Department of Mathematics

Spring 2015

GRADUATE COURSE SPRING 2015 - (1/20/2015 - 5/15/2015)

SENIOR UNDERGRADUATE COURSES

Course	Sec #	Course Title	Course Day & Time	Rm #	Instructor
Math 4309	16971	Mathematical Biology	MWF 10:00AM-11:00AM	CBB 214	Z. Kilpatrick
Math 4315	12669	Graph Theory with Applications	MWF 10:00AM-11:00AM	C 107	S. Fajtlowicz
Math 4332	12670	Introduction to Real Analysis	TTh 10:00AM-11:30AM	MH 127	D. Blecher
Math 4335	21884	Partial Differential Equations	MWF 11:00AM-12:00PM	SEC 201	D. Onofrei
Math 4351	21885	Differential Geometry	MW 1:00PM-2:30PM	GAR 118	M. Ru
Math 4355	17698	Mathematics of Signal Representation	MWF 10:00AM-11:00AM	SEC 203	D. Labate
Math 4365	19627	Numerical Analysis	MW 4:00PM-5:30PM	AH 202	T. Pan
Math 4377	15549	Advanced Linear Algebra I	TTh 11:30AM-1:00PM	SEC 203	J. He
Math 4377	22019	Advanced Linear Algebra I (online)	Arrange (Online Course)	-	J. Morgan
Math 4378	12671	Advanced Linear Algebra II	MWF 10:00AM-11:00AM	F 154	D. Wagner
Math 4380	12672	Mathematical Introduction to Options	MWF 10:00AM-11:00AM	SEC 201	I. Timofeyev
Math 4389	12673	Survey of Undergrad Mathematics	MW 4:00PM-5:30PM	CBB 120	K. Josic

GRADUATE ONLINE COURSES

Course	Section	Course Title	Course Day & Time	Instructor
Math 5330	14457	Abstract algebra	Arrange (online course)	K. Kaiser
Math 5332	12701	Differential equations	Arrange (online course)	G. Etgen
Math 5333	19048	Analysis	Arrange (online course)	S. Ji
Math 5334	21886	Complex analysis	Arrange (online course)	S. Ji
Math 5386	16446	Regression and Linear Models	Arrange (online course)	C. Peters

GRADUATE COURSES

Course	Sec #	Course Title	Course Day & Time	Rm #	Instructor
Math 6303	12708	Modern Algebra II	TTh 2:30PM-4:00PM	F 162	K. Kaiser
Math 6308	14674	Advanced linear algebra	TTh 11:30AM-1:00PM	SEC 203	J. He
Math 6308	22020	Advanced linear algebra - Online	Arrange (online course)		J. Morgan
Math 6309	14675	Advanced linear algebra	MWF 10:00AM-11:00AM	F 154	D. Wagner
Math 6313	14673	Introduction to Real Analysis	TTh 10:00AM -11:30AM	MH 127	D. Blecher
Math 6321	12726	Theory of Functions of a Real Variable	TTh 4:00PM-5:30PM	AH 15	W. Ott
Math 6325	21887	Differential Equations	TTh 11:30AM-1:00PM	MH 127	M. Nicol
Math 6361	14677	Applicable Analysis	TTh 8:30AM - 10:00AM	C 109	Y. Gorb
Math 6367	12727	Optimization and Variational Methods	MWe 1:00PM-2:30PM	F162	R. Hoppe

Math 6371	12728	Numerical Analysis	MW 4:00PM-5:30PM	C 108	A. Quaini
Math 6378	19730	Basic Scientific Computing	MW 4:00PM-5:30PM	CBB 214	R. Sanders
Math 6383	12729	Probability Models and Mathematical Statistics	TTh 4:00PM-5:30PM	AH 202	Zhang
Math 6385	12730	Continuous-Time Models in Finance	TTh 2:30-4:00PM	F 154	E. Kao
Math 6395	21889	Complex Geometry and Analysis	MWF 11:00AM-12:00PM	AH 301	G. Heier
Math 6395	21890	Many Particle Systems	MWF 12:00PM-1:00PM	CBB 214	I. Timofeyev
Math 6395	21888	Introduction to Sobolev Spaces and Variation Analysis	TTh 1:00PM-2:30PM	AH 301	G. Auchmuty
Math 6395	25803	Mathematics of Quantum Information Theory	TTh 11:30AM-1:00PM	SW 229	V. Paulsen
Math 6397	21893	Automatic Learning and Data Mining	TTh 10:00AM-11:30AM	MH 138	R. Azencott
Math 6397	21894	Mathematics of Medical Imaging	MWF 12:00PM-1:00PM	AH 301	D. Labate
Math 6397	26022	Linear Models and Applications	TTh 1:00PM-2:30PM	CV N113	W. Fu
Math 7321	21895	Functional Analysis	MWF 11:00AM-12:00PM	CBB 214	M. Tomforde
Math 7350	12790	Geometry of Manifolds	MWF 10:00AM-11:00AM	C 108	V. Climenhaga
Math 7397	21896	Monte Carlo Methods in Finance	TTh 11:30AM-1:00PM	M120	E. Kao

