

Term Information

Effective Term Spring 2022

General Information

Course Bulletin Listing/Subject Area Mathematics
Fiscal Unit/Academic Org Mathematics - D0671
College/Academic Group Arts and Sciences
Level/Career Graduate, Undergraduate
Course Number/Catalog 5636
Course Title Stochastic Calculus for Finance II
Transcript Abbreviation Stochastic Calc 2
Course Description Continuation of 5635. Feynman-Kac theorem, diffusion with drift, applications to problems in financial mathematics.
Semester Credit Hours/Units Fixed: 3

Offering Information

Length Of Course 14 Week, 12 Week, 8 Week, 7 Week, 6 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? No
Grading Basis Letter Grade
Repeatable No
Course Components Lecture
Grade Roster Component Lecture
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites A grade of C- or better in 5635; and enrollment in Math major or Actuarial Science major, or Grad standing; or permission of department.
Exclusions
Electronically Enforced Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 27.0101
Subsidy Level Doctoral Course
Intended Rank Junior, Senior, Masters, Doctoral

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Understand Feynman-Kac theorem
- Understand mathematics of diffusion with drift.
- Understand the application of stochastic calculus to problems in financial mathematics.

Content Topic List

- Feynman-Kac theorem.
- Interest rate models.
- Diffusion.
- Properties of Brownian motion.
- Cantor stairs, maximum Brownian motion with drift.
- Quadratic variation, Markov property.
- Lookback options, Asian options.
- Change of Numeraire and foreign exchange.
- Forward measure.
- Yield curve evolution models, forward LIBOR model.
- Jump-diffusion and its Ito Calculus.
- Stopping times, American options.

Sought Concurrence

No

Attachments

- Mathematics 5636.pdf: Syllabus
(Syllabus. Owner: Husen, William J)
- Mathematics 5636_update.pdf: Syllabus - updated
(Syllabus. Owner: Husen, William J)
- Curriculum_map_actsci_03102021.docx: Curriculum map - Act Sci
(Other Supporting Documentation. Owner: Husen, William J)
- Curriculum_map_math_03102021.docx: Curriculum map - Math
(Other Supporting Documentation. Owner: Husen, William J)

Comments

- Revised according to comments (additional syllabus details and curriculum maps) *(by Husen, William J on 03/30/2021 02:56 PM)*
- See NMS panel feedback sent on 2-26-20. *(by Vankeerbergen, Bernadette Chantal on 02/26/2020 11:52 AM)*

COURSE REQUEST
5636 - Status: PENDING

Last Updated: Vankeerbergen, Bernadette
Chantal
04/06/2021

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Husen, William J	02/11/2020 12:25 PM	Submitted for Approval
Approved	Husen, William J	02/11/2020 12:25 PM	Unit Approval
Approved	Haddad, Deborah Moore	02/11/2020 01:58 PM	College Approval
Revision Requested	Vankeerbergen, Bernadette Chantal	02/26/2020 11:52 AM	ASCCAO Approval
Submitted	Husen, William J	03/30/2021 02:55 PM	Submitted for Approval
Approved	Husen, William J	03/30/2021 02:56 PM	Unit Approval
Approved	Vankeerbergen, Bernadette Chantal	04/06/2021 01:48 PM	College Approval
Pending Approval	Jenkins, Mary Ellen Bigler Hanlin, Deborah Kay Oldroyd, Shelby Quinn Hilty, Michael Vankeerbergen, Bernadette Chantal	04/06/2021 01:48 PM	ASCCAO Approval

Mathematics 5636

Stochastic Calculus for Finance II

Format: Lecture

Credit Hours: 3 (3 contact hours per week)

Description: Continuation of 5635. Feynman-Kac theorem, diffusion with drift, applications to problems in financial mathematics.

Prerequisites: A grade of C- or better in 5635; and enrollment in Math major or Actuarial Science major, or Grad standing; or permission of department.

