



MA 373: Financial Mathematics Spring 2025

Lecture: MA 175 on Tues/Thurs 10:30 – 11:45 AM

Office Hours: Tues/Thur 1:30 – 3:00 PM in MA 918

Homework Help Sessions: Mon/Wed 3:30 – 5:00 PM in BRNG B230 (led by TA, Sophie Cavanaugh)

Contact Information

Instructor	Sally Ray
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Course Description

This 3-credit hour course is a mathematically rigorous treatment of interest theory and will cover the learning objectives for the Society of Actuaries (SOA) Examination FM and the Casualty Actuarial Society (CAS) Examination 2. There is a link to the Learning Outcomes and Objectives on the class site. The course is also an excellent course for business or finance majors who want a deeper understanding of financial mathematics.

Students enrolled in this course are eligible to earn University-Earned Credit (UEC) for the SOA Exam FM: Financial Mathematics by achieving a minimum score of 85% based on the UEC grading scale listed later in the syllabus.

Students who earn credit for Exam FM through the SOA's University-Earned Credit (UEC) program will receive credit for CAS Exam 2, just as candidates who pass Exam FM can obtain credit.

Communication

- *Email:* Main method of communication, please check daily
- *Brightspace:* Gradebook
- *Variate:* Homework

Textbooks

- *Required:* none
- *Optional:* Mathematical Interest Theory, First or Second Edition by James Daniel and Leslie Vaaler (ISBN 978-0-88385-754-0). Note: The first edition of Mathematical Interest Theory is exactly the same as the second edition.
- *Note:* You may access an electronic copy for free through Purdue Libraries. Link available through the class website or through the "External Links" module in Brightspace.

*WebEx instructions at the back of the syllabus

Calculators

You may only use calculator(s) from the following list as these are the only calculators permitted for use by the Society of Actuaries. Use of any other calculator will result in disqualification from UEC credit and a 0 toward your University grade.

- BA II Plus
- BA II Plus Professional
- BA-35
- TI-30Xa or TI-30XA, same model just different casing, both approved
- TI-30X II (IIS solar or IIB battery)
- TI-30XS MultiView (or XB battery)

You need to purchase a BA II Plus or Plus Professional for this course. Additional calculators above may be used to supplement if desired. The student is expected to learn the functionality of the calculator as part of the preparation for class exams and the Exam FM/Exam 2. Some of the calculator functionality will be covered in class. **Please bring your calculator(s) to each class.**

Class Structure

Students enrolled in this course are eligible to earn UEC credits for the SOA Exam FM: Financial Mathematics. Students who earn credit for Exam FM through the SOA's University-Earned Credit (UEC) program will receive credit for Exam 2, just as candidates who pass Exam FM can obtain credit.

You will receive two separate grades for this course – one to count toward your University GPA and degree and another to count toward eligibility for UEC credit. Evaluation will be based on a combination of the following items.

- *Quizzes and Tests*
 - Closed book and closed notes
 - 5 quizzes, with lowest quiz score dropped
 - 3 cumulative tests – 2 midterms and final
 - Midterms – 60 minutes on the evenings listed in the course schedule
 - Midterm 1 will only count toward your University Grade
 - Midterm 2 will count toward your University Grade and your UEC Grade
 - Final – 2 hours during finals week
- *Homework*
 - Online using Variate
 - Due Tuesdays and Fridays by 11:59 PM
 - One extension permitted – must notify 24 hours in advance of original due date
 - Lowest three homework scores will be dropped.
- *One-on-One Meeting*
 - One required 10-minute meeting.
 - It is your responsibility to schedule this meeting. If you schedule and attend this meeting, you will earn 1% toward your final grade.
 - Google doc will be available for sign-up the first week of class.

Classroom Procedures and Attendance

This course follows Purdue's academic regulations regarding attendance, which states that students are expected to be present for every meeting of the classes in which they are enrolled. When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, you should inform me of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification is not possible, contact me as soon as possible by email or phone.

For cases that fall under excused absence regulations, you or your representative should contact or go to the [Office of the Dean of Students \(ODOS\) website](#) to complete appropriate forms for instructor notification. Under academic regulations, excused absences may be granted by ODOS for cases of grief/bereavement, military service, jury duty, parenting leave, or emergent medical care. The processes are detailed, so plan ahead.

Grade Distribution

Final grades will be determined using the following weights. You will receive a separate grade for Purdue and to count toward UEC. Students achieving at least 85% under the UEC grade criterion below will be eligible for UEC credit.