--Course Details--

SENIOR UNDERGRADUATE COURSES

Math 4309 Mathematical Biology (Section# 16971)

Time:	MoWeFr 10:00AM - 11:00AM - Room: CBB 214
Instructor:	Z. Kilpatrick
Prerequisites:	Linear Algebra (MATH 2331) and Differential Equations (MATH 3321 or MATH 3331)
Text(s):	Mathematical Models in Biology by Leah Edelstein-Keshet (2005); ISBN-13:978-0898715545
Description:	This course introduces and analyzes a variety of mathematical models of biological systems at the molecular, cellular, and population levels. Applications to enzyme kinetics, population dynamics, gene expression, epidemiology, and neuroscience will all be discussed. Studying these systems will require mathematical techniques for dynamical systems, stochastic processes, pattern formation, and matrix analysis.

<< back to top >>

Math 4315 Graph Theory with Applications (Section# 12669)

Time:	MoWeFr 10:00AM - 11:00AM - Room: C 107
Instructor:	S. Fajtlowicz
Prerequisites:	
Text(s):	
Description:	

<< back to top >>

Math 4332 Introduction to Real Analysis (Section# 12670)

Time:	TuTh 10:00AM - 11:30AM - Room: MH 127
Instructor:	D. Blecher

Prerequisites:	Math 4331
Text(s):	No text is required since we will be using notes provided by instructor, however some recommended books are: Tom Apostol, Mathematical Analysis, 2nd Ed., Addison Wesley. W. Rudin, Principles of Mathematical Analysis, McGraw Hill. Kenneth A. Ross, Elementary Analysis: The Theory of Calculus, Springer-Verlag.
Description:	In this course we continue to develop the theory underlying calculus, and some other important aspects of mathematical analysis. Much emphasis will be placed on rigorous proofs and the techniques of mathematical analysis. The tests and exam will be based on the notes given in class, and on the homework. After each chapter we will schedule a problem solving workshop, based on the homework assigned for that chapter. The homework assignment for each chapter is fairly lengthy, and you should attempt all problems. However, a smaller number of problems will be deemed `central', and you are required to turn in some of these for grading. Final grade is aproximately based on a total score of 500 points consisting of homework (100 points), two semester tests (100 points each), and a final exam (200 points). The instructor may change this at his discretion. CourseOutline Chapter I: Infinite series of real numbers. Various tests for convergence. Double series. Chapter II: Sequences and series of functions. Uniform convergence. Weierstrass M-test. Connection with integration and differentiation. Power series. Taylor series. Elementary functions. Weierstrass approximation theorem. Chapter III: Fourier Series. Convergence in mean. Pointwise convergence of Fourier series. Fejers theorem. Chapter IV: Multivariable differential calculus. Differentiability. The inverse and implicit function theorems.

<< back to top >>

Math 4335 Partial Differential Equations (Section# 21884)

Time:	MoWeFr 11:00AM - 12:00PM - Room: SEC 201
Instructor:	D. Onofrei
Prerequisites:	
Text(s):	"Partial Differential Equations: An Introduction" by Walter A. Strauss
Description:	

<< back to top >>

Math 4351 Differential Geometry (Section# 21885)

Time:	MoWe 1:00PM - 2:30PM - Room: GAR 118
Instructor:	M. Ru
Prerequisites:	Math 4350
Text(s):	Instructor's lecture notes, together with the online book of Differential Geometry: A first course in curves and surfaces by Prof. Theodore Shifrin at the University of Georgia (http://www.math.uga.edu/~shifrin/ShifrinDiffGeo.pdf)
Description:	This is a continuation of the study of Differential Geometry from Math 4350. I plan to finish the rest of the chapter 3 in Prof. Theodore Shifrin's book, and cover some advanced topics.

