

Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MATH 535	Written Exposition Skills	1	1	0	0	1	4

Prerequisites	
Admission Requirements	

Language of Instruction	Turkish
Course Type	Compulsory
Course Level	Masters Degree
Objective	Yüksek lisans tezi ve makale yazımında gerekli bilimsel metin yazma tekniklerini yaparak öğrenmek.
Content	Yazılacak bilimsel metin içeriği değişkendir ve seçim yapmak öğrencinin ilgisine bırakılmıştır.
References	Uygun şekilde atıf yapmak suretiyle tüm matematik metinleri kullanmak serbesttir.

Theory Topics

Week	Weekly Contents
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Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MATH 501		1	3	0	0	3	7

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Compulsory
Course Level	Masters Degree
Objective	Reminder of real and complex analysis in order to proceed to more advanced topics.
Content	1. Basic facts of real analysis, normed vector spaces, metric topology 2. Sequences and limits in normed vector spaces, uniform convergence 3. Cauchy sequences and Banach spaces 4. Series of vectors and functions, and their convergence properties 5. Continuity in normed vector spaces, differentiability in $\mathbb{R}^n$ 6. Gradient vector field and implicit function theorem 7. Extrema and Hessian, Taylor expansion 8. Mid-term exam 9. Integration of functions in $\mathbb{R}^2$ 10. Parametrized curves and Green Theorem 11. Parametrized surfaces and Stokes Theorem 12. Holomorphic functions and Cauchy theory 13. Laurent series, singularities and residues 14. Conformal applications
References	

Theory Topics

Week	Weekly Contents
1	Finite and infinite sets, countability.
2	Interchange of Limits, Pointwise Convergence, Uniform Convergence

Week	Weekly Contents
3	Riemann Integral
4	Metric Spaces, Open/Closed sets, Compactness, Completeness, Examples: $C(S)$ and $B(S)$
5	Riemann Integral for several variable functions, Fubini's theorem.
6	Lebesgue Outer measure. Measurable sets in $\mathbb{R}$, then in $\mathbb{R}^n$
7	Measurable Functions
8	Completion of a Measure space
9	Lebesgue Integral
10	Properties of Lebesgue Integral / Midterm
11	Comparison of Riemann and Lebesgue Integrals, Lebesgue Convergence Theorems
12	Lebesgue Integral in $\mathbb{R}^n$, Fubini's theorem for Lebesgue Integral
13	L^p spaces, Convolution
14	Jordan and Hahn Decompositions, Radon–Nikodym Theorem

Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MATH 521		1	3	0	0	3	7

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Elective
Course Level	Masters Degree
Objective	-Bu dersin amacı, diferansiyellenebilir manifoldların temel kavramlarını tanıtmak ve çok değişkenli analiz araçlarının geometrik ortamlara nasıl taşındığını öğretmektir. Öğrencilerin manifoldlar, teğet uzaylar, diferansiyel formlar ve integrasyon arasındaki ilişkileri kavramaları; Stokes teoremini kullanarak geometrik ve analitik problemleri yorumlayabilmeleri hedeflenmektedir.
Content	-Diferansiyellenebilir manifoldlar; kartlar, atlaslar ve düzgün dönüşümler; altmanifoldlar; teğet uzaylar ve teğet dönüşüm; ters fonksiyon, sabit rütbe ve düzenli değer teoremleri; submersiyonlar, immersiyonlar ve gömmeler; teğet demet ve vektör alanları; integral eğriler ve akışlar; kotanjant uzaylar ve diferansiyel formlar; dış cebir, dış türev ve çekme dönüşümü; yönelim, manifoldlar üzerinde integrasyon ve Stokes teoremi; de Rham kohomolojisi; giriş; eğriler ve yüzeyler üzerinde temel geometrik uygulamalar.
References	

Theory Topics

Week	Weekly Contents
1	Review of multivariable calculus: differentiability, inverse function theorem, and constant rank theorem.
2	Differentiable manifolds: charts, atlases, changes of coordinates, and fundamental examples.
3	Smooth maps between manifolds; submanifolds and examples defined by equations.
4	Tangent spaces: definitions using curves and derivations.
5	Tangent maps, chain rule, and the inverse function theorem on manifolds.
6	Submersions, immersions, embeddings, and the regular value theorem.
7	Tangent bundles, vector fields, integral curves, and an introduction to flows.
8	Midterm

Week	Weekly Contents
9	Cotangent spaces, differential forms, and exterior algebra.
10	Pullbacks of forms, exterior derivative, closed forms, and exact forms.
11	Orientation, manifolds with boundary, and integration of differential forms.
12	Stokes' theorem and classical applications.
13	Introduction to de Rham cohomology and elementary examples.
14	Applications to the geometry of curves and surfaces; general review.

Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MATH 536	Teaching Experience	1	2	0	0	2	5

Prerequisites	
Admission Requirements	

Language of Instruction	Turkish
Course Type	Compulsory
Course Level	Masters Degree
Objective	Matematiğin tarihi gelişimini ve felsefesini aktarabilmek.
Content	Matematik tarihi ve felsefesi üzerine bir bakış (bknz: konu başlıkları)
References	W. Dunham, Journey through Genius: The Great Theorems of Mathematics, Penguin, 1991 J. R. Brown, Philosophy of Mathematics: A Contemporary Introduction to the World of Proofs and Pictures, Routledge, 2008

Theory Topics

Week	Weekly Contents
1	1 Platonism
2	2 Picture proofs
3	What is applied mathematics?
4	4 Hilbert and Gödel
5	5 Knots and notation
6	6 What is a definition?
7	7 Constructive approach
8	8 Midterm exam
9	Proofs, pictures and procedures
10	Computation, proof and conjecture
11	How to refute the continuum hypothesis
12	Calling the bluff
13	Euler and his contributions to mathematics
14	Gauss and his contributions to mathematics

Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MATH 540		1	3	0	0	3	7

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Elective
Course Level	Masters Degree
Objective	Öğrencilerin Bilgisayar Cebir Sistemlerinin çalışma prensiplerini öğrenmesi ve matematiksel çalışmaları için bu programları etkili bir şekilde kullanabilecek hale gelmeleri.
Content	SageMath'in Yapısı SageMath'te Aritmetik SageMath kütüphanelerinde etkili bir şekilde gezinme, kaynak koda erişim SageMath'te Doğrusal (Lineer) Cebir SageMath'te Reel Analiz ve Görselleştirme SageMath'te Denklemleri Çözme GAP Aracılığıyla SageMath'te Grup Teorisi SageMath'e Yeni Özellikler Ekleme ve Bunları Belgeleme
References	Computational Mathematics with SageMath, Zimmermann et al., https://dl.lateralis.org/public/sagebook/sagebook-ba6596d.pdf Lecture Notes of MSC320 Intoduction to Symbolic Computation, Jan Verschelde, Department of Mathematics, Statistics and Computer Science, University of Illinois at Chicago, https://homepages.math.uic.edu/~jan/mcs320/mcs320notes/index.html Lecture Notes of MAT007 Introduction to computer algebra and mathematical programming, Johannes Schmitt, University of Zurich, https://johannesschmitt.gitlab.io/mat007/index.html Sage for Undergraduates, 2nd Edition, Gregory V. Bard, American Mathematical Society SageMath ile Matematik, Sinan Kapçak, Nesin Yayınevi, 2023 https://nesinkoyleri.org/wp-content/uploads/2023/06/sagemath_kitap_20230510.pdf

Theory Topics

Week	Weekly Contents
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Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MATH 504		1	3	0	0	3	7

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Compulsory
Course Level	Masters Degree
Objective	Temel cebirsel kavramların anlaşılması ve bu kavramların profesyonel matematik içerisinde kullanılabilmesi

Content	1. Gruplar : Temel tanımlar ve örnekler 2. Altgruplar, Normal altgruplar. Bölüm grupları 3. Grup etkileri ve bunun sonuçları (Cayley, Lagrange teoremleri, Sınıf Denklemi) 4. Sylow teoremleri ve sonlu bazı grupların tasnifi 5. Halkalar, tamlık bölgeleri ve cisimler : Temel tanımlar ve örnekler 6. Alt halkalar, idealler. Bölüm halkaları 7. Asal ve maksimal idealler 8. Halkalarda çarpanlara ayırma, indirgenmezlik 9. Cisimler ve cisim genişlemeleri
References	Algebra, Lang Abstract Algebra, Dummit & Foote Algebra, Hungerford

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