Department of Mathematics

2011 - Fall semester

I. GRADUATE COURSE CATALOG

II. GRADUATE COURSE Fall 2011 (08/22/2011 - 12/16/2011)

SENIOR UNDERGRADUATE COURSES

Math 4310 - Section# 23081 - Biostatistics - by B. Bodmann
Math 4320 - Section# 17491 - Introduction to Stochastic Processes - by I. Timofeyev
Math 4331 - Section# 18498 - Introduction to Real Analysis - by V. Paulsen
Math 4335 - Section# 23082 - Partial Differential Equations - by M.Perepelitsa
Math 4364 - Section# 17492 - Numerical Analysis - by J. He
Math 4377 - Section# 18497 - Advanced Linear Algebra I - by G. Heier
Math 4377 - Section# 20462 - Advanced Linear Algebra I - by W. Ott
Math 4388 - Section# 23777 - History of mathematics (online) - by S. Ji
Math 4389 - Section# 19552 - Survey of Undergraduate Mathematics (Online)- by C. Peters

GRADUATE ONLINE COURSES

Math 5331 - Section# 20464 - Linear algebra with applications - by K. Kaiser
Math 5385 - Section# 18501 - Statistics - by C. Peteres
Math 5389 - Section# 20465 - Survey of Mathematics - by G. Etgen
Math 5397 - Section# 23085 - Scientific computing with Excel - by J. Morgan

GRADUATE COURSES

Math 6302 - Section# 17505 - Modern Algebra (K. Kaiser)
Math 6308 - Section# 18499 - Advanced Linear Algebra I (G. Heier)
Math 6308 - Section# 20463 - Advanced Linear Algebra I (W. Ott)
Math 6312 - Section# 18500 - Introduction to Real Analysis (V. Paulsen)
Math 6320 - Section# 17540 - Theory of Functions of a Real Variable (M. Tomforde)
Math 6322 - Section# 23086 - Theory of Functions of a Complex Variable (M. Ru)
Math 6326 - Section# 23087 - Partial Differential Equations (G. Auchmuty)
Math 6342 - Section# 17541 - Topology (D. Blecher)
Math 6360 - Section# 18469 - Applicable Analysis (R. Glowinski)
Math 6366 - Section# 17542 - Optimization and Variational Methods (R. Hoppe)
Math 6370 - Section# 17543 - Numerical Analysis (T. Pan)
Math 6382 - Section# 17544 - Probability Models and Mathematical Statistics (R. Azencott)
Math 6384 - Section# 17545 - Discrete -Time Models in Finance (E. Kao)
Math 6395 - Section# 23301 - Introduction to completely positive maps and quantum computing (V. Paulsen)
Math 6397 - Section# 23090 - Mathematics of Neuronal Network (K. Josic)

Math 6397 - Section# 23091 - Stochastic Differential Equation (A. Torok)
Math 6397 - Section# 23093 - Time series analysis (E. Kao)
Math 6397 - Section# 24486 - Numerical methods for Diffusion Equations (Y. Kuznetsov)

III. HOW TO REGISTER COURSES

1. Log in to My UH (People Soft)
2. Select "UH Self-Service"
3. Select "Enrollment"
4. Select "Enrollment: add classes" and choose the semester in which you would like to be enrolled.
5. Enter the specific section number for the class.
6. Continue to add more courses if needed and continue to finish the enrollment process.

IV. ARCHIVE OF PREVIOUS COURSES

SENIOR UNDERGRADUATE COURSES

	Math 4310 Biostatistics (Section# 23081)
Time:	TuTh 1:00PM - 2:30PM - **Room:** PGH 348
Instructor:	B. Bodmann
Prerequisites:	MATH 1432 and MATH 2311 or equivalent
Text(s):	The lectures will be as self-contained as possible. The course material follows the book: Bernard Rosner, Fundamentals of Biostatistics, 6th edition, Thomson Brooks/Cole, 2006. Due to its price, this is recommended, not mandatory. An alternative text, which covers most of the material in the course, is the book: Michael Whitlock and Dolph Schluter, The analysis of biological data, Roberts and Company, 2009

This course covers applications of statistics in biology and medicine, motivated by typical case studies. The students will learn a variety of uses, and abuses, of statistical methods. The material will be interspersed with simple programming projects, which allows the students to become familiar with R, the open-source software package used in this course.