<< back to top >>

Math 4355 Mathematics of Signal Representation (Section# 17698)

Time: MoWeFr 10:00AM - 11:00AM - Room: SEC 203

Instructor: D. Labate

Prerequisites: MATH 2331 and one of the following: MATH 3333, MATH 3334, MATH 3330, MATH 3363

Text(s): A first course in wavelets with Fourier analysis by A. Boggess and F.Narcowich, Wiley, 2nd edition 2009.

Description: This course is a self-contained introduction to a very active and exciting areaof applied mathematics which deals the representation of signals and images. Itaddresses fundamental and challenging questions like: how to efficiently androbustly store or transmit an image or a voice signal? how to remove unwantednoise and artifacts from data? how to identify features of interests in asignal? Students will learn the basic theory of Fourier series and waveletswhich are omnipresent in a variety of emerging applications and technologiesincluding image and video compression, electronic surveillance, remote sensingand data transmission. Some specific applications will be discussed in thecourse.

<< back to top >>

Math 4365 Numerical Analysis II(Section# 19627)

Time: MoWe 4:00PM - 5:30PM - Room: AH 202

Instructor: T. Pan

Prerequisites:
- Math 2331 (Linear Algebra)
- Math 3321 (Engineering Mathematics)
- Ability to do computer assignments in one of FORTRAN, C, Pascal, Matlab, Maple, Mathematica, and etc..

Note: The first semester (Math 4354) is not a prerequisite.

Text(s): R. L. Burden & J. D. Faires, Numerical Analysis, 8th edition, Thomson, 2005.

Description: We will develop and analyze numerical methods for approximating the solutions of common mathematical problems. The emphasis this semester will be on the iterative methods for solving linear systems, numerical solutions of nonlinear equations, iterative methods for approximating eigenvalues, and elementary methods for ordinary differential equations with boundary conditions and partial differential equations. This is an introductory course and will be a mix of mathematics and computing.

<< back to top >>

Math 4377 Advanced Linear Algebra I (Section# 15549)

Time: TuTh 11:30AM - 1:00PM - Room: SEC 203

Instructor: J. He

Prerequisites:

Text(s):

Description:

<< back to top >>

Math 4377 Advanced Linear Algebra I (Section# 22019)

Time: Arrange (online course)

Instructor: J. Morgan

Prerequisites:

Text(s):

Description:

<< back to top >>

Math 4378 Advanced Linear Algebra II (Section# 12671)

Time: MoWeFr 10:00AM - 11:00AM - Room: F 154

Instructor: D. Wagner

Prerequisites:

Text(s):
Description:

<< back to top >>

Math 4380 Mathematical Introduction to Options (Section# 12672)

Time: MoWeFr 10:00AM - 11:00AM - Room: SEC 201
Instructor: I. Timofeyev
Prerequisites: Math 3338 (Probability) and Math 2433 (Calculus III)
Text(s): An Introduction to Financial Option Valuation: Mathematics, Stochastics and Computation" by Desmond Higham
Description: This course is an introduction to mathematical modeling of various financial instruments, such as options, futures, etc. The topics covered include: calls and puts, American and European options, expiry, strike price, drift and volatility, non-rigorous introduction to continuous-time stochastic processes including Wiener Process and Ito calculus, the Greeks, geometric Brownian motion, Black-Scholes theory, binomial model, martingales, filtration, and self financing strategy.

<< back to top >>

Math 4389 Survey of Undergraduate Mathematics (Section# 12673)

Time: MoWe 4:00PM - 5:30PM - Room: CBB 120
Instructor: K. Josic
Prerequisites:
Text(s):
Description:

<< back to top >>

GRADUATE ONLINE COURSES

Math 5330 Abstract algebra (Section# 14457)

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

<< back to top >>

Math 5332 Differential equations (Section# 12701)

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

<< back to top >>

Math 5333 Analysis (Section# 19048)

Time: Arrange (online course)
Instructor: S. Ji
Prerequisites: graduate standing
Text(s): Analysis, by Steven R. Lay, 5th edition, Prentice Hall

