

# INTRODUCTION TO DIFFERENTIABLE MANIFOLDS

<b>1</b>	Course Title:	INTRODUCTION TO DIFFERENTIABLE MANIFOLDS
<b>2</b>	Course Code:	MAT4036
<b>3</b>	Type of Course:	Optional
<b>4</b>	Level of Course:	First Cycle
<b>5</b>	Year of Study:	4
<b>6</b>	Semester:	8
<b>7</b>	ECTS Credits Allocated:	6.00
<b>8</b>	Theoretical (hour/week):	3.00
<b>9</b>	Practice (hour/week):	0.00
<b>10</b>	Laboratory (hour/week):	0
<b>11</b>	Prerequisites:	There are no prerequisites.
<b>12</b>	Language:	Turkish
<b>13</b>	Mode of Delivery:	Face to face
<b>14</b>	Course Coordinator:	Doç.Dr. ESEN İYİGÜN
<b>15</b>	Course Lecturers:	Prof.Dr.Kadri Arslan Prof.Dr.Cengizhan Murathan
<b>16</b>	Contact information of the Course Coordinator:	e-posta: esen@uludag.edu.tr telefon: 0.224.2941766 adres: Uludağ Üniversitesi, Fen-Edebiyat Fakültesi, Matematik Bölümü, 16059, Görükle Kampüsü, Bursa
<b>17</b>	Website:	
<b>18</b>	Objective of the Course:	In classical analysis we are traditionally concerned with real-valued functions in the number space $R^n$ . In order to be able to define continuous function between more general sets it is necessary to give these sets a topological structure. They then become topological spaces. The idea can be taken a stage further. To define a differentiable function between two general sets we give these sets what is called a differentiable structure. They then become differentiable manifolds. This generalization of a differentiable function is the elementary starting point for some far-reaching extensions of classical mathematics, both in analysis and geometry, and it has many applications.
<b>19</b>	Contribution of the Course to Professional Development:	
<b>20</b>	Learning Outcomes:	
	<b>1</b>	Learns set, function, continuous functions, topological space concepts and some special topological space.
	<b>2</b>	Learns differentiable manifold, differentiable function and differential varieties.
	<b>3</b>	To obtain information on Grassman manifolds.
	<b>4</b>	Learns manifolds structure on a topological space and their properties.
	<b>5</b>	Understands partitions of unity, partial differentiation, tangent vector and derived linear function concept.
	<b>6</b>	Learns the inverse function theorem and their application and also Leibniz's formula.
	<b>7</b>	Learns immersions, submanifolds and submersions concepts.
	<b>8</b>	
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<b>21</b>	Course Content:		
	<b>Course Content:</b>		
Week	Theoretical	Practice	
1	Sets and functions, Continuous functions		
2	Topological spaces, Some special topological spaces		
3	Differentiable manifolds		
4	Differentiable functions		
5	The induced topology on a manifold, Differentiable varieties		
6	Grassmann manifolds		
7	Manifold structure on a topological space		
8	Midterm Exam + Repeating courses		
9	Properties of the induced topology		
10	Partitions of unity, Partial differentiation		
11	Tangent vectors, Derived linear functions		
12	The inverse function theorem, Leibniz's Formula		
13	Immersion, General properties of immersions		
14	Submanifolds, Submersions.		
<b>22</b>	Textbooks, References and/or Other Materials:	Differentiable Manifolds An Introduction, F.Brickell and R.S.Clark, Van Nostrand Reinhold Company Ltd, 1970.	
<b>23</b>	Assesment		
<b>TERM LEARNING ACTIVITIES</b>		<b>NUMBER</b>	<b>WEIGHT</b>
Midterm Exam		1	40.00
Quiz		0	0.00
Home work-project		0	0.00
Final Exam		1	60.00
Total		2	100.00
Contribution of Term (Year) Learning Activities to Success Grade		40.00	
Contribution of Final Exam to Success Grade		60.00	
Total		100.00	
Measurement and Evaluation Techniques Used in the Course			
<b>24</b>	<b>ECTS / WORK LOAD TABLE</b>		

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	3.00	42.00
Homeworks	0	0.00	0.00
Projects	14	1.00	14.00
Field Studies	0	0.00	0.00
Midterm exams	1	11.00	11.00
Others	14	4.00	56.00
Final Exams	1	15.00	15.00
Total Work Load			180.00
Total work load/ 30 hr			6.00
ECTS Credit of the Course			6.00

25	CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS															
	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ10	PQ11	PQ12	PQ13	PQ14	PQ15	PQ16
ÖK1	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK2	0	0	0	4	3	0	0	0	0	0	0	0	0	0	0	0
ÖK3	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
ÖK4	4	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0
ÖK5	0	4	0	0	3	0	0	0	0	0	0	0	0	0	0	0
ÖK6	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0
ÖK7	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
<b>LO: Learning Objectives PQ: Program Qualifications</b>																
<b>Contribution Level:</b>	<b>1 very low</b>			<b>2 low</b>			<b>3 Medium</b>			<b>4 High</b>			<b>5 Very High</b>			