Term Information

Effective Term	Spring 2020
Previous Value	*Spring 2014*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

Add DL certification

What is the rationale for the proposed change(s)?

Ability to run an online DL version of this course

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

None

Is approval of the request contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

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	5632
Course Title	Financial Economics for Actuaries
Transcript Abbreviation	Fin Ec for Actuars
Course Description	Introduction to the evaluation of options, futures, and other derivatives, interest models and risk management techniques. Includes material from examinations by the Society of Actuaries and the Casualty Actuarial Society.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	Yes
Is any section of the course offered	100% at a distance
Previous Value	*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   Prereq: A grade of C- or above in 3618, or credit for 618; and a grade of C- or above in 4530, 5530H, or Stat 4201, or credit for 530, 531H, or Stat 420; and enrollment in Math major or Actuarial Science major or Actuarial Science Pre-major, or Grad standing; or permission of department.

Exclusions   Not open to students with credit for 632.

Electronically Enforced   No

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code   27.0101

Subsidy Level   Doctoral Course

Intended Rank   Junior, Senior, Masters, Doctoral

Previous Value   *Junior, Senior, Masters*

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors

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

Previous Value

- Students understand the theoretical evaluation of options, futures, derivatives and portfolios.

Content Topic List

- Option relationships
- Binomial option pricing
- Black-Scholes formula
- Market making and delta hedging
- Exotic options
- Brownian motions and Ito's Lemma
- Interest rate models

Sought Concurrence   No

Attachments

- Syllabus 5632 In Person.pdf: In person syllabus

  (Syllabus. Owner: Husen,William J)

- Syllabus 5632 Online.pdf: Online syllabus

  (Syllabus. Owner: Husen,William J)

- Math 5632 Online Review Checklist.pdf: Distance learning checklist

  (Other Supporting Documentation. Owner: Husen,William J)

- Additional notes on online.docx: Notes on online/in-person differences

  (Other Supporting Documentation. Owner: Husen,William J)

Comments

- Notes on online vs. in-person differences added in response to committee questions. *(by Husen,William J on 11/12/2019 12:53 PM)*

- See 9-17-19 email to T. Kerler and W. Husen *(by Oldroyd,Shelby Quinn on 09/17/2019 04:05 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Husen,William J	08/20/2019 01:18 PM	Submitted for Approval
Approved	Husen,William J	08/20/2019 01:19 PM	Unit Approval
Approved	Haddad,Deborah Moore	08/20/2019 03:17 PM	College Approval
Revision Requested	Oldroyd,Shelby Quinn	09/17/2019 04:05 PM	ASCCAO Approval
Submitted	Husen,William J	11/12/2019 12:53 PM	Submitted for Approval
Approved	Husen,William J	11/12/2019 12:53 PM	Unit Approval
Approved	Haddad,Deborah Moore	11/12/2019 01:00 PM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Oldroyd,Shelby Quinn Vankeerbergen,Bernadette Chantal	11/12/2019 01:00 PM	ASCCAO Approval

Math 5632: Financial Economics for Actuaries

Spring Semester 2019 – The Ohio State University

Lecturer: Dr. Bradley Waller

Office: Mathematics Building 232

Office Hours: Tuesday, Thursday 11:30am-12:30pm

Email: waller.44@osu.edu

Purpose: This course is designed to give students an introduction to the evaluation of options, futures, derivatives, and portfolio theory. Students will learn how to compute the payoffs of derivatives. The computations of the payoffs will be used to determine prices of derivatives under various models. This course will help actuarial candidates prepare for the Society of Actuaries' (SOA) exam IFM .