Description:	This course is an introduction to Analysis. It will cover limit, continuity, differentiation and integration for functions of one variable and functions of several variables, and some selected applications. More precisely, it will cover the textbook from the chapter 3 to the chapter 7 (skip the section 15 and the section 24). On-line course is taught through Blackboard Learn, visit https://accessuh.uh.edu/login.php for information on obtaining ID and password. Homework: Homework will be submitted through Blackboard Learn by pdf file. The deadline for each homework assignment can be found in Blackboard Learn. No late homework assignments accepted. Exams: There are two exams. The mid-term exam, and the comprehensive final exam. The dates are to be dertermined

<< back to top >>

Math 5334 Complex analysis (Section# 21886)

Time:	Arrange (online course)
Instructor:	S. Ji
Prerequisites:	Math 5333 or 3333, or consent of instructor
Text(s):	Instructor's lecture notes.
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, harmonic and subharmonic functions, and other topics. On-line course is taught through Blackboard Learn, visit http://www.uh.edu/webct/ for information on obtaining ID and password. The course will be based on my notes. In each week, some lecture notes will be posted in Blackboard Learn, including homework assignment. Homework will be turned in by the required date through Blackboard Learn. It must be in pdf file. There are two exams. Homework and test problems are mostly computational in nature.

<< back to top >>

Math 5386 Regression and Linear Models (Section# 16446)

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

<< back to top >>

GRADUATE COURSES

<< back to top >

Math 6303 Modern Algebra (Section# 12708)

Time:	TuTh 2:30PM - 4:00PM - Room: F 162

Instructor: K. Kaiser
Prerequisites: Graduate standing; previous exposure to senior or graduate algebra, for example Math 6302
Text(s): Thomas W. Hungerford, Algebra; My own course notes available on http://www.math.uh.edu/~klaus/
Description: Modules over Principal Ideal Domains with applications to finitely generated abelian groups and normal forms of matrices; Sylow theory, Universal algebraic constructions, like co-products, ultraproducts and ultrapowers of the real numbers.

<< back to top >>

Math 6308 Advanced Linear Algebra I (Section# 14674)

Time: TuTh 11:30AM - 1:00PM SEC 203
Instructor: J. He
Prerequisites:
Text(s):
Description:
Remark: There is a limitation for counting graduate credits for Math 6308, 6309, 6312, or 6313. For detailed information, see Masters Degree Options.

<< back to top >>

Math 6308 Advanced Linear Algebra I (Section# 22020)

Time: Arrange (online course)
Instructor: J. Morgan
Prerequisites:
Text(s):
Description:
Remark: There is a limitation for counting graduate credits for Math 6308, 6309, 6312, or 6313. For detailed information, see Masters Degree Options.

<< back to top >>

Math 6309 Advanced Linear Algebra II (Section# 14675)

Time: MoWeFr 10:00AM - 11:00AM Room: F 154
Instructor: D. Wagner
Prerequisites:
Text(s):
Description:
Remark: There is a limitation for counting graduate credits for Math 6308, 6309, 6312, or 6313. For detailed information, see Masters Degree Options.

<< back to top >>

Math 6313 Introduction to Real Analysis (Section# 14673)

Time: TuTh 10:00AM - 11:30AM MH 127
Instructor: D. Blecher
Prerequisites: Math 6312
Text(s): No text is required since we will be using notes provided by instructor, however some recommended books are: Tom Apostol, Mathematical Analysis, 2nd Ed., Addison Wesley. W. Rudin, Principles of Mathematical Analysis, McGraw Hill. Kenneth A. Ross, Elementary Analysis: The Theory of Calculus, Springer-Verlag

Description:	In this course we continue to develop the theory underlying calculus, and some other important aspects of mathematical analysis. Much emphasis will be placed on rigorous proofs and the techniques of mathematical analysis. The tests and exam will be based on the notes given in class, and on the homework. After each chapter we will schedule a problem solving workshop, based on the homework assigned for that chapter. The homework assignment for each chapter is fairly lengthy, and you should attempt all problems. However, a smaller number of problems will be deemed `central', and you are required to turn in some of these for grading. Final grade is aproximately based on a total score of 500 points consisting of homework (100 points), two semester tests (100 points each), and a final exam (200 points). The instructor may change this at his discretion. CourseOutline Chapter I: Infinite series of real numbers. Various tests for convergence. Double series. Chapter II: Sequences and series of functions. Uniform convergence. Weierstrass M-test. Connection with integration and differentiation. Power series. Taylor series. Elementary functions. Weierstrass approximation theorem. Chapter III: Fourier Series. Convergence in mean. Pointwise convergence of Fourier series. Fejers theorem. Chapter IV: Multivariable differential calculus. Differentiability. The inverse and implicit function theorems.
Remark:	There is a limitation for counting graduate credits for Math 6308, 6309, 6312, or 6313. For detailed information, see Masters Degree Options.

