Course History

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The following is the title, term, instructor, grade received, text used, and content summary of the advanced mathematics courses I have taken or will take before May of 2014. Any course taken as an undergraduate below the 400-level is omitted (with one 300-level exception), as these courses are considered standard among math majors. The courses are given in chronological order of being taken.

Malone University–Canton, Ohio

Math 432: Algebraic Structures (more commonly known as Abstract Algebra I)–Fall 2007
- Instructor: Dr. David Hahn
- Grade Received: A
- Text Used: *A First Course in Abstract Algebra* by John Fraleigh, 7th edition
- Content Summary: This course was a standard introduction to Abstract Algebra. In this course, we covered group theory, including definitions and examples, cyclic groups, subgroups, permutations and orbits, symmetric and alternating groups, group homomorphisms, normal subgroups, factor groups, and the First Isomorphism Theorem. We also covered ring and field theory, including definitions and examples, integral domains, fields, ideals (including prime and maximal ideals), ring homomorphisms, factor rings, and the First Isomorphism Theorem for rings.

Math 422: Mathematical Modeling–Spring 2008
- Instructor: Dr. Eddy Patuwo (guest lecturer from Kent State University)
- Grade Received: A
- Text Used: *A First Course in Mathematical Modeling* by Frank Giordano, Maurice Weir, and William Fox, 3rd edition
- Content Summary: In this course, we covered basic methods of mathematical modeling. We also covered probability theory, random walks and Markov processes, and linear programming.

Math 341: Modern Geometry–Fall 2008
- Instructor: Dr. John Williams
- Grade Received: A
- Text Used: *Euclidean and Non-Euclidean Geometries: Development and History* by Marvin Greenberg, 3rd edition
• Content Summary: In this course, we studied Euclidean geometry from an axiomatic approach. Much focus was given to Euclid’s parallel postulate. In the latter half of the course, we studied hyperbolic geometry.

Math 450: Advanced Topics–Spring 2009

• Instructor: Dr. David Hahn
• Grade Received: A
• Text Used: *An Introduction to Gröbner Bases* by William Adams and Philippe Loustaunau
• Content Summary: This course was an introduction to Algebraic Geometry. We worked through the first chapter of a graduate-level textbook and studied Buchberger’s algorithm for transforming a given generating set of a polynomial ideal into a Gröbner basis with respect to a monomial order.

Math 460: Mathematics Seminar–Fall 2009

• Instructor: Dr. Kyle Calderhead
• Grade Received: A-
• Text Used: None
• Content Summary: This course was a capstone for mathematics majors. I completed a project on the Merkle-Hellman knapsack cryptosystem.

Math 435: Real Analysis–Spring 2010

• Instructor: Dr. David Hahn
• Grade Received: A
• Text Used: *Elementary Real and Complex Analysis* by Georgi Shilov
• Content Summary: This was an introduction to concepts used in Advanced Calculus and Real Analysis. Topics included axioms of the real number system, properties of sequences and sets, and abstract metric spaces.
University of Akron–Akron, Ohio

Math 515: Combinatorics and Graph Theory–Fall 2011
- Instructor: Dr. Stefan Forcey
- Grade Received: A
- Content Summary: This was an introductory course in enumerative combinatorics, including topics such as permutations, combinations, the Catalan numbers, binomial coefficients, and generating functions. We also covered topics in graph theory, including colorings, connectivity, adjacency matrices, trees, Eulerian trails, and Hamiltonian paths and cycles. I also completed a project on amenable groups and their corresponding Cayley graphs as part of the requirements for this course.

Math 521, 522: Advanced Calculus I and II–Fall 2011 and Spring 2012
- Instructor: Dr. J. Patrick Wilber
- Grades Received: A, A
- Text Used: *Elementary Analysis: The Theory of Calculus* by Kenneth Ross
- Content Summary: This sequence of courses gave a solid foundation in analysis on the real line $\mathbb{R}$. Topics included an axiom system for the real line, sequences, lim sup and lim inf, limit theorems, continuous and uniformly continuous functions, convergence and uniform convergence, series and convergence tests, differentiation, the Mean Value Theorem, Taylor's theorem, the Riemann integral, and the Fundamental Theorem of Calculus.

Statistics 550: Probability–Fall 2011
- Instructor: Dr. David Stark
- Grade Received: A
- Text Used: *Introduction to Probability and Its Applications* by Richard Scheaffer and Linda Young, 3rd edition
- Content Summary: This was an introductory course for higher-level probability. Topics included basic combinatorics and probability, discrete and continuous random variables, probability distribution functions, cumulative distribution functions, functions of random variables, and the Central Limit Theorem.

