

King Fahd University of Petroleum & Minerals

Department of Mathematics

AS 201 Syllabus, Semester 261 (2026–2027)

Instructor: Dr. Dhaker Kroumi (dhaker.kroumi@kfupm.edu.sa)

Course Code & Title: AS 201 — Financial Mathematics

Course Credit Hours: 3-0-3

Prerequisite: MATH 102

Instructor: Dr. Dhaker Kroumi

Building 5, Room 201-3 Tel.

Office Hours: MW 11:00 – 1:00 PM, or by appointment

Class Time & Venue: UTR 9:00 – 10:00 AM · Building 59, Room 2017

Textbook: Broverman, S. A., Mathematics of Investment and Credit (5th Edition), 2010, ACTEX Publications, ISBN 978-1-56698-767-7.

Calculator: Texas Instruments BA II Plus or BA II Plus Professional.

Additional References:

(1) Daniel & Vaaler, Mathematical Interest Theory (2nd Edition), 2009, MAA, ISBN 978-0883857540.

(2) Kellison, The Theory of Interest (3rd Edition), 2009, Irwin/McGraw-Hill, ISBN 978-1259215445.

Course Description: Theory of compound interest and the mathematics of investment and credit. Measurement of interest; annuities-certain (level, non-level, and continuous); amortization schedules; sinking funds; investment yield rates; and valuation of bonds and other securities. Methods of loan measurement and payment (Islamic and conventional) are illustrated through amortization and sinking-fund schedules. Islamic views on interest and investments.

Course Objectives: To develop a thorough understanding of the theory of compound interest and its applications to investment and credit — the measurement of interest, valuation of annuities, loan repayment, bond valuation, yield rates, the term structure of interest rates, and duration and immunization — including both conventional and Islamic perspectives, and to prepare students for the Society of Actuaries (SOA) Financial Mathematics (FM) examination.

Course Learning Outcomes: Upon the completion of the course, students should be able to:

- Measure interest using effective and nominal rates of interest and discount, the force of interest, and the real (inflation-adjusted) rate of interest.
- Compute the present and accumulated values of level and non-level annuities-certain.
- Construct amortization and sinking-fund schedules for the repayment of loans (conventional and Islamic).
- Determine the price and book value of bonds and build bond amortization schedules.
- Evaluate the yield of an investment using the internal rate of return and the dollar-weighted and time-weighted rates of return.
- Analyze the term structure of interest rates using spot and forward rates.
- Apply duration, convexity, and immunization to measure and manage interest-rate risk.

These outcomes are aligned with the Society of Actuaries (SOA) Financial Mathematics (FM) examination objectives.

Grading Policy:

	Date	Time	Place	Material	Points
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Exam I	TBA	TBA	TBA	Chapters 1 & 2	22.5%
Exam II	TBA	TBA	TBA	Chapters 3, 4 & 5	22.5%
Homework & Attendance	—	—	—	Homework 10% + Attendance 5%	15%
Class Work	—	—	—	Quizzes / class tests	10%
Final Exam	As per Registrar			Comprehensive	35%
Total					100%

Letter Grades: Final letter grades will be assigned according to a grading curve, which will be determined based on the overall performance of all students enrolled in the course. The exact cutoffs may change from one term to another, depending on how the scores are distributed.

Exam Questions: Exam questions will be similar in style and level of difficulty to the examples and exercises provided in the textbook.

Examination Policies: You are expected to adhere to KFUPM policies for all examinations in this course, including quizzes, major exams, midterms, and final exams. The following policies are enacted in this course during examinations:

- Students are expected to arrive at the examination hall on time with proper University ID.
- Students are seated according to the instructor's seat assignment and may request a seat change only for legitimate reasons.
- Late arrival to the exam may result in the student being denied admission. Once a student has completed the examination and left the examination hall/room, no late student will be admitted.
- Students are not permitted to leave the examination room to use the restroom during an exam, except in rare cases involving a documented medical condition (e.g., diabetes, kidney disease). Any excused restroom leave will be fully supervised by a same-gender proctor.
- Students must leave all smart devices outside the examination hall, including smartphones, smartwatches, earbuds, and unauthorized calculators. Possession of any unauthorized device will be considered a cheating attempt and will be handled accordingly.
- Cheating attempts will be reported according to KFUPM policy and will result in a DN grade in the course, along with potential further penalties upon investigation.

Missing an Exam: In case a student misses an exam (Exam I, Exam II, or the Final Exam) for a legitimate reason (such as medical emergencies), the student must submit an official excuse approved by the Deanship of Student Affairs within seven calendar days of the missed exam date. Without an approved excuse, the student will receive a score of zero for the missed exam. When the excuse is accepted, the instructor will arrange a makeup exam for the missed exam.

Class Attendance: Students are expected to arrive on time for class, consistent with expectations in professional settings. Attendance is normally recorded within the first five minutes of class; entering after that counts as one late, and every two lates count as one absence. Recording attendance for another student, signing another student's attendance, or asking another student to record yours will be reported for investigation and may result in severe consequences for both students involved.

A DN grade will be given after two warnings if a student exceeds 9 unexcused absences (20% of the course) or exceeds a total of 15 absences, whether excused or not (one-third of the course).

Use of Mobile Devices in Class: The use of mobile phones during class is strictly prohibited. Students who wish to use laptops or tablets for notetaking must first obtain permission from the instructor. Any violation will result in a penalty determined by the instructor.

Academic Integrity: All KFUPM academic integrity policies apply to this course. For details, students should refer to the Undergraduate Bulletin available on the Registrar's website.

