BALL STATE UNIVERSITY
Department of Mathematical Sciences
Fall 2025 Blended

COURSE NUMBER: MATH 355

TITLE: Exam Prep for Exam FM/2

CREDIT HOURS: Math 355, Section 802 2-credits

Instructor: Richard Owens, FSA, MAAA, CFA
Office: New Jersey/Florida
Office Telephone: 973-650-7613 **Preferred e-mail:** reowens@bsu.edu

Virtual Office Hours via Webex: by Appointment

Prerequisites: C- or better in Math 351 or Permission of the Department Chair.

Course Description:
Math 355 is a course dealing in the review of fundamental concepts from financial mathematics. Topics include theory of interest (time value of money, annuities, mortgages, bonds, rates of return, term structure of interest rates, and asset/liability management), interest rate swaps, and determinants of interest rates.

Course Goals
The goal of the course is to sharpen students' financial mathematics and problem-solving skills so that they can answer at least 80% of Exam FM/2 questions correctly, which is expected to lead to passing Exam FM/2.

Texts for Course:
Fall 2022 Actex FM/2 Study Manual by Dinius, Hassett, Ratliff, Garcia & Steeby. Or the ACTEX Interactive Study Manual for SOA Exam FM | 1st Edition, 2nd Printing. Please let me know which edition you are using as the assignments are based on the Fall 2022 Study Manual, which will have minor problem numbering differences from earlier manuals.

Other Materials for Course
Society of Actuaries Study Notes:
FM 24 – 17 Using Duration and Convexity to Approximate Change in Value
Exam FM/2 Financial Mathematics Sample Exam Questions and Solutions (on Canvas)

Calculators
The SOA exams assume the use of a calculator. Please bring your calculator to every class. You will need it. Being consistent with the SOA rules for calculator use during an exam, only the following Texas Instrument calculator models, with the memory cleared, may be used for all course tests, and the final exam:

- BA-35 TI-30Xa
- BA II Plus* TI-30XIIS*
- BA II Plus Professional Edition* TI-30XIIB*
- TI-30XS MultiView*
- TI-30XB MultiView*.

Review of Calculator Functions for the Texas Instruments BA-35
http://www.soa.org/files/pdf/FM-22-05.pdf

Review of Calculator Functions for the Texas Instruments BA II Plus
http://www.soa.org/files/pdf/FM-23-05.pdf

Videos on how to use the BA II Plus basic and financial functions
http://www.atomiclearning.com/k12/en/ti_ba2

Online RESOURCES
A BSU network account for email and Canvas are needed. An Internet connection is necessary to participate in discussions and assignments, access readings, transfer course work, and receive feedback from your instructional associate and/or professor. For web-based courses, students should have a basic working knowledge of computers and Internet use as well as access to a computer with a broadband (DSL, cable, satellite) Internet connection. Other requirements for each course are listed in the university catalog.

SOFTWARE
At a minimum, you must have Microsoft Office 2003, XP, 2007 or OpenOffice. Microsoft Office is the standard office productivity software used by faculty, students, and staff. Microsoft Word is the standard word processing software, Microsoft Excel is the standard spreadsheet software, and Microsoft PowerPoint is the standard presentation software. You will also be required to copy + paste and attach and upload documents for assignment submissions.

Course Learning Objectives

Students will learn how the theory of compound interest and the time value of money are used to compute the present value of future payments. Students will be able to calculate both the present and accumulated values of annuities certain, figure loan payments and equity amounts for mortgages and loans, and the price of bonds and other fixed income investments. They will be able to construct loan amortization schedules under various payment schedules and interest assumptions. They will be able to set up equations of value to be solved for unknown yield rates, payment amounts, or payment times. The student will be able to find the swap rate and the market value of interest rate swaps, explain various the components of interest rates for different investment products, US and Canadian differences and the role of central banks.

The SOA's Exam FM/2 Learning Objectives are shown in detail below

Course Policies

Attendance

Attendance in Ball State University online classes is measured by your active participation in course activities at least once each week. Be sure to complete your course work as assigned to ensure you are recorded as attending the course.

In-Class Weekly Tests

The weekly class period during which tests will be administered is on Friday from 2:00 – 3:15 in RB 418. Samuel Ofosuhene will be the GA who will proctor your tests. He can be reached at Samuel.ofosuhene@bsu.edu.

Participation and Timeliness

Your regular participation and timeliness are important to your academic success. In online courses, this takes the form of participation in discussion via forums, chat, and other electronic means provided.

As this is a Blended course, it is up to every student to stay on track and not fall behind. You must be self-motivated and disciplined to meet all due dates. Developing a routine is essential. All assignments are expected to be submitted by a specific time and date. Assignments submitted late will not be accepted.

