students aware of the connection between the geometry and the calculus.

Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field). Not at present

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Understand and know the scientific background about Geometry of curves in planes as well as space	K1
1.2	Gain knowledge about the geometry of Curves and surfaces in Space	K3
1.3	Describe appropriate method to find arc length, torsion etc.	K4
2	**Skills :**	
2.1	Apply the results of Isoperimetric Inequality, Hopf's and Meunier's Theorems	S1
2.2	Able to find simple applications of Hopf's and Menunier's Theorems and draw graph	S3

C. Course Content

No	List of Topics	Contact Hours
1	Review of basic concepts of Geometry of Curves – Arc Length – Tangential and Normal Vectors	4
2	Reconstruction of Curves with given curvature and arc length – Evolutes and Involutes	4
3	Isoperimetric Inequality	4
4	Introduction to Geometry of Curves in Space – Arc Length - Curvature	4
5	Torsion = Frenet –Serret Equations	4
6	Reconstruction of a curve with given curvature and torsion	4
7	Generalised helices – Evolutes and Involutes	3
8	Surface in Space – First and Second Fundamental forms	3
9	Gaussian curvature	3
10	Developable surfaces– principal curvature	3
11	Surfaces of constant Gaussian curvature – mean curvature	3
12	Minimal surfaces – Intrinsic Geometry of Surfaces – Geodesic curvature of curves on surfaces	3
13	First variation of arc length – The Gauss– Bonnet Theorem and applications.	6
Total		48

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	Understand and know the scientific background about Geometry of curves in planes as well as space	1. Class Room Lectures 2. Interactive sessions 3. Exclusive Office Hours for clearing doubts in small groups	1. Two Internal Exams 2. Atleast two Quiz 3. End Semester Exam
1.2	Gain knowledge about the geometry of Curves and surfaces in Space		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.3	Describe appropriate method to find arc length, torsion etc.		
2	**Skills :**		
2.1	Apply the results of Isoperimetric Inequality, Hopf's and Meunier's Theorems	1. Application oriented exercises during tutorial session. 2. Homework to improve the analytical skills	1. Homework 2. Assignments 3. Quiz
2.2	Able to find simple applications of Hopf's and Menunier's Theorems and draw graph		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Mid Term Exam I	**6**	**20%**
2	Quiz	**4 & 10**	**5%**
3	Mid Term Exam II	**13**	**20%**
4	Continuous Assessment – Homework, Assignment, Attendance etc.	**--**	**5%**
5	End Semester Exam (Practical 10%, Theory 40%)	**15**	**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 :

1. Exclusive Office Hours – 5 Hours per week
2. Academic Advising for Students – 1 Hour per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	-Dirk Jan Struik, "Lectures on classical differential geometry", Dover Publications. - Elementary Differential Geometry, Second Edition, Barrett O'Neill, 2006 - Schaum's outlines. "Differential Geometry", Martin M. Lipschutz, Ph. D., 1969, McGraw-Hill.
Essential References Materials	NIL
Electronic Materials	NIL
Other Learning Materials	Lecture Notes Prepared by the Department of Mathematics

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms with Smart boards with seating facilities for at least 30 students
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart board, Internet Connection for Blackboard
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NIL

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course learning outcomes,	Quality Assurance Committee	Course Evaluation
effectiveness of Classroom teaching strategies from students through interactions	Senior Faculty Members / HoD	Peer Review
Effectiveness of teaching and assessment	University	End Semester online survey

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	