Required Text: *Stochastic Calculus for Finance II: Continuous-Time Models*, by Steven E. Shreve, published by Springer, ISBN: 0387401016

Homework: Weekly homework will be assigned and collected. This homework will consist of textbook problems along with additional assigned applied problems. Homework, along with class preparation, should take approximately 6 hours per week.

Exams: There will be one midterm and one final exam in this course. Both exams will be similar to homework questions but also contain problems that are designed to assess student understanding. The midterm will be a 55 minute exam and the final exam will be 1 hour and 45 minutes.

Course Grade: Grades for this course will be based on student performance according to the following weighting of assessment:

Homework and participation	25%
Midterm exam (up to Ito integral)	25%
Final exam (comprehensive)	50%

Weekly Course Outline:

Week	Topics	Assignment
1	Feynman-Kac theorem	HW 1
2	Interest rate models	HW 2
3	Diffusion	HW3
4	Properties of Brownian motion	HW 4
5	Cantor stairs	HW 5
6	Maximum Brownian motion with drift	HW 6
7	Quadratic variation; Review	Midterm Exam
8	Markov property	HW 7
9	Lookback options, Asian options	HW 8
10	Change of Numeraire and foreign exchange	HW 9
11	Forward measure	HW 10
12	Yield curve evolution models, forward LIBOR model	HW 11
13	Jump-diffusion and its Ito Calculus	HW 12
14	Stopping times, American options; Review	

Disability Statement: The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; 098 Baker Hall, 113 W. 12th Avenue.

Academic Misconduct Statement: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Actuarial Science BS/BA Curriculum Map					
Goal 1	To supply a strong general background in mathematics, statistics, and relevant concepts from the insurance industry				
Goal 2	To prepare students to take some of the national actuarial examinations administered by the Society of Actuaries and the Casualty Actuarial Society				
Course	Goal 1	Goal 2			
Math 1151	Beginning	Beginning			
Math 1152	Beginning	Beginning			
ACCTMIS 2000	Beginning				
Econ 2001.01	Beginning				
Econ 2002.01	Beginning				
CSE 1222	Beginning	Intermediate			
CSE 1223	Beginning	Intermediate			
CSE 2111	Beginning	Intermediate			
Comm 2110	Beginning				
Comm 2131	Beginning				
Comm 2367	Beginning				
BusFin 3120	Intermediate	Beginning			
English 3304	Beginning				
Math 2153	Intermediate	Beginning			
Math 2568	Intermediate	Beginning			
Math 3588	Intermediate	Advanced			
Math 3618	Intermediate	Advanced			
Math 4530	Advanced	Advanced			
Stat 4201	Advanced	Advanced			
Math 5632	Advanced	Advanced			
Stat 4202	Advanced	Advanced			
Math 5630	Advanced	Advanced			
Math 5631	Advanced	Advanced			
Math 5633	Advanced	Advanced			
Math 5634	Advanced	Advanced			
Math 5635	Advanced	Advanced			
Math 5636	Advanced	Advanced			

Math - BS/BA Curriculum Map					
Goal 1	Learn conceptual frameworks needed to study higher mathematics, including an introduction to mathematical reasoning and an understanding of how to read and write proofs.				
Goal 2	Aquire basic mastery of core areas of mathematics including calculus, analysis and algebra.				
Goal 3	Develop powerful mathematical problem solving skills.				
Goal 4	Learn to communicate mathematical understanding effectively.				
Goal 5	Become proficient in chosen tracks within the major.				
Course	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5
AcctMIS 2000			Beginning		Intermediate
Biochem 4511					Advanced
Biology 1113			Beginning		Intermediate
Biology 1114			Beginning		Intermediate
Biology 3401					Intermediate
BusFin 3120			Intermediate	Intermediate	Advanced
BusFin 3220			Intermediate	Intermediate	Advanced
Chem 1210			Beginning		Intermediate
Chem 1220			Beginning		Intermediate
Chem 2210					Advanced
Chem 2510					Advanced
Chem 4300					Advanced
Chem 4310					Advanced
CSE 1222			Beginning		Intermediate
CSE 1223			Beginning		Intermediate
CSE 2221			Beginning	Beginning	
CSE 2111			Beginning		Intermediate
Econ 2001.01			Beginning		Intermediate
Econ 2002.01			Beginning		Intermediate
EEOB 3310					Advanced
EEOB 3420					Advanced
EEOB 4520					Advanced
Math 1151	Beginning	Beginning	Beginning		
Math 1152	Beginning	Beginning	Beginning		
Math 1181H	Intermediate	Intermediate	Beginning		
Math 1295				Intermediate	Beginning
Math 2153	Intermediate	Intermediate	Beginning		
Math 2182H	Intermediate	Intermediate	Beginning		
Math 2255	Beginning	Intermediate	Intermediate	Beginning	