Communication

Questions of a personal nature, such as questions about your grade or anything personal intended for the instructor, please use your BSU email. Do not hesitate to contact me with any questions or concerns. Individual office hours will be done via Webex. I will typically respond to e-mail questions usually within 24/48 hours.

Students with Disabilities

Some elements of this course may not be accessible to persons with some types of disabilities. If you need course adaptations or accommodations because of a disability, please contact Ball State's Disability Services office. This office coordinates services for students with disabilities. Documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-285-5293 or dsd@bsu.edu. Further online information for students may be found at the BSU Disability Services web page, http://cms.bsu.edu/about/administrativeoffices/disability-services

Mental Health Concerns Statement

If you are experiencing mental health concerns, telehealth services are available – here is a link to the Counseling Center website.

Academic Integrity Policy

Students are expected to adhere to University guidelines as presented in the Code of Student Rights and Responsibilities as outlined in the student handbook.

Honesty, trust, and personal responsibility are fundamental attributes of the University community. Academic dishonesty by a student will not be tolerated, for it threatens the foundation of an institution dedicated to the pursuit of knowledge. To maintain its credibility and reputation, and to equitably assign evaluations of scholastic and creative performance, Ball State University is committed to maintaining a climate that upholds and values the highest standards of academic integrity.

Course Withdrawal:

The course withdrawal period ends probably late October. Before this date, students can elect to receive a "W" for the course by completing and submitting the proper form. The instructor's permission is not required. For details, see *https://www.bsu.edu/about/administrativeoffices/registrar/registration-activities/withdraw-from-classes* as well as Degree Requirements and Time Limits in the current Undergraduate Catalog OR Withdrawal Procedures in the current graduate catalog.

TECHNICAL INFORMATION

Become familiar with the class interface before the semester begins and seek help if necessary. BSU provides resources to help you. A lack of Canvas knowledge is not an acceptable excuse for late or incomplete work.

Technical Equipment

In order for you to be successful in this type of course (e.g. Blended delivery, distance education); you will need the technology listed in the "Technology for Online and Distance Education Students."

Technical Assistance

If you have technical questions, you can contact Ball State's Help Desk. In addition, the Help Desk staff has put together many how-to video clips in its Tech Clips section that can guide you through many of the most common questions. The helpdesk can be contacted at: 1-765-285-1517 or email at helpdesk@bsu.edu.

Grading Policies

Tests

The course will have weekly tests, one in each week of class, and be 65% of your grade. Most tests will consist of 12 multiple-choice questions similar to those that might be expected on Exam FM/2. Each test will be worth 24 points. No partial credit will be given on the tests. No tests may be made up, but the two lowest test grades, other than the mid-term tests, may be dropped.

Tests will be administered on in-person on Friday afternoons, 2:00 – 3:15 on RB 418, on campus proctored by a graduate assistant who will provide the test and answer sheet both to be turned back into the graduate assistant at the end of the test.

Tests are closed book and closed notes. No computers, laptops, cell phones or other electronic devices, other than SOA approved calculations, are permitted during the test. Please remember the academic integrity policy, see above, and the SOA/CAS Candidate Code of Conduct, which is in the SOA Materials folder on Canvas.

Please let me know that you have completed the test and turned it in to the proctor. Then go into Canvas and complete the “Week x Test Exit Ticket”. You could simply say "Completed". The 24 possible points for this assignment are for the grading of your test questions. You do **not** receive 24 points for submitting the exit ticket.

When your test is received from the proctor, I will grade it and you will be given an indication of which questions you did correctly, in the “Week x Test Exit Ticket” assignment.

After you have completed the test, please review your test to learn from your mistakes. Saturday morning’s, a folder will become available below the test link that includes video solutions to selected test questions. This folder also includes the actual test questions. Consider using them to assist in your study.

Reading Homework
Students are expected to read the section of the study manual before the lecture video.

Video Lectures
There are video lectures for the different parts of the text. Links are in the weekly folder. Clicking the link will take you to screencast.com, which asks for a password. The password for both lecture videos and test problem solution videos will be: Math355R

Problem Solving Homework
Written homework problems, about 9% of your grade, will be assigned from both the text and the SOA sample problems (on Canvas). It is recommended that the assignment be nicely organized with space between problems and include a statement of each problem with its solution. Please show all the steps in the solution of the problems so I can tell where there may be any misunderstanding and provide you with feedback. Also, please circle your answer and indicate the letter of your choice. If you do not understand a problem, on the homework ask a specific question, which will be evidence of your best effort on the problem. Your grade will be effort based. As Exam FM/2, which is totally problem based, much of the homework be doing problems. However, it is important to read the text as it provides key insights into the subject matter.