The first part of the course is a rapid review of essentials in probability and statistics. The main part of the material focuses on typical estimation problems and hypothesis testing applied to data from medicine as well as population, molecular and physiological biology.

Topic - Approximate Time

- Probability and statistics essentials - 2 weeks
- Inferences for one sample - 2 weeks
- Summarizing and describing data - 1 week
- The two sample problem - 2 weeks
- Contingency tables - 2 weeks
- Case-control and cross-sectional studies - 2 weeks
- Introduction to non-parametric methods - 2 weeks
- Large datasets - 1 week

Description:

Topics include:
Independence, Bayes rule, sensitivity and specficity of a test, likelihood ratio; normal and chi-squared distribution, condence intervals; students t-distribution; empirical quantiles, boxplot, qauntilequantile plot; kernel density estimates, stem and leaf plots, histograms; bootstrap principle; binomial confidence intervals; group comparisons; Pearsons chi-squared test; retrospective case/control studies; multiplicity: Bonferroni adjustment for family-wise error, false-discovery rate; stratified tables; matched pairs; Poisson processes and rate estimate.

Assignments:
You will be asked to hand in approximately ten assignments, which will be due on Thursdays in the lecture. To obtain full credit for the course, graduate students will need to complete 4 additional projects on biological datasets.

Final Grade:
Final exam contributes 40%, midterm 30%, assignments 30%. Allgrades are summed and divided by the total number of points you can collect in the course. A percentage of 46% or more is D- , 54% or more is D, 62% or more is C, 70% is B-, 77% is B, 85% or more is A- , of 90% or more is A.

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Math 4320 Introduction to Stochastic Processes (Section# 17491)

Time:	TuTh 10:00AM - 11:30AM - **Room:** PGH 347
Instructor:	I. Timofeyev
Prerequisites:	Math 3338
Text(s):	"An Introduction to Stochastic Modeling" by Mark Pinsky, Samuel Karlin. Academic Press, Fourth Edition ISBN-10: 9780123814166 ISBN-13: 978-0123814166
Description:	We study the theory and applications of stochastic processes. Topics include discrete Markov chains, Poisson process, renewal phenomena, introduction to Brownian motion and stochastic calculus, and queueing theory.

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Math 4331 Introduction to Real Analysis (Section# 18498)

Time:	MoWeFr 12:00PM - 1:00PM - **Room:** AH 301
Instructor:	V. Paulsen
Prerequisites:	Math 3333
Text(s):	Maxwell Rosenlicht, Introduction to Analysis, Dover books Georgi Shilov, Elementary Real and Complex Analysis, Dover books
Description:	This is the first semester of a two semester course. In this semester we will introduce metric spaces and study basic properties of sequences and continuous functions on metric spaces. We will finish with a deeper look at differentiation and Riemann integration.

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Math 4335 Partial Differential Equations (Section# 23082)

Time:	TuTh 11:30AM - 1:00PM - **Room:** PGH 348
Instructor:	M.Perepelitsa
Prerequisites:	
Text(s):	
Description:	

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Math 4364 Numerical Analysis (Section# 17492)

Time:	TuTh 1:00PM - 2:30PM - **Room:** SR 138
Instructor:	J. He
Prerequisites:	Math 2331 (Linear Algebra), Math 3331 (Differential Equations). Ability to do computer assignments in Matlab, FORTRAN, C, or equivalent; or consent of instructor.
Text(s):	R. Burden and J. Faires, Numerical Analysis, 8th edition, Thomson, 2005.
Description:	The purpose of this one year course is to introduce modern approximation techniques; to explain how, why, and when they can be expected to work; and to provide a foundation for further study of numerical analysis and scientific computing.