Textbook: *Derivative Markets*, 3rd edition, by McDonald, published by Addison-Wesley, ISBN: 9780321543080 (Optional)

Assessment: Your course grade will be based on homework, quizzes, and exams; it will be computed as follows:

Computation	Grades
Homework 10%	A ≥ 93 93> A- ≥ 90
Group Work 3%	90> B+≥ 87 87> B ≥ 83 83> B- ≥ 80
Quizzes (3) 20%	80> C+≥ 77 77> C ≥ 73 73> C- ≥ 67
Exams (3) 67%	67> D ≥ 60 60> E

There will be no makeup exams given, or late homework accepted, without documentation of a medical emergency or university-excused absence, unless we have made arrangements in advance.

Homework: Assignments can be found on Carmen. Homework will be graded on completeness, correctness of your solution, presence/organization of supporting work, and proper use of notation/terminology. Correct answers with no supporting work will receive no credit; incorrect answers with work shown, on the other hand, will often receive partial credit.

Group Work: There are several online videos on Carmen. They can be found in the lectures and multimedia section of each module. During two or three lectures, I will ask you to work as a group to answer a question similar to the online video.

Quizzes: There will be three quizzes. They are 20-30 minutes of short answer questions.

Exams: Exams will be multiple choice, short answer, and matching. Multiple choice questions will have partial credit. No formulas are provided on the exams.

Corrections: In case there is an error in grading or tabulating, you need to write a short petition explaining your case. This petition must be stapled on top of the assignment and handed to me no later than one week after I have returned the assignment to the class.

Course Updates: Every now and then announcements to the entire course need to be made. These announcements will be made using the news feature on Carmen. It is your responsibility to check the news for this course. You can sign up for news item notifications so that you are aware of any such updates.

Calculator Policy: Only SOA approved calculators are allowed during exams and quizzes. One of the goals of this course is to become proficient in the use of these calculators.

https://www.soa.org/education/exam-req/exam-day-info/edu-calculators.aspx

Email Etiquette: Outside of class time, the primary means of communication between us will be email. Please treat any emails you send me as a professional correspondence. Your email should have a subject, a greeting, and some sort of signature.

Academic Misconduct: "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 3335-5-48.7). For additional information, see the Code of Student Conduct at http://studentlife.osu.edu/csc/."

Students with Disabilities: "Students with disabilities that have been certified by Student Life Disabilities Services (SLDS) will be appropriately accommodated and should inform the instructor as soon as possible of their needs. SLDS contact information: slds@osu.edu; 614-292-3307; 098 Baker Hall, 113 W. 12th Avenue."

Spring Semester 2019   Math 5632

Monday	Tuesday	Wednesday	Thursday	Friday
January 7	8 Underlying Assets	9	10 Forward Contracts	11
14	15 Futures	16	17 Options **Quiz 1**	18
21 **Martin Luther King Day – No Classes**	22 Put-Call Parity	23	24 Cash/Asset or Nothing Options	25
28	29 Combinations of Options	30	31 Asian Options Put-Call Duality	**February 1** **Last day to drop w/o a "W"**
4	5 Review	6	7 **Exam 1**	8
11	12 Binomial Models	13	14 Binomial Models	15
18	19 Binomial Models	20	21 American and Asian Options – **Quiz 2**	22
25	26 Lognormality	27	28 Black-Scholes Formula	**March 1**
4	5 Review	6	7 **Exam 2**	8
11 **Spring Break**	12 **Spring Break**	13 **Spring Break**	14 **Spring Break**	15 **Spring Break**
18	19 Cash/Asset or Nothing Options & Greeks	20	21 Hedging & Approximation	22 **Last day to drop w/o a petition**
25	26 More Hedging	27	28 Gap & Barrier Options – **Quiz 3**	29
April 1	2 Exchange Options	3	4 Monte Carlo Methods	5
8	9 Portfolio Theory	10	11 Portfolio Theory	12
15	16 Review	17	18 **Final Exam**	19

Math 5632: Financial Economics for Actuaries

Autumn Semester 2019 – The Ohio State University

Lecturer: Dr. Bradley Waller

Office: Mathematics Building 210

Office Hours: Thursdays from 4-5pm in a Zoom meeting or by appointment.