<< back to top >>

Math 6321 Theory of Functions of a Real Variable (Section# 12726)

Time:	TuTh 4:00PM - 5:30PM - Room: AH 15
Instructor:	W. Ott
Prerequisites:	
Text(s):	Required textbook: Real Analysis (Second Edition) by Gerald Folland Suggested reading: Analysis (Second Edition) by Lieb and Loss
Description:	Math 6321 is the second course in a two-semester sequence intended to introduce the theory and techniques of modern analysis. The core of the course covers elements of functional analysis, Radon measures, elements of harmonic analysis, the Fourier transform, distribution theory, and Sobolev spaces. Additonal topics will be drawn from potential theory, ergodic theory, and the calculus of variations.

<< back to top >>

Math 6325 Differential Equations (Section# 21887)

Time:	TuTh 11:30AM - 1:00PM Room: MH 127
Instructor:	M. Nicol
Prerequisites:	An upper level course in differential equations, preferably Math6324.

Text(s):	No texbook is required. Recommended Texts: • Mathematics Methods of Classical Mechanics, by V. I. Arnold, Springer Verlag, 2nd edition. • Classical Mechanics, by H. Goldstein, Addison Wesley, 2nd edition. These books are recommended but purchase of them is not required as lecture notes will be comprehensive.
Description:	This course is an introduction to applications of mathematics (in the guise of differential equations theory) to the natural sciences, in particular classical mechanics. Topics covered include Newtonian mechanics (energy, momentum, planetary motion), Lagrangian and Hamiltonian mechanics and Hamilton-Jacobi theory. Applications will include celestial mechanics, fluid dynamics and rigid body motion. Along the way topics such as differential forms, manifolds, Lie groups and Lie algebras, symplectic geometry, dynamical systems and ergodic theory will be naturally introduced. Assessment: There will be one midterm (worth 30 points), a final exam (50 points) as well as 2 to 4 take-home problem sheets (20 points in total).

<< back to top >>

Math 6361 Applicable Analysis (Section# 14677)

Time:	TuTh 8:30AM - 10:00AM Room: C 109
Instructor:	Y. Gorb
Prerequisites:	MATH 6360 or equivalent or consent of instructor
Text(s):	TEXTS: - Dr. Auchmuty's lecture notes on Finite Dimensional Optimization Theory - L.D. Berkowitz, Convexity and Optimization in Rn , Wiley Interscience, 2002.
Description:	This course will cover theoretical topics in finite dimensional optimization theory. An introduction to the theory of convex sets and functions, convex constrained optimization, conjugate functions and duality will be given, and linear eigenvalue problems will be studied. Both unconstrained and constrained optimization problems will be handled, and basic applications are considered.

<< back to top >>

Math 6367 Optimization and Variational Methods (Section# 12727)

Time:	MoWe 1:00PM - 2:30PM Room: F162
Instructor:	R. Hoppe
Prerequisites:	Graduate standing or consent of the instructor
Text(s):	Textbooks: None Recommended Books: - D.P. Bertsekas; Dynamic Programming and Optimal Control, Vol. I, 3rd Edition. Athena Scientific, 2005 - J.R. Birge and F.V. Louveaux; Introduction to Stochastic Programming. Springer, New York, 1997
Description:	This course gives an introduction to Dynamic Programming (DP) and to Stochastic Programming (SP). As far as DP is concerned, the course focuses on the theory and the application of control problems for linear and nonlinear continuoustime and discrete-time dynamic systems both in a deterministic and in a stochastic framework. Since DP-based control is essentially restricted to Markovian decision processes, we introduce SP as a more general framework to model path independence of the stochastic process within an optimization model. In particular, stochastic linear programming (SLP) will be addressed. Applications aim at decision problems in finance.

