



## Course Specifications

<b>Course Title:</b>	Differential Geometry
<b>Course Code:</b>	2024204-3
<b>Program:</b>	Bachelor in Mathematics.
<b>Department:</b>	Mathematics and Statistics Department
<b>College:</b>	Faculty of sciences
<b>Institution:</b>	Taif university

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Differential Geometry-TU

## A. Course Identification

<b>1. Credit hours:</b> 3
<b>2. Course type</b>
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"/>
<b>3. Level/year at which this course is offered:</b> Level :12 / 4th year
<b>4. Pre-requisites for this course (if any):</b> 2022103-3 Geometry 2022202-4 Calculus III
<b>5. Co-requisites for this course (if any):</b> None

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	5Hr /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	50
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	<b>50</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description

This course covers basic theory on curves, and surfaces in the Euclidean three space. Topics include: regular curves, Frenet formulas, local theory of curves, global properties of curves such as isoperimetric inequality, regular surfaces, 1st and 2nd fundamental form, Gaussian curvature and mean curvature, Gauss map, special surfaces such as ruled surfaces, surfaces of revolution, minimal surfaces, intrinsic geometry: geodesic, and Gauss-Bonnet Theorem.

### 2. Course Main Objective

The student will be taught as follows:

1. Understanding the basic principles of differential geometry and its various applications.
2. Analyzing the different kinds of curves and surfaces.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding:</b>	
1.1	Recognize the notion for various curves and surfaces.	K2
1.2	Describe the laws and equations of curves and surfaces.	K2
2	<b>Skills:</b>	
2.1	Explain the simple rules of curvatures and torsion their applications.	S4
2.2	Compare between different forms of curvatures of curves and surfaces.	S4
2.3	Evaluate different forms of curvatures of curves and surfaces.	S4
3	<b>Values:</b>	
3.1	Show the responsibility for their own learning and continuing personal and professional development.	V2
3.2	Articulate ethical behaviour associated with institutional Guidelines in classroom, and in Lab.	V3

### C. Course Content

No	List of Topics	Contact Hours
1	Curves and their representations: definition of a curve, regular curves, Parametric representation of curves.	5
2	Natural representation of curves and arc length.	5
3	Definitions of tangent, curvature, torsion, normal and bi-normal.	5
4	Tangent, normal and bi-normal lines. Normal osculating and rectifying planes.	5
5	Derivation of the Basic laws of curvature, torsion and Serret-Frenet.	5
6	<b>Midterm exam,</b> Regular parametric representation of surfaces.	5
7	Definition of simple surfaces. Tangent and normal planes on surfaces.	5
8	First fundamental form and first factors on surfaces.	5
9	Second fundamental form and second factors on surfaces.	5
10	Gaussian curvature and mean curvature, Gauss map and Gauss-Bonnet Theorem.	5
<b>Total</b>		50

## 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	<b>Knowledge and Understanding:</b>		
1.1	Recognize the notion for various curves and surfaces.	<ul style="list-style-type: none"> <li>Lectures</li> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Quizzes</li> <li>Assignments</li> </ul>
1.2	Describe the laws and equations of curves and surfaces.	<ul style="list-style-type: none"> <li>Lectures</li> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Exams</li> <li>Assignments</li> </ul>
2.0	<b>Skills:</b>		
2.1	Explain the simple rules of curvatures and torsion and their applications	<ul style="list-style-type: none"> <li>Interactive classes</li> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Quizzes</li> <li>Assignments</li> </ul>
2.2	Compare between different forms of curvatures of curves and surfaces.	<ul style="list-style-type: none"> <li>Lectures</li> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Exams</li> <li>Quizzes</li> </ul>
2.3	Evaluate different forms of curvatures of curves and surfaces.	<ul style="list-style-type: none"> <li>Lectures</li> <li>Self-learning through the website</li> </ul>	<ul style="list-style-type: none"> <li>Exams</li> <li>Quizzes</li> <li>Assignments</li> </ul>
3.0	<b>Values:</b>		
3.1	Show the responsibility for their own learning and continuing personal and professional development.	Projects	<ul style="list-style-type: none"> <li>Oral exams</li> </ul>
3.2	Articulate ethical behaviour associated with institutional Guidelines in classroom, and in Lab.	<ul style="list-style-type: none"> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Assignments</li> </ul>

### 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes + Home works	Continues	10 %
2	Midterm exam	5 <sup>th</sup> -6 <sup>th</sup>	30 %
3	Class Work (Homework- report- class test....)	8 <sup>th</sup>	10 %
4	Final exam	11 <sup>th</sup>	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:

6 hours per week (as defined in the teaching schedule of the faculty member) for academic advice and consultations.

Teaching staff is also available using Blackboard web site and Taif University “Edugate” System.

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	1- <b>Tapp, Kristopher, Differential Geometry of Curves and Surfaces</b> , Springer International Publishing 20016, <b>ISBN</b> 978-3-319-81969-3, <b>ISSN</b> 0172-6056, Department of Mathematics Saint Joseph's University Philadelphia, PA, USA 2- <b>T. J. Willmore, An Introduction to Differential Geometry (Dover Books on Mathematics) Paperback – January 18, 2012, ISBN-10: 0486486184 ISBN-13: 978-0486486185</b>
<b>Essential References Materials</b>	<b>S. Kobayashi and K. Nomizu, Foundations of Differential Geometry, 1969, Inter science Publisher.</b>
<b>Electronic Materials</b>	<b>Introduction to Differential Geometry -online.</b>

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	<b>Classrooms containing white boards. The seats fit the number of students.</b>
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	<b>Data show and smart board.</b>
<b>Other Resources</b> (Specify, e.g., if specific laboratory equipment is required, list requirements or attach a list)	<b>Wi-Fi internet connections.</b>

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Indirect
Quality of learning resources	Peer Reviewer Students	Direct Indirect
Extent of achieving the course learning outcomes	Peer Reviewer Students	Direct 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

<b>Council / Committee</b>	Department of Mathematics and Statistics
<b>Reference No.</b>	11
<b>Date</b>	12-7-1443 H