A list of courses taken during the master program and in advance: 2003 - present

FALL 2005

- MATH 6398: DOCTORAL RESEARCH

Advisor: Dr. Vern Paulsen
Subject: Operator Theory ***** Working in progress *****

- MATH 6395: C* ALGEBRA

Instructor: Dr. David Blecher
Textbook: A COURSE IN OPERATOR THEORY, J. B. Conway, Springer-Verlag.
Description: This is a one semester course containing some beautiful, and more advanced, topics in functional analysis and operator theory. These topics are very algebraic in nature, indeed often the most inspiring feature is the way in which the algebra, analysis, and topology, all fit and work together. We begin by quickly discussing Banach algebras, spectral theory, and operator theory (complete notes will be provided so that we can get through this fast). Then we develop the theory of C*-algebras, von Neumann algebras, and related spaces such as C*-modules. Finally we discuss some connections and applications to other subjects. It would be best for the student to have taken the basics of functional analysis, although it would be possible to read up these basics as we proceed.

- MATH 6342: TOPOLOGY/GEOMETRY (retaken)

Instructor: Dr. Andrew Torok
Textbook: J. R. Munkres, TOPOLOGY, A FIRST COURSE, Publisher: Prentice Hall
Description: An axiomatic development of point set topology: connectivity, compactness, separability, metrizability, function spaces.

SUMMER 2005

- MATH 6298 + MATH 6498: SPECIAL PROBLEMS

Insructor: Dr. Vern Paulsen
Textbook: BANACH ALGEBRA TECHNIQUES IN OPERATOR THEORY,Douglas
Description: First three chaptered covered, worked with selected problems.

SPRING 2005

- MATH 6303: MODERN ALGEBRA II

Instructor: Dr. Jutta Hausen
Textbook: A FIRST GRADUATE COURSE IN ABSTRACT ALGEBRA,
W. J. Wickless, Marcel Dekker, Inc. New York, 2004. ISBN: 0824756274.
Description: This is the second part of a two-semester course on Abstract Algebra. The

first part covered most of the first three chapters (Groups, Rings, and Modules) including some results on infinite dimensional Vector Spaces. Chapters five and six (Fields and Galois Theory, Topics in Noncommutative Rings) will be the subject of the spring semester. Additional topics as time permits. Homework will be an integral part of the course.

- MATH 6346: TOPOLOGICAL GROUPS

Instructor: Dr. Vern Paulsen
Textbook: SYMMETRY GROUPS AND THEIR APPLICATIONS, Willard Miller, Academic Press, Series in Pure and Applied Math, vol 50.
Description: This course will be loosely based on the above text. Lecture notes will be distributed. The course will begin with a brief introduction to some important groups. We will then introduce the concept of a group acting on a set and of group algebras. We will study the basics of group representation theory, including Schur's theorem, the theory of irreducible representations, and the characters of a group. In the second part of the course, we will introduce topological groups, Haar measures and generalize many of the results of the first semester to continuous representations.

- MATH 7315: MASTERS TUTORIAL II

Advisor: Dr. Vern Paulsen
Subject: FRAME THEORY

FALL 2004

- MATH 6302: MODERN ALGEBRA I

Instructor: Dr. Jutta Hausen
Textbook: A FIRST GRADUATE COURSE IN ABSTRACT ALGEBRA, W. J. Wickless, Marcel Dekker, Inc. New York, 2004. ISBN: 0824756274.
Description: This is a two-semester course on Abstract Algebra. It is anticipated that most of the first four chapters (Groups, Rings, Modules, (infinite dimensional-Vector Spaces) will be covered in the fall and chapters five and six (Fields and Galois Theory, Topics in Noncommutative Rings) in the spring. Homework will be an integral part of the course.

- MATH 6304: THEORY OF MATRICES

Instructor: Dr. Vern Paulsen
Textbook: MATRIX ANALYSIS, Horn and Johnson, Cambridge University Press
Description: We will present topics in linear algebra and matrix theory that have proven to be important in analysis and applied mathematics. We assume that the student is familiar with standard concepts and results from linear algebra and basic analysis. We will study canonical factorizations of matrices, including the QR, triangular and Cholesky factorizations. We will develop ways to acheive the Jordan canonical form. We will study eigenvalue perturbation

and estimation results and we will study special families of matrices such as positive definite, Hermitian, Hankel, Toeplitz. Matrix analysis is in a sense an approach to linear algebra that is willing to use concepts from analysis, such as limits, continuity and power series to get results in linear algebra.