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Math 4377 Advanced Linear Algebra I (Section# 18497)

Time:	MoWeFr 9:00AM - 10:00AM - **Room:** SR 140
Instructor:	G. Heier
Prerequisites:	Math 2331 and minimum 3 hours of 3000 level mathematics.
Text(s):	Linear Algebra, 4th edition, by Friedberg, Insel, and Spence, ISBN 0-13-008451-4
Description:	We will cover material up to Chapter 5.2 (diagonalizability). Topics covered include linear systems of equations, vector spaces, linear transformations, matrices, determinants, eigenvalues and eigenvectors.

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Math 4377 Advanced Linear Algebra I (Section# 20462)

Time:	TuTh 4:00PM - 5:30PM - **Room:** F 154
Instructor:	W. Ott
Prerequisites:	Math 2331 and minimum 3 hours of 3000 level mathematics.
Text(s):	Linear Algebra, 4th edition, by Friedberg, Insel, and Spence, ISBN 0-13-008451-4
Description:	We will cover material up to Chapter 5.2 (diagonalizability). Topics covered include linear systems of equations, vector spaces, linear transformations, matrices, determinants, eigenvalues and eigenvectors.

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Math 4388 History of Mathematics (Section# 23777)

Time:	Online course

Instructor: S. Ji
Prerequisites: MATH 3333 or equivalent
Text(s): Victor Katz, A History of Mathematics: An Introduction, 3rd (or 2nd Ed.), Addison-Wesley, 2009 (or 1998), and lecture notes.

Description: This course is designed to provide a college-level experience in history of mathematics. Students will understand some critical historical mathematics events, such as creation of classical Greek mathematics, and development of calculus; recognize notable mathematicians and the impact of their discoveries, such as Fermat, Descartes, Newton and Leibniz, Euler and Gauss; understand the development of certain mathematical topics, such as Pythagoras theorem, the real number theory and calculus.

Aims of the course: To help students
to understand the history of mathematics;
to attain an orientation in the history and philosophy of mathematics;
to gain an appreciation for our ancestor's effort and great contribution;
to gain an appreciation for the current state of mathematics;
to obtain inspiration for mathematical education,
and to obtain inspiration for further development of mathematics.

On-line course is taught through Blackboard Vista, visit http://www.uh.edu/webct/ for information on obtaining ID and password.

The course will be based on my notes. The textbook is used for extra reading, do homework or do project.

In each week, three chapters of my notes will be posted in Blackboard Vista. Weekly homework and reading assignment will be posted in Blackboard Vista, including projects(essays).

In each week, turn all your homework once by Saturday midnight through Blackboard Vista.

All homework, essays or exam paper, handwriting or typed, should be turned into PDF files and be submitted through Blackboard Vista. (In case you are in the campus, you could submit directly to my mailbox in the math department).

There is one final exam in multiple choice.

Grading: 30% homework, 50% projects, 20 % Final exam.

By petition, this course may count toward major or minor requirements in mathematics. For more information, please contact Dr. Peters.

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Math 4389 Survey of Undergraduate Mathematics (Section# 19552)

Time: Online course
Instructor: C. Peters
Prerequisites:
Text(s):
Description:

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GRADUATE ONLINE COURSES

Math 5331 Linear algebra with applications (Section# 20464)

Time:	Arrange (online course)
Instructor:	K. Kaiser
Prerequisites:	
Text(s):	
Description:	

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Math 5385 Statistics (Section# 18501)

Time:	Arrange (online course)
Instructor:	C. Peters
Prerequisites:	
Text(s):	
Description:	

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Math 5389 Survey of Mathematics (Section# 20465)

Time:	Arrange (online course)
Instructor:	
Prerequisites:	G. Etgen
Text(s):	
Description:	

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Math 5397 Scientific computing with Excel (Section# 23085)

Time:	Arrange (online course)
Instructor:	J. Morgan
Prerequisites:	Undergraduate linear algebra and Differential Equations
Text(s):	Numerical Methods with VBA Programming by James W. Hiestand, Published by Jones and Bartlett. Additional Reference Material: Excel for Scientists and Engineers by E. Josheph Billo, Published by Wiley.