Math 2568	Beginning	Beginning	Beginning		Beginning
Math 2568H	Intermediate	Beginning	Intermediate	Beginning	Beginning
Math 3345	Advanced	Advanced	Intermediate	Intermediate	Intermediate
Math 3345H	Advanced	Advanced	Intermediate	Intermediate	Intermediate
Math 3350				Intermediate	Beginning
Math 3589			Intermediate	Intermediate	Advanced
Math 3607			Intermediate	Intermediate	Advanced
Math 3618			Intermediate	Advanced	Advanced
Math 4181H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 4182H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 4350			Intermediate	Advanced	Advanced
Math 4504	Advanced	Intermediate	Intermediate	Advanced	Advanced
Math 4507	Advanced	Intermediate	Intermediate	Advanced	Advanced
Math 4512	Intermediate		Intermediate	Intermediate	Intermediate
Math 4530	Intermediate	Beginning	Intermediate	Intermediate	Intermediate
Math 4547	Advanced	Advanced	Intermediate	Advanced	Beginning
Math 4548	Advanced	Advanced	Intermediate	Advanced	Beginning
Math 4551	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Math 4552	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Math 4556			Intermediate	Advanced	Advanced
Math 4557	Intermediate		Intermediate	Intermediate	Intermediate
Math 4570	Intermediate	Intermediate	Advanced	Intermediate	Intermediate
Math 4573	Advanced	Intermediate	Intermediate	Intermediate	Intermediate
Math 4575	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Math 4578	Intermediate	Intermediate	Intermediate	Intermediate	Advanced
Math 4580	Advanced	Advanced	Intermediate	Advanced	Beginning
Math 4581	Advanced	Advanced	Intermediate	Advanced	Beginning
Math 5101	Beginning	Advanced	Intermediate		Intermediate
Math 5102	Beginning	Advanced	Intermediate		Intermediate
Math 5421	Beginning	Beginning	Intermediate	Beginning	Advanced
Math 5451	Beginning	Beginning	Intermediate	Beginning	Advanced
Math 5520H	Advanced	Advanced	Advanced	Advanced	Intermediate
Math 5522H	Advanced	Advanced	Advanced	Advanced	Intermediate
Math 5529H	Advanced	Advanced	Advanced	Advanced	Intermediate
Math 5530H	Advanced	Advanced	Advanced	Advanced	Intermediate
Math 5540H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 5540H	Advanced	Advanced	Advanced	Intermediate	Beginning
Math 5576H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 5590H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 5591H	Advanced	Advanced	Advanced	Advanced	Advanced
Math 5632			Intermediate	Advanced	Advanced

Math 5635			Intermediate	Advanced	Advanced
Math 5636			Intermediate	Advanced	Advanced
Math 5660					Intermediate
Math 5756			Beginning	Intermediate	Intermediate
Math 5757			Beginning	Intermediate	Intermediate
MolGen 4500					Advanced
MolGen 5601					Advanced
Physics 1250			Beginning		Intermediate
Physics 1251			Beginning		Intermediate
Physics 2300					Advanced
Physics 2301					Advanced
Stat 4201	Intermediate	Beginning	Intermediate	Intermediate	Intermediate
Stat 4202	Intermediate		Intermediate		Intermediate