جامعـة الزيتونــة الأردنيــة
Al–Zaytoonah University of Jordan
كلية العلوم وتكنولوجيا المعلومات
Faculty of Science and information Technology

" عراقة وجودة"
"Tradition and Quality"

QF01/0408-4.0E	**Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Mathematics Department**

Study plan No.	2021/2022	University Specialization	**Bachelor of Mathematics**
Course No.	**0101433**	**Course name**	**Differential Geometry**
Credit Hours	**3**	**Prerequisite/ Co-requisite**	**Calculus (3)**

Course type	☐ MANDATORY UNIVERSITY REQUIREMENT	☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT	☐ Support course family requirements	☐Mandatory requirements	✓ Elective requirements
Teaching style	☐ Full online learning		✓ Blended learning		☐Traditional learning	
Teaching model	☐ 1 Synchronous: 1 asynchronous		✓ 1 face to face : 1 asynchronous		☐2 Traditional	

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail

Division number	Time	Place	Number of students	Teaching style	Approved model

Brief description

Plane and space curves, Reparametrization by arc length, Curvature, Torsion, Frenet formulas, Osculating plane, normal plane, Rectifying plane, Bertrand curves, Surfaces in three dimensions, Smooth surfaces, The first fundamental form, length of curves on surfaces, Surface area, The Gauss map, The second fundamental form, Gauss formula, The normal and geodesic curvatures, Principal curvatures, Mean and Gauss curvatures, Geodesics and applications.

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	1) Banchoff, T. and Lovett, S. (2010), Differential Geometry of Curves and Surfaces, USA, A. K. Peters, Ltd., Taylor and Francis Group, LLC. 2) O' Neill, B. (2006), Elementary Differential Geometry, 2nd edition,USA, Elsevier Inc.
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1. Pressely, A. (2010), Elementary Differential Geometry, 2ndedition, London, Springer – Verlage,Springer Undergraduate Mathematics Series. 2. Gray, A., Abbena,E. andSalamon, S.(2006), Modern Differential Geometry of Curves and Surfaces with Mathematica, 3rd edition, USA,Chapman & Hall/CRC, Studies in Advanced Mathematics, Boca Raton. 3. Kühnel, W. (2006),Differential Geometry, Curves-Surfaces-Manifolds,2nd edition, USA, AMS.
Supporting websites	• http://en.wikipedia.org/wiki/Differential_geometry • http://ocw.mit.edu/courses/mathematics/18-950-differential-geometry-fall-2008/# • http://www.trillia.com/online-math/geometry.html • d. http://people.math.gatech.edu/~ghomi/LectureNotes/
The physical environment for	✓ Class room	☐ labs	✓ Virtual educational platform	☐ Others

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teaching				
Necessary equipment and software				
Supporting people with special needs				
For technical support				

Course learning outcomes (S= *Skills, C= Competences K= Knowledge,*)

No.	Course learning outcomes	The associated program learning output code
Knowledge		
K1	Define plane curves and space curves and their properties	MK 2
K2	Describe curvature and torsion and their geometric meanings	MK 2
K3	Characterize the different associated curves to a plane or a space curve.	MK 2
K4	Identify regular surfaces in the three dimension space	MK 1
K5	Perform the difference between the Euclidean distance and the distance on a surface, the role of the first fundamental form.	MK 2
K6	Identify the Gauss map, the second fundamental form.	MK 1
K7	Explain the Meaning of the Gauss's Theorem Egregium.	MK 1
Skills		
S1	Draw the role of the second and third fundamental form of a surface.	MS 4
S2	Construct simple surfaces such as revolution surfaces, spheres, cylinder, ellipsoid…	MS 2
S3	Illustrate, using examples, minimal surfaces and surface of constant Gauss curvature.	MS 1
S4	Use concepts of differential geometry to diverse situations in physics, engineering or other mathematical contexts	MS 2
Competences		
C1	Cooperate to work effectively in the group assignments.	MC 1
	Solve different types of the important problems of geometry in everyday life.	MC 2

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm exam	30%	**30%**	40%	30%
Participation / practical applications	0	**0**	10%	30%
Asynchronous interactive activities	30%	**20%**	0	0
Final exam	40%	**50%**	50%	40%

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style*	Reference **

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1	Plane and space curves		Lecture	25-33 Ref 1
2	Reparametrization by arc length, Curvature and Torsion, Applications.		Lecture	35-49 Ref 1
3	Frenet- Serret frame, Frenet- Serret Theorem.		Lecture	50-81 Ref 1
4	Osculating plane, Normal plane, Rectifying plane.		Lecture	81-93 Ref 1
5	Involutes, Evolutes,		Lecture	95-100 Ref 1
6	Bertrand curves, Spherical indicatrix.		Lecture	116-127 Ref 1
7	Global properties of curves, Simple closed curve.		Lecture	127-139 Ref 1
8	Isoperimetric inequality. **Midexam**		Lecture	140-144 Ref 1
9	Surfaces in three dimensions.		Lecture	60-77 Ref 2
10	Smooth surfaces. Examples of surfaces.		Lecture	77-89 Ref 2
11	The first fundamental form. Length of curves on surfaces		Lecture	100-118 Ref 2
12	Surface area. Propositions and examples.		Lecture	118-126 Ref 2
13	The second fundamental form. Gaussian formula.		Lecture	139-148 Ref 2
14	The normal and geodesic curvature, Principal curvatures.		Lecture	148-153 Ref 2
15	Mean and Gauss's curvatures.		Lecture	153-158 Ref 2
16	**Final Exam**			

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1	Background	On vector valued functions and partial derivatives Students Notes or any Calculus book	Self-reading and Discussion
2	Video 1 Solving exercises	E-learning	Discussion in the class
3	Home work1: On the subjects studied on the first three weeks	(Lecture notes and Ref.1)	Submit a pdf or word sheet
4	Quiz 1	On the subjects studied on the first three weeks	Submitting on the E-learning
5	Assignment 1: On Frenet-Serret frame	Internet sources and the other Supportive learning resources	Presentation
6	Video 2	Solving exercises	Discussion in the class
7	Home work 2 On the subjects studied in the weeks 4,5 and 6	(Lecture notes and Ref.1)	Submit a pdf or word sheet
8	Assignment 2: On Bertrand curves	Internet sources and the other Supportive learning resources	Submitted with the mid exam
9	Self-reading	Surfaces in three dimensions. (Ref.2)	Talk
10	Video3 Solving exercises	E-learning	Discussion in the class
11	Home work 3: On the subjects studied after the midexam	(Lecture notes and Ref.1)	Submit a pdf or word sheet
12	Self-reading	Surface area (Ref.2)	Talk
13	Quiz 2	On the subjects studied on the subject studied after midexam	Submitting on the E-learning
14	Presentation of the subject: The second fundamental form.	Internet sources and the reference book	Video

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15	Video 4 Revision of all the course	E-learning	
16	**Final Exam**	-	