University Letter Grade	
Quizzes	20%
Homework	4%
One-on-One Meeting	1%
Midterm 1	25%
Midterm 2	25%
Final	25%
Total	100%

UEC Grade	
Homework	20%
Midterm 2	30%
Final	50%
Total	100%

Grading Scale

Grades will be on a plus/minus scale as follows:

Below 60	60- 62.9	63- 66.9	67- 69.9	70- 72.9	73- 76.9	77- 79.9	80- 82.9	83- 86.9	87- 89.9	90- 92.9	93- 96.9	Above 97
F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+

Make-up Policy

There will be no make-up exam permitted for the final. For midterms and quizzes, the make-up policy varies between the UEC Grade and the University Letter grade.

UEC Grade

There will be no make-up exams under any circumstances for the purpose of obtaining UEC credit. If you do not attend the regularly scheduled Midterm 2 and Final, you will not be eligible to earn UEC credit for this course.

University Letter Grade

Make-up exams are permitted if I am notified within 24 hours of the regularly scheduled exam time with the reason for the make-up request. Documentation for the request can be provided beyond the 24 hours, but initial contact with me must be made within 24 hours of the regular scheduled exam time. *Make-up exams are typically more difficult than the original exam and receive an automatic 10% deduction.* In the event the student has an official, university-excused absence through the Office of the Dean of Students, the automatic deduction will not apply.

Academic Integrity

Academic integrity is one of the highest values that Purdue University holds. Purdue has a student-initiated Purdue Honors Pledge you are expected to follow:

“As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue.”

Students can report issues of academic integrity that they observe, either through the Office of the Dean of Students (purdue.edu/odos), call 765-494-8778 or email integrity@purdue.edu .

Course Schedule

To satisfy the learning objectives and outcomes in the SOA syllabus, below is a rough schedule.

- Time value of money
 - Week 1 – definitions: accumulation function, simple and compound interest, effective rates of interest, and discount rates
 - Week 2 – definitions: nominal rates, force of interest, inflation, reinvestment, interest rate relationships
 - Week 3 – discount factor, writing and solving equations of value , net present value
- Annuities/cash flows with non-contingent payments
 - Week 4 – definitions: annuity immediate, annuity due, perpetuity, annuity payable continuously, annuity payable m-thly
 - Week 5 – definitions: arithmetic increasing/decreasing annuity, geometric annuity
 - Week 6 – solving for missing annuity component by setting up equations of value
 - Week 7 – deferred annuities, non-level annuities
- Loans
 - Week 8 – definitions: outstanding loan balance, principal, interest, term of loan, amortization, final payments (drop and balloon)
 - Week 9 – calculating outstanding loan balances and final payments (drop and balloon)
 - Week 10 – bond amortization, calculating principal and interest in a given payment
- Bonds
 - Week 11 – definitions: bond terminology, selling at a discount/premium
 - Week 12 – non-level patterns of payment, bond amortization, callable bonds
- General cash flows, portfolios, and asset liability management
 - Week 13 – definitions: yield rates, macaulay and modified duration, spot/forward rates
 - Week 14 – calculating duration and convexity, approximate price changes
 - Week 15 – immunization techniques: exact matching a set of liability cashflows, Redington immunization, full immunization

Quiz Schedule						
Week	Tues	Thurs		Week	Tues	Thurs
1					Spring Break (3/17-3/22)	
2				10		
3		Q1 – 1/30		11		*No Class
4				12		
5		Q2 – 2/13		13		Q4 – 4/17
6		*No Class		14		Q5 – 4/24
7				15		
8		Q3 – 3/6		16	Wed, 5/7, 3:30-5:30 PM, UC 114	
9						

Key: Q=Quiz

MIDTERM 1 – Wednesday, 2/19
PHYS 112 from 8:00 – 9:00 PM
Non-UEC Midterm

MIDTERM 2 – Thursday, 4/3
MA 175/BRNG 2290 from 8:00 – 9:00 PM
UEC Midterm

*"No Class" Dates are compensation for evening midterms

Appendix

Use of External Resources

I am aware that there are many resources available for finding homework solutions. Some of them will give you the correct answer and others will not. Regardless, it is in your best interest to ensure that all of your work is your own since you will need to demonstrate your knowledge on quizzes and tests. Please learn from each other as you study, but make sure you independently master the material as well.

Students with Disabilities

Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247, as soon as possible.