Description:	Course Overview: This course is an introduction to scientific computing which will include numerical differentiation and integration, numerical approximation of roots of equations, power series and Fourier series approximation of functions, numerical solutions of systems of linear equations, least squares solutions and multiple regression, numerical solutions of nonlinear systems of equations, numerical optimization, and numerical solutions to differential equations and partial differential equations. All computations will be done in Excel using either direct spreadsheet functionality or via VBA programming, and consequently, the course will also include instruction associated with the use of Excel and programming in VBA. Students are expected to have access and basic familiarity with Excel, but they are not expected to know advanced spreadsheet functionality or have programming experience with VBA. Excel and VBA will be incorporated into every lesson and assignment. Online Meetings: The class will meet live online on Wednesday evenings from 6-8:00pm. Notes will be posted for students who miss online sessions, and additional videos will be posted to help with course topics. Grades: Students will be given regular homework, and they will take both a midterm exam and a comprehensive final exam.

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GRADUATE COURSES

Math 6302 Modern Algebra (Section# 17505)

Time:	TuTh 11:30AM - 1:00PM - **Room:** SR 138
Instructor:	K. Kaiser
Prerequisites:	Graduate Standing
Text(s):	Thomas W. Hungerford, Algebra, Springer Verlag (required). But I will teach the course from my own circulated classroom notes
Description:	Course Description: During the first semester we will cover the basic theory of groups, rings and fields with strong emphasis on principal ideal domains. We will also discuss the most important algebraic constructions from a universal algebraic, as well from a categorical point of view. The second semester will be mainly on modules over principal ideal domains, Sylow theory, free algebras and sums, ultraproducts. Students will receive weekly homework assignments and there will be a final.

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Math 6308 Advanced Linear Algebra I (Section# 18499)

Time:	MoWeFr 9:00AM - 10:00AM - **Room:** SR 140
Instructor:	G. Heier
Prerequisites:	Math 2331 and minimum 3 hours of 3000 level mathematics.
Text(s):	Linear Algebra, 4th edition, by Friedberg, Insel, and Spence, ISBN 0-13-008451-4
Description:	We will cover material up to Chapter 5.2 (diagonalizability). Topics covered include linear systems of equations, vector spaces, linear transformations, matrices, determinants, eigenvalues and eigenvectors.

Remark: There is a limitation for counting graduate credits for Math 6308, 6309, 6312, or 6313. For detailed information, see Masters Degree Options.

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Math 6308 Advanced Linear Algebra I (Section# 20463)

Time: TuTh 4:00PM - 5:30PM - **Room:** F 154
Instructor: W. Ott
Prerequisites: Math 2331 and minimum 3 hours of 3000 level mathematics.
Text(s): Linear Algebra, 4th edition, by Friedberg, Insel, and Spence, ISBN 0-13-008451-4
Description: We will cover material up to Chapter 5.2 (diagonalizability). Topics covered include linear systems of equations, vector spaces, linear transformations, matrices, determinants, eigenvalues and eigenvectors.
Remark: There is a limitation for counting graduate credits for Math 6308, 6309, 6312, or 6313. For detailed information, see Masters Degree Options.

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Math 6312 Introduction to Real Analysis (Section# 18500)

Time: MoWeFr 12:00PM - 1:00PM - **Room:** AH 301
Instructor: V. Paulsen
Prerequisites: Math 3333
Text(s): Maxwell Rosenlicht, Introduction to Analysis, Dover books Georgi Shilov, Elementary Real and Complex Analysis, Dover books
Description: This is the first semester of a two semester course. In this semester we will introduce metric spaces and study basic properties of sequences and continuous functions on metric spaces. We will finish with a deeper look at differentiation and Riemann integration.
Remark: There is a limitation for counting graduate credits for Math 6308, 6309, 6312, or 6313. For detailed information, see Masters Degree Options.