Math 510: Advanced Linear Algebra–Spring 2012
- Instructor: Dr. Jeffrey Riedl
- Grade Received: A
- Content Summary: This course covered vector spaces, basis and dimension, linear transformations, dimension theorems, matrix theory, diagonalization, inner product spaces, and the Jordan canonical form.

- Instructor: Dr. James Cossey
- Grade Received: A
- Content Summary: This course was a sequel to Algebraic Structures taken at Malone. Topics included homomorphisms, direct products, the Fundamental Theorem of Finite Abelian Groups, Sylow theory, vector spaces, field extensions, geometric constructibility, and Galois theory.

Math 636: Advanced Combinatorics and Graph Theory–Spring 2012

- Instructor: Dr. Stefan Forcey
- Grade Received: A
- Content Summary: This was a survey course in many topics, primarily in combinatorics. Topics included posets and lattices, sequences of sets of objects where the cardinalities of the sets are counted by the Catalan numbers, categories and functors, species, and convex polytopes.

Math 513: Theory of Numbers–Fall 2012

- Instructor: Dr. Hung Nguyen
- Grade: A
- Content Summary: In this course, we covered properties of the integers, divisibility and prime numbers, the Fundamental Theorem of Arithmetic, congruences, the Chinese Remainder Theorem, Wilson’s Theorem, Fermat’s Little Theorem, Euler’s Theorem, multiplicative functions, primitive roots, and arithmetic indices.

Math 525: Complex Variables–Fall 2012

- Instructor: Dr. Peter Gordon
- Grade: A
- Content Summary: This course was an introductory course in complex analysis, taking many concepts from advanced calculus and applying them to the complex plane \( \mathbb{C} \). Topics included complex functions, differentiable and analytic functions, Cauchy-Riemann equations, sequences and series, geometric series and convergence theorems, trigonometric and hyperbolic functions, complex integration, Taylor and Laurent Series, and residue theory.
Math 621: Real Analysis–Fall 2012
• Instructor: Dr. Truyen Nguyen
• Grade: A
• Text Used: Measure and Integral: An Introduction to Real Analysis by Richard Wheeden and Antoni Zygmund
• Content Summary: This was an introduction to graduate real analysis. Topic include set theory, sequences of sets, the Heine-Borel Theorem, Lebesgue outer measure, Lebesgue measurable sets, Lipschitz transformations on $\mathbb{R}^n$, Lebesgue measurable functions, Egorov’s theorem and Lusin’s theorem, the Lebesgue integral, and integration theory, including the Monotone Convergence Theorem, the Uniform Convergence Theorem, Fatou’s Lemma, and Lebesgue’s Dominated Convergence Theorem.

Math 545: Introduction to Topology–Spring 2013
• Instructor: Dr. Curtis Clemons
• Grade: A
• Text Used: Topology by Sheldon Davis
• Content Summary: This was an introduction to Point Set Topology. Topics included sets, functions, metric spaces, continuity, topological spaces, bases, product topologies, separation axioms, Urysohn’s Lemma and Urysohn’s Metrization Theorem, the Tietze Extension Theorem, compact and locally compact spaces, connected spaces, the Alexandroff one-point compactification, and continua.

Math 611: Topics in Algebra–Spring 2013
• Instructor: Dr. Jeffrey Riedl
• Grade: A
• Text Used: Character Theory of Finite Groups by I.M. Isaacs and Algebra: A Graduate Course by I.M. Isaacs
• This course was a one-on-one seminar with the instructor, intended to fill in gaps from character theory, as well as help me prepare for the algebra comprehensive exam to be taken at another university.

Math 636: Advanced Combinatorics and Graph Theory–Spring 2013
• Instructor: Dr. James Cossey
• Grade: A
• Text Used: None
• Content Summary: The math department allows students to take this course multiple times for credit, as different topics are covered by different instructors. This course covered a different approach to Catalan numbers than given in the Spring 2012 semester. Other topics included network flows, counting arguments using the Cauchy-Frobenius lemma, and an introduction to representation theory.
Ohio University–Athens, Ohio

Math 6301: Analysis I–Fall 2013
- Instructor: Dr. Archil Gulisashvili
- Grade: A
- Text Used: *Real Analysis* by Halsey Royden and Patrick Fitzpatrick, 4th edition
- Content Summary: This course is similar to the Real Analysis course taken at the University of Akron. Topics include sets, functions, continuity, σ-algebras, Borel sets, the Carathéodory construction for measurable sets, properties of measurable sets, measurable functions, Egorov’s Theorem, simple approximation, Lusin’s Theorem, and the Lebesgue integral.