Accessibility and Accommodations: Students with documented special needs, approved by the Deanship of Student Affairs, should contact the instructor to arrange reasonable accommodation.

Honor code: Students of this course are expected to maintain the highest level of academic integrity and ethics. A KFUPM student does not cheat or tolerate those who do. Every student is expected to submit work that is entirely their own, to properly cite all sources used, and to refrain from any form of academic misconduct.

Plagiarism: Use of another person's ideas, processes, results, or words requires appropriate credit or reference to the author. Use of Generative AI tools is subject to the instructor's authorization. Submitting the same work in more than one course without the instructor's permission is not allowed.

Communication:

- Announcements are posted on Blackboard; students should check it regularly.
- Bring pens, note-taking materials, and an approved financial calculator (BA II Plus or BA II Plus Professional) to every lecture, quiz, and examination.
- Handout homework problems are posted on Blackboard toward the end of each chapter and must be submitted on time; no late homework will be accepted.
- Do not round intermediate results; round only final answers, to at least four decimal places unless otherwise specified.

Suggested Weekly Coverage Plan

Week	Date	Sec.	Titles
Week 1	Aug. 19 – 20	—	Course introduction and overview
Week 2	Aug. 23 – 27	1.1	Chapter 1 — Interest Rate Measurement Interest Accumulation and Effective Rates of Interest
		1.2	Present Value (excluding 1.2.1)
Week 3	Aug. 30 – Sep. 03	1.3	Equation of Value
		1.4	Nominal Rates of Interest
		1.5	Effective and Nominal Rates of Discount
Week 4	Sep. 06 – 10	1.6	The Force of Interest
		1.7	Inflation and the "Real" Rate of Interest
Week 5	Sep. 13 – 17	2.1	Chapter 2 — Valuation of Annuities Level Payment Annuities
		2.2	Level Payment Annuities — Some Generalizations
Week 6	Sep. 20 – 22	2.3	Annuities with Non-Constant Payments
Sep. 23, 2026 – Sep. 24, 2026: National Day Holiday			
Week 7	Sep. 27 – Oct. 01	2.4	Applications and Illustrations (excluding 2.4.2 & 2.4.3) ► Exam I — Material: Chapters 1 & 2
Week 8	Oct. 04 – 08	3.1	Chapter 3 — Loan Repayment The Amortization Model of Loan Repayment
		3.2	Amortization of a Loan with Level Payments (excluding 3.2.1 & 3.2.2)
Week 9	Oct. 11 – 15	3.3	The Sinking Fund Method of Loan Repayment
Week 10	Oct. 18 – 19	4.1	Chapter 4 — Bond Valuation Determination of Bond Prices
Oct. 20, 2026 – Oct. 22, 2026: Midterm Break			
Week 11	Oct. 25 – 29	4.2	Amortization of a Bond
		4.3	Applications and Illustrations (excluding 4.3.2)
Week 12	Nov. 01 – 05	5.1	Chapter 5 — Measuring the Rate of Return of an Investment Internal Rate of Return and Net Present Value (excluding 5.1.4)
		5.2	Dollar-Weighted and Time-Weighted Rate of Return
Week 13	Nov. 08 – 12	5.3	Applications and Illustrations (excluding the investment-year portion of 5.3.1, 5.3.2 & 5.3.3) ► Exam II — Material: Chapters 3, 4 & 5
Week 14	Nov. 15 – 19	6.1	Chapter 6 — The Term Structure of Interest Rates Spot Rates of Interest
		6.3	Forward Rates of Interest
Nov. 22, 2026 – Nov. 23, 2026 : Autumn Break			
Week 15	Nov. 24 – 26	7.1	Chapter 7 — Cash Flow Duration and Immunization Duration of a Set of Cash Flows and Bond Duration (excluding 7.1.6)
Week 16	Nov. 29 – Dec. 03	7.2	Asset-Liability Matching and Immunization
		8.1	Chapter 8 — Additional Topics in Finance and Investment The Dividend Discount Model of Stock Valuation
Week 17	Dec. 06 – 10	SOA FM	Using Duration and Convexity to Approximate the Change in Present Value (SOA Exam FM note)
		—	Review — Exam FM practice problems

Suggested Practice Problems

Problems refer to Broverman, *Mathematics of Investment and Credit*, 5th Edition (end-of-chapter exercises).

Sec.	Question Numbers
1.1	5, 7, 9, 10
1.2	5, 8, 11, 12
1.3	17, 18
1.4	3, 5, 7, 8
1.5	4, 8, 9, 11
1.6	2, 4, 6, 9, 11
1.7	1, 2, 3, 4, 7
2.1	1, 7, 11, 12, 16, 19
2.2	1, 3, 4, 5, 9, 13
2.3	2, 3, 4, 5, 8, 10, 11, 14, 17, 18
2.4	3, 6, 7, 9, 11
3.1	1, 2, 4, 5, 7, 9
3.2	3, 4, 6, 7, 8, 11, 26
3.3	3, 4, 6, 7
4.1	1, 3, 4
4.2	3, 4, 5, 7
4.3	2, 4, 5, 9, 10, 14, 21
5.1	2, 3, 5, 6(a), 7, 10
5.2	1, 3, 4, 5, 6
5.3	1, 2, 3
6.1	1, 2, 3(a-i, b-i, c-i), 5
6.3	4, 5
7.1	1, 2, 5, 6
7.2	1, 2, 4, 7, 12
8.1	1, 2