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Math 6320 Theory of Functions of a Real Variable (Section# 17540)

Time: MoWeFr 11:00AM - 12:00PM **Room:** PGH 347
Instructor: M. Tomforde
Prerequisites: Math 4331 and Math 4332, or a Real Analysis Course at the level of "Baby Rudin". A little knowledge of metric spaces and topology would be useful.
Text(s): "Real Analysis: Modern Techniques and Their Applications" by Gerald Folland
Description: This is the first semester of a two semester sequence. This course deals with subjects that underlie much of modern analysis, including measure and integration theory, point set topology, convergence of sequences of functions, and the basics of functional analysis. Also, a number of other topics will be developed to illustrate the uses of this core material in important areas of mathematics and to introduce students to more advanced techniques.

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Math 6322 Theory of Functions of a Complex Variable (Section# 23086)

Time: MoWe 1:00PM - 2:30PM **Room:** AH 301
Instructor: M. Ru
Prerequisites: Consent of instructor
Text(s): "Function theory of one complex variable" by Robert Everist Greene, Steven George Krantz, Third Edition
Description: This course is an introduction to complex analysis. It will cover the theory of holomorphic functions, Cauchy theorem and Cauchy integral formula, residue theorem, Holomorphic functions as Geometric Mappings, harmonic and subharmonic functions, and other topics.

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Math 6326 Partial Differential Equations (Section# 23087)

Time:	TuTh 4:00PM - 5:30PM - **Room:** PGH 348
Instructor:	G. Auchmuty
Prerequisites:	Math 6321 and Math 6361 or consent of instructor.
Text(s):	L.C. Evans, Partial Differential equations, AMS
Description:	Weak differentiation and Sobolev spaces. Fourier transforms and fundamental solutions. Harmonic functions and their properties. Second order elliptic boundary value problems, Lax-Milgram theorem and well-posedness. Variational problems, imbedding theorems and inequalities and maximum principles.

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Math 6342 Topology (Section# 17541)

Time:	MoWeFr 10:00AM - 11:00AM - **Room:** PGH 350
Instructor:	D. Blecher
Prerequisites:	Math 4331
Text(s):	Topology, A First Course, J. R. Munkres, Second Edition, (recommended, not required), or V. Runde A taste of topology, Springer Universitext (paperback, $34, recommended, not required).
Description:	This is the first semester of a two-semester introductory graduate course in topology (the second semester is largely devoted to differential geometry and I probably won't teach that). This is a central and fundamental course and one which graduate students usually enjoy very much! This semester we cover point-set topology. We begin by discussing a little set theory, the basic definitions of topology and basis, and go on to discuss separation properties, compactness, connectedness, nets, continuity, local compactness, Urysohn's lemma, local compactness, Tietze's theorem, the characterization of separable metric spaces, paracompactness, partitions of unity, and basic constructions such as subspaces, quotients, and products and the Tychonoff theorem. I will circulate my own typed notes so you will not need to buy a textbook, although I recommend the Munkres or the Runde books, and I will expect that you have access to the Munkres book somehow (probably it will be put on hold at the library). You are expected to read the classnotes carefully each week, and bring to me things you don't understand there. You are also expected to do most of the homework sets, and turn in selected homework problems for grading. You are encouraged to work with others, form study groups, and so on, however copied turned in homework will not help you assimilate the material, and will not be graded. The final grade is aproximately based on a total score of 400 points consisting of homework (100 points), a semester test (100 points), and a final exam (200 points). The instructor may change this at his discretion. We may also move the class time to a time thats more convenient for all; if the latter is possible.

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Math 6360 Applicable Analysis (part I) (Section# 18469)

Time:	TuTh 10:00AM - 11:30AM - **Room:** PGH 345
Instructor:	R. Glowinski
Prerequisites:	A good knowledge of linear algebra, optimization, differential equations, mathematics for engineers, will help, but the instructor will do his best to make the course as self contained as possible.
Text(s):	J. Hunter & B. Nachtergaele , Applied Analysis, World Scientific, Singapore, 2001.

Description:

Mathematical modeling has always been an important part of the Chemical, Mechanical and Physical Sciences. More recently, the importance of mathematical modeling has been surging in applied areas like Finance and Bio/ Medical Sciences. The main goal of this Applicable Analysis course is to introduce the students to mathematical concepts, tools and methods which have proved useful when solving problems encountered in the above applied areas.

