

COURSE PROFILE

Course Name	Code	Semester	Term	Theory +PS+Lab. (hour/week)	Local Credits	ECTS
Differential Geometry	MATH 361	Fall	5	3+0+0	3	8

Prerequisites	None
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Course Language	English
Course Type	Required
Course Lecturer	<ul style="list-style-type: none"> • Prof. Dr. Uğur Dursun
Course Assistant	--
Course Objectives	The aim of this course is to introduce the fundamentals of differential geometry to the students. The focus will be on the study of the geometry of curves and surfaces in 3-dimensional Euclidean space with additional topics in the theory of abstract surfaces. The course will cover classical material that will prepare students for more advanced studies.
Course Learning Outcomes	<p>The students who succeeded in this course;</p> <ul style="list-style-type: none"> • will be able to parametrize a regular curve by its arc length parameter. • will be able to find the curvature and torsion of a space curve. • will be able to find a plane curve from a curvature function. • will be able to evaluate the differential of a differentiable map and determine a regular surface. • will be able to identify some specific surface and define a surface of revolution. • will be able to evaluate Gauss map, Gauss and mean curvatures. • will be able to determine the differential equations of geodesics of a surface.
Course Content	Space curves, Frenet formulas; surfaces in three dimensional Euclidean space, Gauss map. First and second fundamental forms, geodesics.

COURSE CONTENT

Week	Subjects	Related Preparation
1	The theory of curves: Some basic definitions, concept of regular curves and length.	Chapter 6
2	Change of parameter, spherical curves, tangent and normal lines, curvature.	Chapter 6

3	Principle normal line and osculating plane, rectifying plane, binormal line, torsion.	Chapter 6
4	Moving thrihedron and Frenet formulas. Helices, Spherical indicatrix.	Chapter 6
5	Intrinsic equations of curves, plane curves with constant curvature.	Chapter 7
6	The theory of surfaces: Some basic definitions, differentiable maps, Jacobian matrix.	Chapter 8
7	The definition of regular surface. MIDTERM EXAM	Chapter 8
8	Interpretations of the conditions of a regular surface, Graph surfaces, ellipsoid, torus.	Chapter 8
9	Surfaces of revolution, differentiable functions on surfaces, parametrized surfaces, tangent plane, normal line.	Chapter 8
10	The first fundamental forms, angle between curves on a surface, area element, Mobius band.	Chapter 8
11	Geometry of Gauss map, the self-adjointness of Gauss map. The second fundamental form, normal curvature.	Chapter 9
12	Principal curvatures, Euler's theorem, Gauss curvature and mean curvature in local coordinates.	Chapter 9
13	Differential equations of asymptotic curve and line of curvature. Gauss theorem and the equations of compatibility.	Chapter 12
14	Covariant derivative, parallel transport and geodesics.	Chapter 16

Course Textbooks	J. McCleary, Geometry from a Differentiable Viewpoint, Cambridge University Press, 1995.
Recommended References	<p>Recommended reading:</p> <ol style="list-style-type: none"> 1. A. Gray, E. Abbena and S. Salamon, Modern Differential Geometry of Curves and Surfaces with Mathematica, Chapman and Hall, 2006. 2. M.M. Lipschutz, Schaum's Outline of Differential Geometry, McGraw-Hill, 1969. 3. M.P. Do Carmo, Differential Geometry of Curves and Surfaces, Pearson, 1976.

Semester Requirements	Number	Percentage of Grade
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Attendance/Participation	14	5
Laboratory	-	-
Application	-	-
Special Course Internship (Work Placement)	-	-
Quizzes/Studio Critics	4	20
Homework Assignments	5	-
Presentation	-	-
Project	-	-
Seminar/Workshop	-	-
Midterms/Oral Exams	1	35
Final/Resit Exam	1	40
Total	26	100

PERCENTAGE OF SEMESTER WORK	25	60
PERCENTAGE OF FINAL WORK	1	40
Total	12	100

Course Category	Core Courses	X
	Major Area Courses	
	Supportive Courses	
	Media and Management Skills Courses	
	Transferable Skill Courses	