Math 6310: Complex Analysis–Fall 2013
- Instructor: Dr. Quoc Vu
- Grade: A
- Content Summary: This is a graduate-level complex analysis course. Topics include the topology of the complex plane, complex differentiation, complex integration, Cauchy’s Integral Theorem, Cauchy’s Integral Formula, Taylor’s Theorem, singularities, residue theory, applications of residue theory to integration, conformal mappings, Möbius Transformations, Schwarz-Christoffel Transformations, and Laplace’s equation.

Math 6700: Point Set Topology–Fall 2013
- Instructor: Dr. Vladimir Uspenskiy
- Grade: A
- Text Used: *General Topology* by Ryszard Engelking, Revised Edition
- Content Summary: This is a graduate-level course in general topology. Topics include metric spaces, open and closed sets, homeomorphisms, subspaces, bases, special topological spaces, separations axioms, compactness and completeness, p-adic numbers and the Cantor set, networks, quotient spaces, the Baire Category Theorem, Čech-complete spaces, product topologies, the Arzela-Ascoli Theorem, Tychonov spaces and metrization theorems, retractions, ordinals, Zorn’s Lemma and applications to other areas of mathematics, the Tychonov theorem, Stone-Čech compactification, the Alexandroff one-point compactification, and other topics.

Math 7200: Advanced Topics in Algebra–Fall 2013
- Instructor: Dr. Alexei Davydov
- Grade: A
- Texts Used: *Linear Representations of Finite Groups* by Jean-Pierre Serre and *Categories for the Working Mathematician* by Saunders MacLane
• Content Summary: This course covers topics generally not covered in a standard graduate algebra course, and will be continued into the Spring 2014 semester. Topics include tensor products of vector spaces, monoidal categories, braided monoidal categories, commutative algebras, Lagrangian algebras, orthogonal groups, categories and functors, cohomology of groups, and other topics.

Note: The following is a list of courses I currently plan to take in the Spring 2014 semester at Ohio University.

Math 5330: Hilbert Spaces and Applications–Spring 2014

• Instructor: Dr. Quoc Vu
• Grade: TBD
• Text Used: Introduction to Hilbert Spaces with Applications by Lokenath Debnath and Piotr Mikusiński, 3rd edition
• Content Summary: From the Ohio University math department webpage, topics will include vector spaces, linear independence, basis and dimension, normed spaces, linear spaces, inner products, Hilbert spaces, orthogonal and orthonormal systems, strong and weak convergence, trigonometric Fourier series, orthogonal complements and projections, linear functional and the Riesz representation theorem, separable spaces, examples of operators, the adjoint of an operator and self-adjoint operators, invertible, normal, isometric and unitary operators, positive and projection operators, compact operators, eigenvalues and eigenvectors, spectral decomposition, Fourier transform, unbounded operators, and applications to differential and integral equations.

Math 6302: Analysis II–Spring 2014

• Instructor: Dr. Archil Gulisashvili
• Grade: TBD
• Text Used: Real Analysis by Halsey Royden and Patrick Fitzpatrick
• Content Summary: This is a continuation of Analysis I. From the Ohio University math department webpage, topics will include the Carathéodory Extension Theorem, integration with respect to abstract measures, the Radon-Nykodym Theorem and the Hahn and Lebesgue decomposition of measures, product measures, Fubini-Tonelli, and applications to $L^p(\mathbb{R}^n)$, normed linear spaces and linear operators in the context of $L^p$ spaces, and Fourier series and the Fourier Transform.

Math 6710: Algebraic Topology–Spring 2014

• Instructor: Dr. Vladimir Uspenskiy
• Grade: TBD
• Text Used: Topology from the Differential Viewpoint by John Milnor, Algebraic Topology by Allen Hatcher, and Algebraic Topology: A First Course by William Fulton
• Content Summary: From the Ohio University math department webpage, topics will include the fundamental group, homology of complexes, singular homology and cohomology, polyhedra and CW-complexes, simplicial complexes, homology and homotopy of groups of spheres, higher homotopy groups, Euclidean spaces (Jordan theorem, Brouwer fixed point theorem, topological invariance of open sets), manifolds and Poincare duality, and characteristic classes of vector bundles.
Math 7200: Advanced Topics in Algebra–Spring 2014

• Instructor: Dr. Alexei Davydov
• Grade: TBD
• Text Used: TBD
• Content Summary: This will be a continuation of Advanced Topics in Algebra from the Fall 2013 semester.