- MATH 7320: FUNCTIONAL ANALYSIS I

Instructor: Dr. Andrew Torok
Textbook: A COURSE IN FUNCTIONAL ANALYSIS by John B. Conway. 2nd ed, New York: Springer-Verlag, c1990.
Description: We will discuss Hilbert spaces, Banach spaces and topological vector spaces, bounded linear operators, the basic principles (Hahn-Banach, Uniform boundedness, Open mapping theorem) and their consequences. We will continue with the spectral theory of compact and Fredholm operators. We intend to also discuss applications of Functional Analysis to PDE's, or other topics of interest for the students.

SUMMER 2004

- MATH 6315: MASTERS TUTORIAL I

Advisor: Dr. Vern Paulsen
Textbook: REAL ANALYSIS WITH REAL APPLICATIONS, Kenneth R. Davidson, Allan P. Donsig, Prentice-Hall Publishers.
Description: We just studied Chapter 14 and Chapter 15. Mostly, it was a study of wavelets, how they are developed as an important variation of Fourier series. We covered Haar wavelets, Multiresolution Analysis, Daubechies Wavelets, Approximations using wavelets, etc.

- MATH 6398: SPECIAL PROBLEMS

Instructor: Dr. Vern Paulsen
Textbook:
Description:

SPRING 2004

- MATH 6343: TOPOLOGY II

Instructor: Dr. David Blecher
Textbook: TOPOLOGY, A FIRST COURSE, J. R. Munkres, Second Edition, Prentice-Hall Publishers
Description: This is the second semester of a two-semester introductory graduate course in topology. This semester we will continue working through several of the main topics in general topology, and perhaps a little algebraic topology. We also will develop several examples that there was no time for in the first semester.

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Thus in the text (Munkres) we hope to cover the main results up to Chapter 9, and a few important results thereafter.

- MATH 6321: FUNCTIONS OF A REAL VARIABLE II

Instructor: Dr. Vern Paulsen
Textbook: FOUNDATIONS of MODERN ANALYSIS, by Avner Friedman, Dover.
Description: This course is a continuation of 6320, beginning where 6320 left off. We will cover a variety of topics in measure theory, some deeper theorems in analysis and an introduction to functional analysis. The subjects covered include, Lebesgue's decomposition theorem, Radon-Nikodym theorem, product measures, absolute continuity and bounded variation, and the Riesz representation theorem.

- MATH 6323: COMPLEX ANALYSIS II

Instructor: Dr. Shanyu Ji
Textbook: INTRODUCTION TO COMPLEX ANALYSIS, Juniro Noguchi, AMS (Translations of mathematical monographs, Volume 168).
Description: The course is an introduction to complex analysis. It covers the theory of holomorphic functions, residue theorem, analytic continuation, Riemann surfaces, holomorphic mappings, and the theory of meromorphic functions. This is the second semester of a two semester course.

FALL 2003

- MATH 6342: TOPOLOGY I

Instructor: Dr. David Blecher
Textbook: TOPOLOGY, A FIRST COURSE, J. R. Munkres, Second Edition, Prentice-Hall Publishers
Description: This semester we discuss a little set theory, the basic definitions of topology and basis, separation axioms, compactness, connectedness, nets, continuity, local compactness, Urysohn's lemma, Tietze, and basic constructions such as subspaces, quotients, products, the fundamental group.

- MATH 6320: FUNCTIONS OF A REAL VARIABLE I

Instructor: Dr. Vern Paulsen
Textbook: FOUNDATIONS of MODERN ANALYSIS, by Avner Friedman, Dover.
Description: This course begins with an introduction to the concept of measure, followed by a detailed examination of Lebesgue measure and integration.

- MATH 4355 : MATHEMATICAL SIGNAL REPRESENTATION

Instructor: Dr. Manos Papadakis
Textbook: A. Pinkus, S. Zafrany, Fourier Series and Integral transforms, Cambridge UP.
Description: The linear algebra of inner product spaces. Finite orthogonal and orthonormal systems, Gram-Schmidt orthogonalization, norms, convergence in the norm,

infinite orthonormal bases. Fourier Series of real valued functions, uniform and pointwise convergence of Fourier Series, Parseval's theorem and the L2-convergence of Fourier Series. The Integral Fourier transform, Riemann -Lebesgue lemma, Inverse Fourier transform, convolutions, Plancherel's theorem, Band-limited and time-limited signals (functions), filtering and its connection with Fourier inversion. An intuitive introduction to tempered distributions and the Dirac delta function. etc.

- MATH 6322: Theory of Functions of a Complex Variable (audit)

Instructor: Dr. Shanyu Ji
Textbook: INTRODUCTION TO COMPLEX ANALYSIS, Juniro Noguchi, AMS (Translations of mathematical monographs, Volume 168).
Description: This course is an introduction to complex analysis. It covers the theory of holomorphic functions, residue theorem, analytic continuation, Riemann surfaces, holomorphic mappings, and the theory of meromorphic functions.