If the Disability Resource Center (DRC) has determined reasonable accommodations that you would like to utilize in this class, you must send your Course Accommodation Letter to the instructor. Instructions on sharing your Course Accommodation Letter can be found by visiting: <https://www.purdue.edu/drc/students/course-accommodation-letter.php>. Additionally, you are strongly encouraged to contact the instructor as soon as possible to discuss implementation of your accommodations.

WebEx Instructions

If at any point we need to meet virtually, below are WebEx instructions:

- Enter purdue.webex.com into your browser and search for my personal room.
- Enter your name and email address in the provided slots.
- Be sure you are using the WebEx App, not WebEx through a web browser.
- If this does not work and you are instead prompted for a Meeting Number, please use 120 451 0432. If a password is required, it is the same as the Meeting Number.
- Please click the green button to “Connect Audio and Video”. Do join by video if at all possible – it’s much more enjoyable when we can communicate face-to-face! Feel free to give me a call using the number on the first page of the syllabus if you have any issues connecting.

Exam FM/Exam 2 Preparation

Exam FM/Exam 2 is will be offered by the Society of Actuaries and the Casualty Actuarial Society from June 10-21. The registration deadline is May 7th. It will also be offered in August. Register [here](#). Select “CBT” (computer-based testing) unless you meet paper and pencil requirements. Notes that for CBT you will receive a pencil and paper to work the test and answers will be entered on the computer. Exam location is selected after registration.

If you want to pass Exam FM/Exam 2, I strongly recommend that you invest 250 hours of study time for the Exam. The 250 hours would include any time spent for this class, plus additional time working as many problems as possible. A supplemental study manual (Actex or ASM) or subscription to Coaching Actuaries of Infinite Actuary is recommended.

If you plan to take the exam, Purdue will reimburse you if you pass. This is a unique program and a great opportunity to save money. To receive reimbursement, you must complete [this application](#) before you take the exam and submit according to the instructions on the form. You must also attend a one evening course here on campus. More details will be sent out later this semester.

Student Not Taking Exam FM/Exam 2

If you are not taking Exam FM/Exam 2, you only need to do the homework for the class. If you master these problems and the material, you should be successful in this course.

Diversity and Inclusion Statement

In our discussions, structured and unstructured, we will explore a variety of challenging issues, which can help us enhance our understanding of different experiences and perspectives. This can be challenging, but in overcoming these challenges we find the greatest rewards. While we will design guidelines as a group, everyone should remember the following points:

- We are all in the process of learning about others and their experiences. Please speak with me, anonymously if needed, if you have concerns about aspects of/experiences in the course.
- Intention and impact are not always aligned, and we should respect the impact something may have on someone even if it was not the speaker's intention.
- We all come to the class with a variety of experiences and a range of expertise, we should respect these in others while critically examining them in ourselves."

This course, as with every course offered at Purdue, plays a part in creating and sustaining a welcoming campus where all students can excel. There are many initiatives in math and statistics departments and supported by the university focused on this goal, and this course is designed to take advantage of those resources. Learning experiences and assignments address diversity and inclusion, not because they are "topics," but because they are necessary to prepare students to be successful in a diverse, global environment.

We strive for equity, providing equal access and opportunity, and working to maximize student potential. This requires both instructor and students to identify and remove barriers that may prevent someone from full access or full participation. You can help by:

- Contacting me, anonymously if needed, if you see a potential barrier for someone or yourself in participating fully in the class. This might be a physical barrier such as access to technology or a personal situation.
- Suggesting ways in which members of our class can support each other. Virtual study groups and discussion boards are examples, but I encourage you to be creative in your ideas.
- Getting to know each other as contributing members of our learning community. Everyone has something to contribute, and while I designed the course to take advantage of the wealth of knowledge, expertise, and experience we bring together, I cannot do it well without your participation. There are many opportunities built into this course for this type of work. It is important we do it together.

Copyright

In general, notes are “considered to be ‘derivative works’ of the instructor's presentations and materials, and they are thus subject to the instructor's copyright in such presentations and materials.” I consider class notes, tests, and quizzes to be derivative works and therefore copyrighted. Class notes, tests, and quizzes may not be sold, bartered, or even given to websites or other resources. Examples of such websites are Course Hero, Chegg, or Quizlet.

Additional Policies and Statements

The following can be found in Brightspace under “University Policies and Statements” or “Student Support and Resources”:

- Nondiscrimination Statement
- Emergency Preparedness
- Violent Behavior Policy
- Accessibility and Academic Adjustments
- Mental Health, Wellness, and Basic Needs Security