As both the text and the SOA Sample Problems include solutions to the problems, it is important that you give the problem your best effort before you look at the solution. It is too easy to look at the solution and say, "Yea, I understand that". You must think through the problem yourself in order to succeed.

Homework will need to be scanned, preferably in pdf format, and posted to Canvas by 11:30 pm each Thursday.

Late homework will not be accepted for any reason. Students must work consistently on the homework in order to succeed in the course.

Discussion Board

There will be an assigned discussion forum each week in which students must participate. Instructions for discussion postings are an initial posting by **Wednesday evening** and a follow-up response post to a classmate’s posting by **Friday evening**. You must post on two separate days at minimum. These are minimum requirements; to discuss a topic you will probably want to post more than two times per discussion. Discussion forums are meant to replicate a face-to-face classroom discussion. Please reference the Discussion Forum Grading Rubric below for more information. NOTE: Only discussion threads posted by Friday at 11:00pm of each respective week will count for grading purposes.

Mid-Term Test 1 (Week 7)

The Mid-Term 1 Test will cover Modules 1 and 2 and is worth 24 points. See "Tests" for other instructions.

Mid-Term Test 2 (Week 12)

The Mid-Term 2 Test includes Mod 5 as new material and will cover Modules 3 and 4 as review and is worth 24 points. See "Tests" for other instructions.

Final Exam

The Final Exam will also be in-person, on campus, date, time and location are to be determined. The final is cumulative and worth 96 points, 20% of your grade. You must take the final exam to pass this course. See "Tests" for other instructions.

Weekly Journal

The journal consists of two parts. First, create an outline of the reading material for the section including key formulas. This can act as a study/formula sheet. Second, for each homework problem and prior week test problem that you initially did incorrectly, write in your journal a description of what you misunderstood, what you did incorrectly, what fact/formula/technique you needed to know in order to correctly solve the problem and what you learned.

For example, in the Probability course, on SOA problem 3, I was stumped by the problem as I did not remember the formula $P(A) = P(A \cap B) + P(A \cap B')$ where B' is not B. With this formula, I was able to get the correct answer. On SOA problem 1, I subtracted incorrectly. Fixing this mistake leads to the correct answer.

The purpose of the journal is for you to analyze and learn from your mistakes, to make clear to you where your learning is inadequate. The journal should be a tool to help you study for tests, our final exam, and Exam FM/2.

Submit your journal in Word via Canvas by 11:30pm each Monday following the weekly test.

Course Grade

Students' grades will be regularly updated on Gradebook. The course grade will primarily be based on the total percentage of points achieved. As the tests will be as challenging as Exam FM/2, the course grade will be curved as is Exam FM/2. 85% + will earn an A, however, in order to earn an A or A-, a 50% grade or higher must be achieved on the final exam. It is expected that a 55% will be needed to pass the course. Class participation is expected and excessive unexcused absences may affect your grade.

Assignments, Tests, Final Exams		Points
Written Homework+	3 * 14.5	= 42
Discussion Board	2 * 15	= 30
Weekly Journal	1 * 15	= 15
Tests (dropping two lowest)	24 * 11.5	= 276
Mid-Term 1 Test	24 * 1	= 24
Final Exam	96 * 1	= 96
Class total		483

"+" includes one "half" homework

GRADING SCALE

The course grade will be based on the total percentage of points achieved: A=[85,100], A-=[82,85), B+=[79,82), B=[76,79), B-=[73, 76), C+=[69,73), C=[65,69), C-=[61,65), D=[55,61). Note that averages are rounded down, a 84.99 is an A-.

Discussion Board Grading

The rubric below serves as the basis for assessing your participation in the Discussion forums. Please note that this assessment is conducted regarding your initial post, and your primary responding post (in which you respond to another student's post). Additional participation throughout the course of a week, beyond these two posts, is certainly invited and encouraged; worthy additional contributions over the course of a week can be taken into account to improve the grade given to your primary responding post of that week. Based on the quality of your work, you might be assigned a grade somewhere in between the different points on the grading scale presented below.

Each week, students are required to post for a possible 1.0 points and then respond to another student's post for an additional 1.0 points. Each discussion thread is worth a possible 2.0 points per week. As noted earlier, posting twice is the bare minimum in terms of contribution and effort. Posting only twice may not earn the full amount of potential points for the week. The following grading rubric will be used to evaluate the quality of a post.

