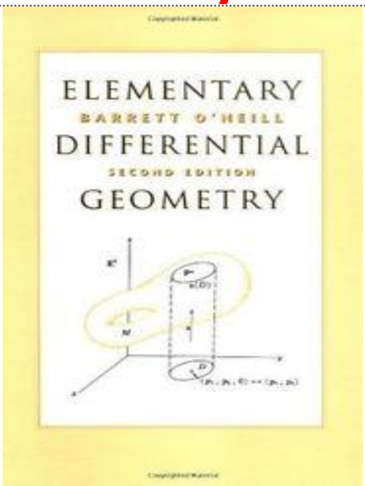
MATH 371: Differential Geometry

Course Syllabus



Course information

Instructor:	Yıldıray Ozan
Classes:	Monday 08:40-10:30, Wednesday 10:40-12:30
Office-Hours:	Tu 15:40-17:30 and also by appoiontment
Teaching Assistant:	Özgür Karabayır, Room: Z-42
Textbook	Barrett O'neill "Elementary Differential Geometry" 2nd Ed.

Course Content

Curves in 3 space: Local Theory of curves. Frenet formulas and Fundamental Theorem.Regular surfaces, definition and examples. Inverse image of regular values. Change of parameters, differentiable functions on surfaces The tangent plane; The differential of a map, vector fields, the first fundamental form. Gauss map, second fundamental form, normal curvature,principal curvature and principal directions, asymptotic directions. Gauss map in local coordinates. Covariant derivative, geodesics, Some Global Theorems including Gauss-Bonnet Theorem.

Grading

Midterm 1	30%	April 20th, Wednesday at 17:40
Midterm 2	30%	May 25th, Wednesday at 17:40
Final	40%	

Schedule

Weeks	Topics	Problems
1	1.1 Euclidean Space 1.2 Tangent Vectors 1.3 Directional Derivatives 1.4 Curves in R^3	1.1: 3,4 1.2: 3(d,e), 5(b) 1.3. 1(a),3(c,f)4,5
2	1.5 1-Forms 1.6 Differential Forms 1.7 Mappings	1.5: 1(c),3,4(b,c),6(c),7,10 1.6: 1-9 1.7: 3,4,6,7,9,10

	2.1 Dot Product	
3	2.2 Curves 2.3 The Frenet Formulas 2.4 Arbitrary Speed Curves	1.4: 4,6,7,9 2.1: 5,11,12 2.2: 3,5,6,8,10,11 2.3: 1,2,6,7,10,11
4	Planar Curves (4.7 of E. Bloch) 2.5 Covariant Derivatives 2.6 Frame Fields	2.4: 1,2,3,5,7,12,16,17,18 2.5: 1(b),2(c,d,e),3,5 2.6: 1,2(c)
5	3.1 Isometries of R^3 3.2 The Tangent Map of an Isometry 3.3 Orientation 3.4 Euclidean Geometry	3.1: 4,6,9 3.2: 3,4 3.3: 3,4,5 3.4: 1(b),2,4,5
6	3.5 Conguence of Curves + Fundamental Theorem of Curves (4.6 of E. Bloch)	3.5: 1,3,6,7
7	4.1 Surfaces in R^3 4.2 Patch Computations	4.1: 1,4,5,8,9,10,11 4.2: 1,2,3,5,7,8,9(a,b),10(b),11(c)
8	4.3 Differentiable Functions and Tangent Vectors 5.1 The Shape Operator of M in R^3 + Gauss map	4.3: 1(b),2,3,4,5,6(b),7,12 5.1: 3(c,d),4,5,7,9
9	5.2 Normal Curvature 5.3 Gaussian Curvature 5.4 Computational Techniques	5.2: 1 5.3: 1-4,7 5.4: 1-3,5,7-15
10	5.5 The Implicit Case	
11	Isometries and Theorema Egregium	6.4:1,8,9,14
12	5.6 Special Curves in Surface: Geodesics	5.6:3,17a,19
13	6.3 Some Global Theorems	6.3: 1,3
14	Gauss-Bonnet Theorem*	

Additional Sources

A First Course in Geometric Topology and Differential Geometry, Ethan D. Bloch