Email: waller.44@osu.edu

Purpose: This course is designed to give students an introduction to the evaluation of options, futures, derivatives, and portfolio theory. Students will learn how to compute the payoffs of derivatives. The computations of the payoffs will be used to determine prices of derivatives under various models. This course will help actuarial candidates prepare for the Society of Actuaries' (SOA) exam IFM .

Textbook: *Derivative Markets*, 3rd edition, by McDonald, published by Addison-Wesley, ISBN: 9780321543080. *Pricing the Future*, by George G. Szpiro, published by Basic Books, ISBN: 9780465022489.

Assessment: Your course grade will be based on homework, quizzes, and exams; it will be computed as follows:

Computation	Grades
Homework 15%	A $\geq$ 93
	93> A- $\geq$ 90
Group Work 15%	90> B+ $\geq$ 87
	87> B $\geq$ 83
	83> B- $\geq$ 80
Mini-Exams (3) 15%	80> C+ $\geq$ 77
	77> C $\geq$ 73
	73> C- $\geq$ 67
Exams (2) 55%	67> D $\geq$ 60
	60> E

There will be no makeup exams given, or late homework accepted, without documentation of a medical emergency or university-excused absence, unless we have made arrangements in advance.

Content Delivery: Since this course is online, there will be a large burden of learning on the individual. Under each part of the modules sections of Carmen, you will find lectures and multimedia. These contain the lecture slides for the part you are working on, and there are video examples with documents containing the work written out. In addition, reading from *Derivatives Markets* is prescribed. There you will find another perspective on the course content. In addition to the slides, videos, and textbook, you can always visit me during my office hours!

The documents posted before the video examples will be the most up to date of the course content. The videos will usually be up to date; however, due to the labor involved in recording and editing a video, there could be a lag in any video corrections.

Homework: Assignments can be found on Carmen's modules. Each assignment comes with problems that are suggested and problems that are due. The suggested problems are usually for extra practice; however, there are times where they will be necessary to complete a problem that is due. Those that are for practice will have solutions provided. You will only be assessed on the problems that are labeled problems due (PD). To submit an assignment, you take an online "quiz" by clicking on the homework assignment for that part of the course and clicking on"Take The Quiz." The assignment is graded immediately upon submission, and you get unlimited attempts before the due date. Each homework assignment is worth 10 points, and the lowest homework is dropped.

Group Work: You will be divided into groups of about 4 people. Each week, a group will have a questions author. The author will write questions regarding the reading from *Pricing the Future* in the discussion section. Each question will be in response to the lecturer's discussion assigning the authorship and reading for the week. The remaining group members will each answer one of the questions posed by the author. The author will check the answers given, state whether or not the questions are correct, and provide correct answers within 72 hours of the deadline for the respondents. You will be expected to author questions

three times this semester. Respondents earn up to 3 points every week, and the authors earn up to 8 points every week.

Mini-Exams: There will be three online mini-exams. The first mini-exam is over the syllabus, and you will be required to take it to access the Unit 1 module. You will be given unlimited attempts at the first mini-exam. The remaining mini-exams are 30 minutes of multiple choice, numerical answer, and file upload questions. You will only have one opportunity to take these online mini-exams. These mini-exams are open book and open notes. In addition, you will need to submit a solution to one of your problems. You can do this using either your phone to take a picture or a scanner. Just make sure you allot the requisite time to complete this task!

Exams: Exams will be given just as the mini-exams are given. They are also open book and open notes. You will be required to submit a small selection of the problems you did on the exam. Once again, you must make sure to allot the requisite time to complete an upload. Make sure to keep a copy of all of your exam problems should I need to see more of your work.

Course Updates: Every now and then announcements to the entire course need to be made. These announcements will be made using the announcements feature on Carmen. It is your responsibility to check the news for this course. You can sign up for announcement notifications so that you are aware of any such updates. Additionally, questions that would benefit the whole class should be posted to the discussion titled "Course Q&A."