Points	Discussion Posting Grading Rubric
1.0	A posting will thoughtfully consider and respond to the question (or classmate's message), using sound argumentation and clear prose. Not only will such a post

	engage with the ongoing conversation in a rhetorically suitable fashion, it will foster further discussion on the topic, perhaps exploring new lines of argument or different perspectives. The full-pointer is not just a response; it is proof that you are facilitating learning for both yourself and your fellow students.
0.3	This posting reflects a less-than-adequate engagement with the subject, or is noticeably under the required word count. It does little to advance the discussion underway, and may even detract from it.
0	No posting, late posting, or a post that is but the briefest nod toward a response. (zero percent)

SOA Exam FM LEARNING OBJECTIVES & Outcomes (October 2025 and later)

A. Time Value of Money (5-15%)
   1. The Candidate will understand and be able to perform calculations relating to present value, current value, and accumulated value.
   2. The candidate will be able to
      a. Define and recognize the definitions of the following terms: interest rate (rate of interest), simple interest, compound interest, accumulation function, future value, current value, present value, net present value, discount factor, discount rate (rate of discount), convertible m-thly, nominal rate, effective rate, inflation and real rate of interest, force of interest, equation of value.
      b. Given any three of interest rate, period of time, present value, current value, and future value, calculate the remaining item using simple or compound interest. Solve time value of money equations involving variable force of interest.
      c. Given any one of the effective interest rate, the nominal interest rate convertible m-thly, the effective discount rate, the nominal discount rate convertible m-thly, or the force of interest, calculate any of the other items.
      d. Write the equation of value given a set of cash flows and an interest rate.

B. Annuities/cash flows with payments that are not contingent (20-30%)
   1. The Candidate will be able to calculate present value, current value, and accumulated value for sequences of non-contingent payments.
   2. The Candidate will be able to define and recognize the definitions of the following terms: annuity-immediate, annuity due, perpetuity, payable m-thly or payable continuously, level payment annuity, arithmetic increasing/decreasing annuity, geometric increasing/decreasing annuity, term of annuity.
   3. For each of the following types of annuity/cash flows, given sufficient information of immediate or due, present value, future value, current value, interest rate, payment amount, and term of annuity, the candidate will be able to calculate any remaining item.
      a. Level annuity, finite term
      b. Level perpetuity
      c. Non-level annuities/cash flows
         (1) Arithmetic progression, finite term & perpetuity
         (2) Geometric progression, finite term & perpetuity
         (3) Other non-level annuities/cash flows

C. Loan Repayment (15-25%)
   1. The Candidate will understand key concepts concerning loans and how to perform related calculations.
   2. The candidate will be able to:
      a. Define and recognize the definitions of the following terms: principal, interest, term of loan, outstanding balance, final payment (drop payment, balloon payment), amortization.
      b. Calculate:

(1) The missing items, given any four of term of loan, interest rate, payment amount, payment period, principal, calculate the remaining item.
(2) Calculate the outstanding balance at any point in time.
(3) Calculate the amount of interest and principal repayment in a given payment.
(4) Similar calculations to the above when refinancing is involved.

D. Bonds (15-25%)
1. The Candidate will understand key concepts concerning bonds, and how to perform related calculations.
2. The candidate will be able to:
   a. Define and recognize the definitions of the following terms: price, book value, market value, amortization of premium, accumulation of discount, redemption value, par value/face value, yield rate, coupon, coupon rate, term of bond, callable/non-callable, call price, call premium, accumulated value with reinvestment of coupons.
   b. Given sufficient partial information about the items listed below, the candidate will be able to calculate the any of the remaining items.
      (1) Price, book value, market value, accumulated value with reinvestment of coupons, amortization of premium, accumulation of discount (Note that valuation of bonds between coupon payment dates will not be covered).
      (2) Redemption value, face value
      (3) Yield rate
      (4) Coupon, Coupon rate
      (5) Term of bond, point in time that a bond has a given book value, amortization of premium, or accumulation of discount
   c. Calculate the price of a callable bond to achieve a specified minimum yield

E. General Cash Flows, Portfolios and Asset Liability Management (20 - 30%)
1. The Candidate will understand key concepts concerning yield curves, rates of return, and measures of duration and convexity, cash flow matching and immunization, and how to perform related calculations.
2. The candidate will be able to:
   a. Define and recognize the definitions of the following terms: yield rate/rate of return, current value, duration (Macaulay and modified), convexity (Macaulay and modified), portfolio, spot rate, forward rate, yield curve, cash flow and duration matching, and immunization (including full immunization and Redington immunization).
   b. Calculate:
      (1) The duration and convexity of a set of cash flows.
      (2) Either Macaulay or modified duration given the other.
      (3) The approximate the change in present value due to a change in interest rate.
         (a) Using 1st-order linear approximation based on modified duration.
         (b) Using 1st-order approximation based on Macaulay duration.
      (4) The present value of a set of cash flows, using a yield curve developed from forward and spot rates.

c. Construct an investment portfolio to:
   (1) Protect the value of an asset-liability portfolio using either Redington or full immunization
   (2) Exactly match a set of liability cash flows.