Content:
- Metric and normed spaces
- Continuous functions
- Contraction mapping theorem
- Topological spaces
- Banach spaces
- Hilbert spaces: orthogonal projection on closed convex sets, Riesz and Lax-Milgram theorems, conjugate gradient solution of linear variational problems in Hilbert spaces.
- Fourier series
- More on Hilbert spaces: dual of an Hilbert space, adjoint operator, weak convergence
- Spectrum of bounded linear operators

In a very systematic way, we will illustrate the above notions by examples from the applied sciences.

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Math 6366 Optimization and Variational Methods (Section# 17542)

Time: MoWeFr 12:00PM - 1:00PM - **Room:** PGH 350

Instructor: R. Hoppe

Prerequisites: Calculus, Linear Algebra

Text(s): I. Ekeland and R. Temam; Convex Analysis and Variational Problems. SIAM, Philadelphia, 1999

Description: This course focuses on convex optimization in the framework of convex analysis, including duality, minmax, and Lagrangians. The course consists of two parts. In part I, we consider convex optimization in a ¯nite dimensional setting which allows an intuitive, geometrical approach. The mathematical theory will be introduced in detail and on this basis e±cient algorithmic tools will be developed and analyzed. In part II, we will be concerned with convex optimization in function space. We will provide the prerequisites from the Calculus of Variations and generalize the concepts from part I to the in¯nite dimensional setting.

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Math 6370 Numerical Analysis (Section# 17543)

Time: MoWe 4:00PM - 5:30PM - **Room:** SEC 206

Instructor: T. Pan

Prerequisites: Graduate standing or consent of instructor.
Students should have had a course in Linear Algebra (for instance Math 4377-4378) and an introductory course in Analysis (for instance Math 4331-4332).

Text(s): J. Stoer and R. Bulirsch: Introduction to Numerical Analysis, 3rd ed., Springer-Verlag, New York, 2002.

Further reference:
Numerical Mathematics, by A. Quarteroni, R. Sacco, and F. Saleri. Springer-Verlag, 2000
Numerical Analysis, by R. L. Burden & J. D. Faires, 8th edition, Thomson, 2005.

Description: We will develop and analyze numerical methods for approximating the solutions of common mathematical problems. It will focus on interpolation, numerical differentiation and integration, numerical quadrature, solving nonlinear equations, and numerical solutions of ordinary differential equations.

Note: This is the first semester of a two semester course.

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Math 6382 Probability Models and Mathematical Statistics (Section# 17544)

Time: TuTh 2:30PM - 4:00PM - **Room:** PGH 347
Instructor: R. Azencott
Prerequisites: Undergraduate course in probability.
Text(s):
Description: The main goals are to reach a good understanding of basic probability concepts, and to develop competence in problem solving. Course contents will include combinatorial analysis, joint distributions and conditional probability, independent random variables and Markov chains, major discrete and continuous distributions, modes of convergence. The course will be illustrated through examples and applications.

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Math 6384 Discrete -Time Models in Finance (Section# 17545)

Time: TuTh 5:30PM - 7:00PM - **Room:** PGH 348
Instructor: E. Kao
Prerequisites: Concurrent registration of MATH 6382, or some prior background in elementary probability.
Text(s): - Introduction to Mathematical Finance: Discrete-Time Models
By Stanley R. Pliska, Blackwell Publishers, ISBN 1-55786-945-6, 1997.

- Portfolio Optimizations, by Michael J. Best, CRC Press, 2010

Description: This course is an introduction to discrete-time models in finance. We start with single-period security markets and discuss arbitrage, risk-neutral probabilities, complete and incomplete markets. We survey consumption investment problems, mean-variance portfolio analysis, and equilibrium models. Theses ideas are then extended to multi-period settings. Valuation of options, futures, and other derivatives on equities, currencies, commodities, and fixed-income securities will be covered under discrete-time paradigms.