Course Technology: You will need a document camera or scanner for the homework assignments, mini-exams, and exams.

You may use any calculator you desire on all assignments.

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Dest. Standard support hours are available at `https://ocio.osu.edu/help/hours`, and support for urgent issues is available all hours.

- **Self-Service and Chat support:** `http://ocio.osu.edu/selfservice`
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Email Etiquette: Outside of class time, the primary means of communication between us will be email. Please treat any emails you send me as a professional correspondence. Your email should have a subject, a greeting, and some sort of signature. During weekdays, you can expect email replies from me within 24 hours of your message.

Advising: For help navigating this large university, you will find that you need advising. In addition, advisors can help you get information regarding accessing course materials to meet the needs of diverse learners. For more information, visit the university's advising website at `https://advising.osu.edu/`. In addition to advising services, OSU main campus students may find assistance at .

Copyright Disclaimer: "The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course."

Statement on Title IX: "Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at `http://titleix.osu.edu` or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu."

Academic Misconduct: "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 3335-5-48.7). For additional information, see the Code of Student Conduct at `http://studentlife.osu.edu/csc/`."

Students with Disabilities:

"Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disabilities Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall 113 W. 12th Avenue; telephone 614-292-3307; slds@osu.edu; `slds.osu.edu`."

Accessibility of Course Technology:

"This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- Carmen (Canvas) accessibility
- Streaming audio and video
- Synchronous course tools"

Your Mental Health:

"As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting `ccs.osu.edu` or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at `suicidepreventionlifeline.org`."

August 18-August 31	Unit 1: Introduction. This unit will cover the preliminaries for our course. It is important that you understand the definitions introduced here.
September 1-September 21	Unit 2: Options and Parity. This unit will introduce call and put options. Their payoffs will be used throughout the term. In addition, parity relationships will be covered.
September 22-October 5	Unit 3 (parts 1 and 2): Binomial Pricing Model. This section will cover the binomial model and how it is used in conjunction with payoffs to determine prices of derivatives.
October 6-October 12	Exam Week: the exam can be accessed in the modules under Unit 3, Part 2.
October 13-October 26	Unit 3 (parts 3 and 4): Lognormal Pricing Model. You will be introduced to the Black-Scholes model here. It will also be used to price European derivatives.
October 27-November 15	Unit 4: Greeks and Portfolios. We will learn how to use differential calculus to determine how our derivatives change in value over time. This will be extended to portfolios containing many assets.
November 16-December 4	Unit 5: Miscellany. This section covers various topics that are important to financial economics but didn't quite fit in well during the rest of the term. Topics include simulation and portfolio theory.
December 6-December 12	Exam Week: the exam can be access in the modules under Unit 5, Part 2.

Some Important Time Windows:

Mini-Exam 1 is available **online** right now! Take it and earn the maximum score before you can access the first module. Take it as many times as you need to so that you achieve the maximum score.

Mini-Exam 2 is available **online** from September 5th at 12am-September 10th at 11:59pm.

Exam 1 is available **online** from October 6th at 12am-October 12th at 11:59pm.

Mini-Exam 3 is available **online** from October 31st at 12am-November 5th at 11:59pm.

Exam 2 is available **online** from December 6th at 12am-December 12th at 11:59pm.

Arts and Sciences Distance Learning Course Component Technical Review Checklist

Course: Math 5632
Instructor: Bradley Waller
Summary: Financial Economics for Actuaries