<< back to top >>

Math 6371 Numerical Analysis (Section# 12728)

Time:	MoWe 4:00PM-5:30PM Room: C 108
Instructor:	A. Quaini
Prerequisites:	Calculus, Linear Algebra, some knowledge of ODEs and PDEs
Text(s):	A. Quarteroni, R. Sacco, F. Saleri, Numerical Mathematics, 2nd edition, Texts in Applied Mathematics, V.37, Springer, 2010.
Description:	This is the second semester of a two semester course. The focus in this semester is on approximation theory, numerical integration and differentiation, and numerical analysis of both ordinary and partial differential equations. The course addresses polynomial and trigonometric interpolation, discrete Fourier and wavelet transforms and there applications, one-dimensional and multi-dimensional quadrature rules. The concepts of consistency, convergence, stability for the numerical solution of differential equation will be discussed. Other topics covered include multistep and Runge-Kutta methods for ODEs; finite difference and finite elements techniques for partial differential equations; and several algorithms to solve large, sparse algebraic systems.

<< back to top >>

Math 6378 Basic Scientific Computing (Section# 19730)

Time:	MoWe 4:00PM - 5:30PM Room: CBB 214
Instructor:	R. Sanders
Prerequisites:	Elementary Numerical Analysis. Knowledge of C and/or Fortran. Graduate standing or consent of instructor.
Text(s):	lecture note
Description:	Fundamental techniques in high performance scientific computation. Hardware architecture and floating point performance. Pointers and dynamic memory allocation. Data structures and storage techniques related to numerical algorithms. Parallel programming techniques. Code design. Applications to numerical algorithms for the solution of systems of equations, differential equations and optimization. Data visualization. This course also provides an introduction to computer programming issues and techniques related to large scale numerical computation.

<< back to top >>

Math 6383 Probability Models and Mathematical Statistics (Section# 12729)

Time:	TuTh 4:00PM - 5:30PM Room: AH 202
Instructor:	H. Zhang
Prerequisites:	Math 6382 or other statistics courses
Text(s):	Mathematical Statistics with Applications, 7th Edition, Wackerly, Mendenhall and Scheaffer. By Brooks/cole.
Description:	We will cover topics on estimation, sampling distributions of estimators, testing hypotheses, linear regression and estimation by least squares, analysis of variance and categorical data, non-parametric methods as well as Bayesian methods for inference. There will be two midterm exams and one final exam. The grade is calculated based on: Midterm I (25%)+Midterm II (25 %)+ Final Exam (30%) + HW (20%)

<< back to top >>

Math 6385 Continuous-Time Models in Finance (Section# 12730)

Time:	TuTh 2:30-4:00PM Room: F 154
Instructor:	E. Kao
Prerequisites:	MATH 6382 and MATH 6384, or consent of the instructor.
Text(s):	Arbitrage Theory in Continuous Time, 3rd edition, by Tomas Bjork, Oxford University Press, 2009.

Description: The course is an introduction to continuous-time models in finance. We first cover tools for pricing contingency claims. They include stochastic calculus, Brownian motion, change of measures, and martingale representation theorem. We then apply these ideas in pricing financial derivatives whose underlying assets are equities, foreign exchanges, and fixed income securities. In addition, we will study the single-factor and multi-factor HJM models, and models involving jump diffusion and mean reversion.

<< back to top >>

Math 6395 Complex Geometry and Analysis (Section# 21889)

Time: MoWeFr 11:00AM - 12:00PM - Room: AH 301
Instructor: G. Heier
Prerequisites: Math 6352 (Complex Analysis and Geometry I), or equivalent, or consent of instructor

Text(s): None required.

Recommended text:
Positivity in Algebraic Geometry I, II, by Lazarsfeld
Principles of Algebraic Geometry, by Griffiths-Harris
Diophantine Geometry--An Introduction, by Hindry-Silverman

Description: This is the second semester of a two semester introductory course in complex analysis and algebraic geometry. We will approach the matter from the point of view of line bundles, linear series and positivity. We will also discuss applications in complex differential geometry and diophantine geometry. Likely topics include: projective varieties, divisors, line bundles, linear series, positivity, curvature, vanishing theorems, classification and structure theorems based on curvature, rational and integral points.

