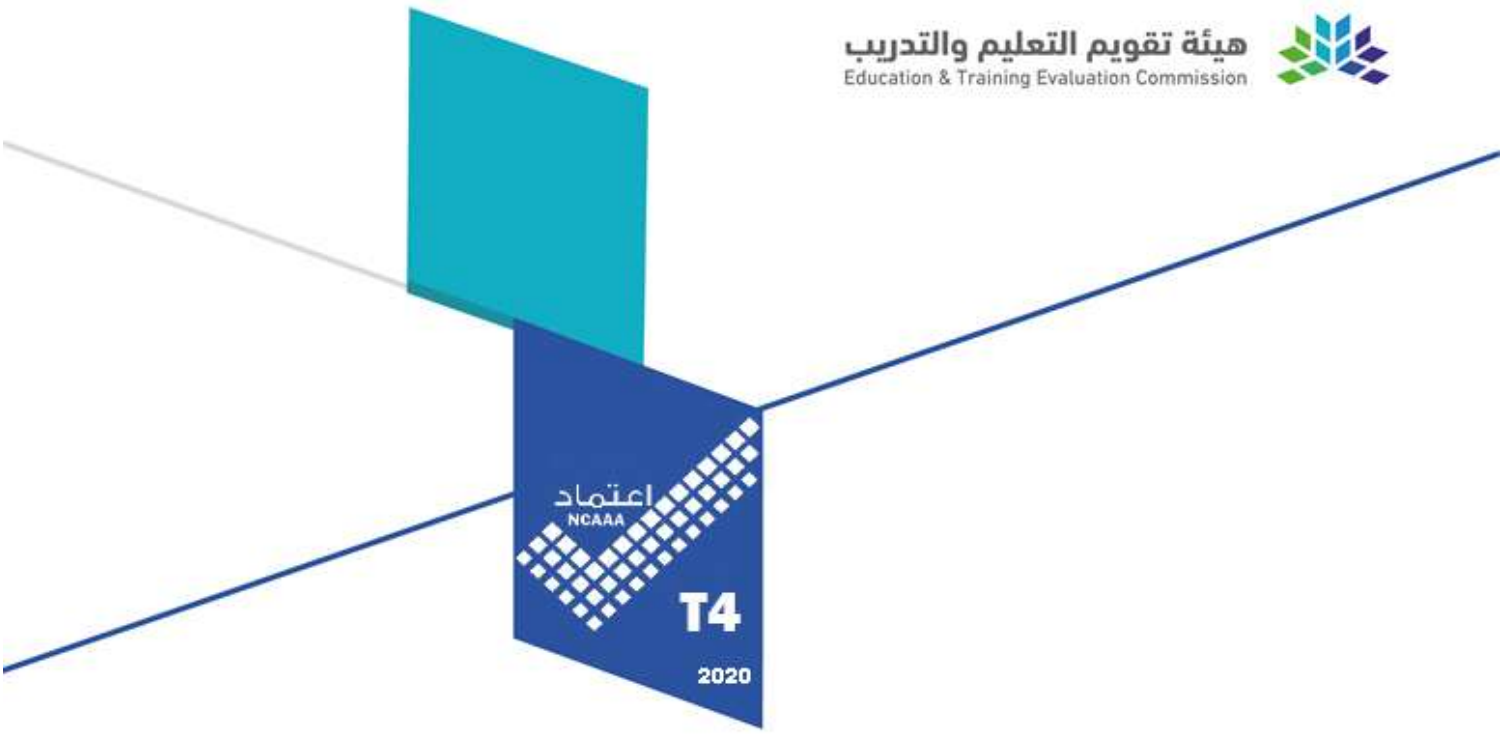
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Differential Geometry**	
Course Code:	**1104482**	
Program:	**Bachelor of Mathematics**	
Department:	**Mathematics**	
College:	**College of Science**	
Institution:	**Northern Border University**	

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☐ Department ■ Others ☐ **b.** Required ■ Elective ☐
3. Level/year at which this course is offered: The Fourth Level – The second year
4. Pre-requisites for this course (if any)**:** Vector Analysis (1104304)
5. Co-requisites for this course (if any)**:** Not applicable

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	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

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

B. Course Objectives and Learning Outcomes

1. Course Description

- Curves in the space, regular curves, arc length , natural parameterization-tangent line, normal plane, curvature-principle normal line, osculating plane, binormal line and rectifying plane.
- Theory of curves: Serret- Frenet equations, existence and uniqueness theorem of space curves, fundamental theorem, involutes and evolutes.