Standard - Course Technology	Yes	Yes with Revisions	No	Feedback/ Recomm.
6.1 The tools used in the course support the learning objectives and competencies.	X			Carmen quizzes and multimedia clips.
6.2 Course tools promote learner engagement and active learning.	X			Group projects and online office hours via Zoom.
6.3 Technologies required in the course are readily obtainable.	X			Carmen is available for free, as is Zoom for OSU affiliated people.
6.4 The course technologies are current.	X			Apps are updated regularly and are web based.
6.5 Links are provided to privacy policies for all external tools required in the course.	X			No third party tools are present other than those already covered by OSU agreements.
Standard - Learner Support				
7.1 The course instructions articulate or link to a clear description of the technical support offered and how to access it.	X			Links are included for 8HELP support
7.2 Course instructions articulate or link to the institution's accessibility policies and services.	X			a
7.3 Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help learners succeed in the course and how learners can obtain them.	X			b
7.4 Course instructions articulate or link to an explanation of how the institution's student services and resources can help learners succeed and how learners can obtain them.	X			c
Standard – Accessibility and Usability				
8.1 Course navigation facilitates ease of use.	X			Recommend using the Carmen Distance Learning "Master Course" template developed by ODEE and available in the Canvas Commons to provide student-users with a consistent user experience in terms of navigation and access to course content.
8.2 Information is provided about the accessibility of all technologies required in the course.	X			No third party tools are used
8.3 The course provides alternative means of access to course materials in formats that meet the needs of diverse learners.	X			Covered by statement a.
8.4 The course design facilitates readability	X			
8.5 Course multimedia facilitate ease of use.	X			All assignments and activities that use the Carmen LMS with embedded multimedia facilitates ease of use. All other multimedia resources facilitate ease of use by being available through a standard web browser

Reviewer Information
- Date reviewed: 8/12/19
- Reviewed by: Ian Anderson

Notes: Consider using the ASC syllabus template to create a familiar and consistent experience for students.

[a]The following statement about disability services (recommended 16 point font): Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, slds@osu.edu; slds.osu.edu.

[b]Add to the syllabus this link with an overview and contact information for the student academic services offered on the OSU main campus. http://advising.osu.edu/welcome.shtml

[c]Add to the syllabus this link with an overview and contact information for student services offered on the OSU main campus. http://ssc.osu.edu. Also, consider including this link in the "Other Course Policies" section of the syllabus.

Additional notes on online – in-person course setup

1. Course sections will be online only or in-person only so each section will correspond to a fixed standard in terms of course differences.

2. *How equivalent are the online and in-person versions:* The homework assignments and notes are identical for both versions (online, in-person). In addition, both sets of students have access to all of the same video lectures. The exams cover the same content with the caveat that the online version permits open notes. This was recommended by specialists in the ASC, as they noted that it would not be possible to enforce a no notes policy.

3. *There online course has significantly more group work (15% vs. 3%). The group work in the online course does not seem as involved or as interactive:* The group work was created in the form of discussions for the online version. This was suggested by the ASC to encourage involvement in the course. To further encourage involvement in discussions, the group work portion of the final grade was increased for the online version. The discussions are based on a book covering the history of the course's main subject. Each week, students are required to either write or respond to questions about the assigned reading. The online students still have questions over videos; they just answer those questions during mini-exams or exams (in contrast to pop-quizzes).

4. *How will the group work be managed by the instructor in the online course:* Each week, the instructor assigns to each group a question author. The author writes several questions regarding the reading. Then the groupmates respond to the author's questions. The author must check the respondents answers as part of their duty. Once a discussion is complete, the instructor checks to see who participated and whether the participation was satisfactory. Comments are provided to let students know where they can improve.

5. *How is the rigor of the exams maintained*: Questions in the online format are constructed in groups of questions covering a similar topic. Each student is only given one question from each group. This ensures that each student gets a different exam, yet the content covered is identical. Since the students get their notes in the online setting, they are required to answer more questions than the students in the in-person class. In addition, the students in the online version still need to execute the mathematical computations necessary to complete each problem.

6. *How do the exams compare between in-person and online:* The exams take the same time; however, the online versionasks more questions and allows open notes. The content of the questions is similar, but the difficulty is shifted from one of recall to one of breadth.

7. *Students are also given significant time to complete the online exams in comparison to the in-person exams:* The students are given identical time limits for their exams. Students in the online course have a one week time window where they can access the exams. Once initiated, the exams must be completed in the allotted 70 minute time frame.