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Math 6395 Introduction to completely positive maps and quantum computing (Section# 23301)

Time: MoWeFr 10:00AM - 11:00AM - **Room:** AH 301
Instructor: V. Paulsen
Prerequisites: None
Text(s): Lecture notes will be distributed.
Description: Unlike classical computing, where the basic object is the bit and the operations are Boolean, in quantum computing the basic object is the qubit and the basic operations are completely positive maps on spaces of matrices. This course will begin by introducing the mathematical basics needed for this study, including including Hilbert spaces and tensor products, followed by a short course on quantum computing, including entangled states and some quantum algorithms. We will then focus on the basic theory of completely positive maps.

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Math 6397 Mathematics of Neuronal Network (Section# 23090)

Time:	TuTh 8:30AM - 10:00AM - **Room:** PGH 345
Instructor:	K. Josic
Prerequisites:	Courses in differential equations and probability theory
Text(s):	Instructor's notes
Description:	The course will give an overview of the different approaches that have been used to model networks of neurons, and the mathematical techniques used to analyze them. The course will start with a quick overview of basic neurophysiology, then discuss early network models, including that by McCulloch and Pitts. Most of the course will focus on developments in the last 30 years. This discussion will start with an overview of mean field, and neural mass models. We will then consider networks of phase oscillators and integrate-and-fire neurons, and different approaches to describe their activity. The course will have a computational component, but It will emphasize analytical approaches. There will be one class project for the course.

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Math 6397 Stochastic Differential Equation (Section# 23091)

Time:	TuTh 2:30PM - 4:00PM - **Room:** PGH 345
Instructor:	A. Torok
Prerequisites:	graduate (or advanced undergraduate) standing
Text(s):	We will begin with the notes of L. C. Evans (UC Berkeley), available on his web-page. Additional material will be handed out or placed on reserve in the library during the course.
Description:	Stochastic differential equations arise when some randomness is allowed in the coefficients of a differential equation. They have many applications, including mathematical biology, theory of partial differential equations, differential geometry and mathematical finance. This is an introduction to the theory and applications of stochastic differential equations. A knowledge of measure theory is strongly recommended but not required. We begin by reviewing measure theory, probability spaces, random variables and stochastic processes. We discuss Brownian motion and its properties, then introduce the Ito integral and relevant aspects of martingale theory. We formulate and solve stochastic differential equations, including numerical schemes. Applications will include mathematical finance (arbitrage and option pricing) and connections to PDE's.

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Math 6397 Time series analysis (Section# 23093)

Time:	TuTh 2:30PM - 4:00PM - **Room:** PGH 348
Instructor:	E. Kao
Prerequisites:	
Text(s):	1. Time Series Analysis, by James D. Hamilton, Princeton Univerisity Press, 1994. 2. Statistcal Models and Methods for Financial Markets, by Tze Leung Lai and Haiping Xing, Springer, 2008
Description:	The course covers the basic ideas in time series analysis. Topics include stationary processes, ARIMA models, nonlinear time series analysis, vector-valued models, cointegration, kalman filters, state space models, and regime-switching paradigms. Students are expected to learn the use of S-Plus in modling and data analysis. This course will be followed by a course in the spring semester entitled “Analysis of Financial and Energy Time Series” which focuses on applications and topics not covered in the fall semester.

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Math 6397 Numerical methods for diffusion equations (Section#24486)

Time:	MoWe 1:00PM - 2:30PM - **Room:** AH 104
Instructor:	Y. Kuznetsov
Prerequisites:	Undergraduate courses on Partial Differential Equations and Numerical Analysis

Text(s):	None
Description:	The Diffusion Equations are among the most common partial differential equations with numerous applications in science and engineering.In this couse,we consider the most efficient discretization methods for the diffusion equations in mixed formulation on general polygonal and polyhedral meshes.In particular,we consider the finite volume and mixed-hybrid finite element discretization methods.We provide the algorithms,stability analysis and error estimated for basic discretization methods.We investigate the matrix properties and propose efficient preconditioned iterative solvers for underlying algebraic systems.We discuss a number of application of the proposed discretization methods and algebraic solvers in physics and geosciences.