<< back to top >>

Math 6395 Many Particle Systems (Section# 21890)

Time: MoWeFr 12:00PM - 1:00PM - Room: CBB 214
Instructor: I. Timofeyev
Prerequisites: Probability
Text(s): instructor's lecture notes

Description: In this class we will consider analytical techniques for the derivation of coarse-level description for spatially-distributed systems of interacting agents. Typically, such derivations start with a detailed specification of microscopic rules for agent interactions and a coarse descriptions for the density is derived. We will consider two types of microscopic systems - (i) lattice (cellular automata) models and (ii) agents with potential interactions. Potential applications include traffic systems, bacteria movement, swarming, etc.

<< back to top >>

Math 6395 Introduction to Sobolev Spaces and Variation Analysis (Section# 21888)

Time: TuTh 1:00PM - 2:30PM - Room: AH 301
Instructor: G. Auchmuty
Prerequisites: The prerequisite for this course is M6320-6321, knowledge of multivariable calculus and some linear operator theory on Hilbert spaces.

Text(s): There is no prescribed text for the class but the Universitext ”Functional Analysis, Sobolev Spaces and Partial Differential Equations” by Haim Brezis, Springer 2011 provides some background material and treats many related results.

Description: This course is a sequel to the graduate real analysis sequence M6320-6321. It will provide an introduction to the calculus of weak derivatives, the associated Sobolev function spaces, their properties and results that are needed for the study of variational problems and partial differential equations.

<< back to top >>

Math 6395 Mathematics of Quantum Information Theory (Section# 25803)

Time:	TuTh 11:30AM - 1:00PM - Room: SW 229
Instructor:	V. Paulsen
Prerequisites:	Math 7321 or a knowledge of Hibert spaces and matrix theory.
Text(s):	None
Description:	This will be a seminar style course. I will start with a brief introduction to quantum theory, ending with an explanation of why the model for a quantum channel is a trace preserving completely positive map. We will then study separable and entangled states, quantum error correction and quantum codes. Following this we will study some current literature on quantum information theory and each student will be required to study a paper and present the material.

<< back to top >>

Math 6397 Automatic Learning and Data Mining (Section# 21893)

Time:	TuTh 10:00AM - 11:30AM - Room: MH 138
Instructor:	R. Azencott
Prerequisites:	previous familiarity (at the undergraduate level) with random variables, probability distributions, basic statistics
Text(s):	**Text Book:** None **Reference Books** : Reading assignments will be a small set of specific chapters extracted by from the following reference texts, as well as a few published articles. - The Elements of Statistical Learning, Data Mining : Freedman, Hastie, Tibshirani - Kernel Methods in Computational Biology : B. Schölkopf, K. Tsuda, J.-P. Vert - Introduction to Support Vector Machines: N. Cristianini , J. Shawe-Taylor
Description:	Automatic Learning of unknown functional relationships Y = F(X) between an output Y and high-dimensional inputs X , involves algorithms dedicated to the intensive analysis of large "training sets" of N "examples" of inputs/outputs pairs (Xn,Yn), with n= 1…N to discover efficient "blackboxes" approximating the unknown function X->F(X). Automatic learning was first applied to emulate intelligent tasks involving complex patterns identification, in artificial vision, face recognition, sounds identification, speech understanding, handwriting recognition, texts classification and retrieval, etc. Automatic learning has now been widely extended to the analysis of high dimensional biological data sets in proteomics and genes interactions networks, as well as to smart mining of massive data sets gathered on the Internet. The course will study major machine learning algorithms derived from Positive Definite Kernels and their associated Self-Reproducing Hilbert spaces. We will study the implementation, performances, and drawbacks of Support Vector Machines classifiers, Kernel based Non Linear Clustering, Kernel based Non Linear Regression, Kernel PCA. We will explore connections between kernel based learning and Dictionary Learning as well as Artificial Neural Nets with emphasis on key conceptual features such as generalisation capacity. We will present classes of Positive Definite Kernels designed to handle the long "string descriptions" of proteins involved in genomics and proteomics. The course will focus on understanding key concepts through their mathematical formalization, as well as on computerized algorithmic implementation and intensive testing on actual data sets

<< back to top >>

Math 6397 Mathematics of Medical Imaging (Section# 21894)