COURSE'S CONTRIBUTION TO PROGRAM

#	Program Qualifications / Outcomes	* Level of Contribution				
		1	2	3	4	5
1	To have a grasp of basic mathematics, applied mathematics and theories and applications of statistics.					X
2	To be able to use theoretical and applied knowledge acquired in the advanced fields of mathematics and statistics,					X

3	To be able to define and analyze problems and to find solutions based on scientific methods,					X
4	To be able to apply mathematics and statistics in real life with interdisciplinary approach and to discover their potentials,				X	
5	To be able to acquire necessary information and to make modeling in any field that mathematics is used and to improve herself/himself,			X		
6	To be able to criticize and renew her/his own models and solutions,			X		
7	To be able to tell theoretical and technical information easily to both experts in detail and nonexperts in basic and comprehensible way,					X
8	To be able to use international resources in English and in a second foreign language from the European Language Portfolio (at the level of B1) effectively and to keep knowledge up-to-date, to communicate comfortably with colleagues from Turkey and other countries, to follow periodic literature,				X	
9	To be familiar with computer programs used in the fields of mathematics and statistics and to be able to use at least one of them effectively at the European Computer Driving Licence Advanced Level,				X	
10	To be able to behave in accordance with social, scientific and ethical values in each step of the projects involved and to be able to introduce and apply projects in terms of civic engagement,			X		
11	To be able to evaluate all processes effectively and to have enough awareness about quality management by being conscious and having intellectual background in the universal sense,			X		
12	By having a way of abstract thinking, to be able to connect concrete events and to transfer solutions, to be able to design experiments, collect data, and analyze results by scientific methods and to interfere,					X
13	To be able to continue lifelong learning by renewing the knowledge, the abilities and the competencies which have been developed during the program, and being conscious about lifelong learning,			X		
14	To be able to adapt and transfer the knowledge gained in the areas of mathematics and statistics to the level of secondary school,				X	
15	To be able to conduct a research either as an individual or as a team member, and to be effective in each related step of the project, to take role in the decision process, to plan and manage the project by using time effectively.					

*1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Number	Duration (Hours)	Total Workload
Course Hours (Including Exams)	14	3	50
Tutorials	-	-	-
Laboratory	-	-	-
Application	-	-	-
Special Course Internship (Work Placement)	-	-	-
Field Work	-	-	-
Study Hours Out of Class	14	4	56
Presentations / Seminar	-	-	-
Project	-	-	-
Preparatory reading	13	3	39
Homework Assignments	5	4	20
Quizzes	4	3	12
Midterm Exams	1	8	8
Final / Resit Exam	1	15	15
		Total Workload	200

COURSE CATEGORY

ISCED GENERAL AREA CODES	GENERAL AREAS	ISCED BASIC AREA CODES	BASIC EDUCATIONAL AREAS	
1	Education	14	Teacher Training and Educational Sciences	0
2	Humanities and Art	21	Art	0
2	Humanities and Art	22	Humanities	0
3	Social Sciences, Management and Law	31	Social and Behavioral Sciences	0
3	Social Sciences, Management and Law	32	Journalism and Informatics	0
3	Social Sciences, Management and Law	38	Law	0

4	Science	42	Life Sciences	0
4	Science	44	Natural Sciences	0
4	Science	46	Mathematics and Statistics	100
4	Science	48	Computer	0
5	Engineering, Manufacturing and Civil	52	Engineering	0
5	Engineering, Manufacturing and Civil	54	Manufacturing and Processing	0
5	Engineering, Manufacturing and Civil	58	Architecture and Structure	0
6	Agriculture	62	Agriculture, Forestry, Livestock, Fishery	0
6	Agriculture	64	Veterinary	0
7	Medicine and Welfare	72	Medical	0
7	Medicine and Welfare	76	Social Services	0
8	Service	81	Personal Services	0
8	Service	84	Transport Services	0
8	Service	85	Environment Protection	0
8	Service	86	Security Services	0