Local theory of surface: basic concepts, simple surface, tangent vectors and tangent space, First and second fundamental forms and its properties-principle normal, mean and Gaussian curvatures .

2. Course Main Objective

- To provide students with analytical approach of geometrical problems

- To enhance students analytical skills with geometric vision

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Master notions of the local theory of curves and surfaces	K1
1.2		
1.3		
1...		
2	**Skills :**	
2.1	Estimate the nature of a regular curves and simple surfaces	S1
2.2		
2.3	Enhance analytical skills with geometric vision	S3
2...		
3	**Values:**	
3.1	Interact with real-life problems using different mathematical methods and methods of thinking .	C1
3.2	Recognize analytically curves and surfaces	C2
3.3	Interact analytical and geometric visions	C3
3...		

C. Course Content

No	List of Topics	Contact Hours
1	General introduction of curves in the plane, parameterization, tangent and normal lines	6
2	Curves in the space, parameterization, arc length, tangent plane , normal line , curvature and torsion.	9
3	principal normal unite vector , principal line and osculating plane binomial line and rectifying plane.	3
4	Theory of curves : Serret-Frenet equations	3
5	Intrinsic equations , the fundamental existence and uniqueness	3
6	**Concept of a surface**: Regular parametric representations, coordinate patches, simple surface, tangent plane and normal line.	9
7	First fundamental forms , arc length and surface area	3
8	Second fundamental form, type of surfaces, normal curvature,	3
9	Principal curvature and directions, Gaussian curvature , Mean curvature	6
Total		

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Master notions of the local theory of curves and surfaces	Lecture Open discussion Brain storming Interactive learning Self-learning Problem solving	Written exams Check list Discussion Assignments
1.2			
…			
2.0	**Skills**		
2.1	Estimate the nature of a regular curves and simple surfaces	Problem solving Interactive learning Small group activities Self-learning Practical application	Written exams Check list Discussion Assignments
2.2	Enhance analytical skills with geometric vision	Problem solving Interactive learning Small group activities Self-learning Practical application	Written exams Check list Discussion Assignments
…			
3.0	**Values**		
3.1	Interact with real-life problems using different mathematical methods and methods of thinking .	Problem solving Interactive learning Small group activities Self-learning Practical application	Written exams Check list Discussion Assignments
3.2	Recognize analytically curves and surfaces .	Problem solving Interactive learning Small group activities Self-learning Practical application	Written exams Check list Discussion Assignments
3.3	Interact analytical and geometric visions	Problem solving Interactive learning Small group activities Self-learning Practical application	Written exams Check list Discussion Assignments

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Home works		15
2	Quizzes (written test)		10
3	Mid Exam (written test)		30
4	Participation		5
5	Final Exam (written test)		40
6	Total		100
7			
8			

***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 :

- Upon admission in the program, each student is assigned to an academic advisor how provides guidance, career advices and general counseling to help him overcoming any academic difficulties.
- The student has not less than three appointments with his academic advisor during the semester, the first is upon registration, the second is after the first mid-term exam and the last is before the final exam.
- Any teaching staff is asked to post his guidance hours; at least three hours in different days during the week.
- The academic advisor keeps a folder that contains the personal information file, the schedule, the transcripts and the study plan for each student in charge.
- The teaching staff member takes into account the needs of both low achievers' and talented students during their lectures and office hours.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- **Differential Geometry of curves and surfaces , M.Docarmo,** - **Modern Differential Geometry of curves and s Boston 1992urfaces , Gray , second edition 1998** - **Elementary Differential Geometry , B.Neil, Academic press Inc, California 1966**
Essential References Materials	**Student notebook**
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms with sufficient numbers of seats depending on the number of enrolled students.
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Printer, Photocopier, Papers A4, Desktop Computer, phone extension, whiteboard markers of different colors, a wiper for whiteboard

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Student	Indirect
	Faculty	Direct / Indirect
	Program Leaders	Indirect
Effectiveness of assessment	Student	Indirect
	Faculty	Direct
	Peer Reviewer	Direct
	Program Leaders	Direct / Indirect
Extent of achievement of course learning outcomes	Faculty	Direct
Quality of learning resources	Student	Indirect
	Faculty	Direct

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	Department of Mathematics Council	
Reference No.	The first topic in 12th meeting of the academic year 1443	
Date	24/01/2022 – 21/06/1443	