Time:	MoWeFr 12:00PM - 1:00PM - Room: AH 301
Instructor:	D. Labate
Prerequisites:	Ideal prerequisites are MATH 6320-21. However the course will be so designedthat any interested student with a solid background of calculus, linear algebra(MATH 4377), and basic mathematical analysis (MATH 4331) will be able to followthe course.
Text(s):	Introduction to the Mathematics of Medical Imaging, by C. L.Epstein, Society for Industrial & Applied Mathematics; 2nd edition (September28, 2007).
Description:	At the heart of every medical imaging technology is a sophisticatedmathematical model of the measurement process and an algorithm to reconstructan image from the measured data. This course provides a firm foundation in themathematical tools used to model the measurements and derive the reconstructionalgorithms used in most imaging modalities in current use, including ComputedTomography (CT) and Magnetic Resonance Imaging (MRI). In the process, we alsocovers many important concepts and techniques from Fourier analysis, integralgeometry, sampling theory, and noise analysis.

<< back to top >>

Math 6397 Linear Models and Applications (Section# 26022)

Time:	TuTh 1:00PM - 2:30PM - Room: CV N113
Instructor:	W. Fu
Prerequisites:	Two years of Calculus, Math 6308 Advanced Linear Algebra I, Math 5386 Regression and Linear Models, and Math 6383 Probability Models and Mathematical Statistics or equivalent.
Text(s):	Required Textbook: Raymond H. Myers, Douglas C. Montgomery, G. Geoffrey Vining, Timothy J. Robinson Generalized Linear Models: with Applications in Engineering and the Sciences, 2nd ed. Wiley, 2010. ISBN: 978-0-470-45463-3. Recommended Textbooks: P. MuCullagh and J.A. Nelder: Generealized Linear Models, 2nd ed. 1999 Chapman Hall/CRC C. MuCulloch, and Searle: Generalized, Linear, and Mixed Models. 2000 Wiley. Faraway J. Linear Models with R. 2004 Chapman Hall/CRC
Description:	This course is designed for graduate students who have been exposed to basic probability and statistics and would like to learn more advanced statistical theory and techniques in modelling data. The selected topics will include basic regression models for continuous and categorical response variables, model validity checking, likelihood function and parameter estimation methods, variable selection methods, model selection, large sample theory, shrinkage models, ANOVA and some recent advances. Applications will include many examples in epidemiology, health science, medical studies, demography, economics, and social science. **Grading:** Final grades will be based on homework assignment (30%), two midterm exams (20% each), the final research project (presentation and written report,30%).

<< back to top >>

Math 7321 Functional Analysis (Section# 21895)

Time:	MoWeFr 11:00AM - 12:00PM - Room: CBB 214
Instructor:	M. Tomforde
Prerequisites:	Math 7320 or equivalent
Text(s):	None. Course notes will be provided

Description: This course is the second semester of a year long sequence introducing the methods and language of functional analysis. The second semester will involve a more technical development of the theory of linear operators on Hilbert spaces as well as the study of operator algebras and C*-algebras.

<< back to top >>

Math 7350 Geometry of Manifolds (Section# 12790)

Time:	MoWeFr 10:00AM - 11:00AM - Room: C 108
Instructor:	V. Climenhaga
Prerequisites:	Math 6342 or consent of the instructor.
Text(s):	Introduction to Smooth Manifolds, by John M. Lee (Springer, 2nd edition, 2013)
Description:	This is the second part of the two-semester topology/geometry sequence. We will study smooth manifolds and maps; tangent and cotangent vectors; vector fields and bundles; Lie groups and algebras; and differential forms. Further topics may include tensors; de Rham cohomology; distributions and foliations; Riemannian manifolds; geodesic flow.

<< back to top >>

Math 7397 Monte Carlo Methods in Finance (Section# 21896)

Time:	TuTh 11:30AM-1:00PM - Room: M120
Instructor:	E. Kao
Prerequisites:	MATH 6384 and MATH 6385, or consent of the instructor.
Text(s):	Monte Carlo Methods in Financial Engineering, by Paul Glasserman, Springer, 2004.
Description:	The course is an introduction to Monte-Carlo Methods in finance. Topics include generating of random samples and sample paths,various reduction techniques, statistical analysis of simulation experiments, quasi-Monte Carlo, sensitivity analysis, and applications of Monte-Carlo methods in valuation of financial derivatives and risk management.