



ATTACHMENT 5.

T6. COURSE SPECIFICATIONS (CS)

ACTU 371 Financial Mathematics

1439/2018

Course Specifications

Institution: King Saud University	Date: 01/02/2018
College/Department: Science, Mathematics	

A. Course Identification and General Information

1. Course title and code: Financial Mathematics ACTU 371			
2. Credit hours: 4(3+2+0)			
3. Program(s) in which the course is offered. Actuarial and Financial Mathematics Program			
4. Name of faculty member responsible for the course: Pr. Dr. Souhail Chebbi			
5. Level/year at which this course is offered: 5/3			
6. Pre-requisites for this course (if any): MATH 106			
7. Co-requisites for this course (if any): None			
8. Location if not on main campus:			
9. Mode of Instruction (mark all that apply):			
a. traditional classroom	<input checked="" type="checkbox"/>	What percentage?	<input type="text" value="100%"/>
b. blended (traditional and online)	<input type="checkbox"/>	What percentage?	<input type="text"/>
c. e-learning	<input type="checkbox"/>	What percentage?	<input type="text"/>
d. correspondence	<input type="checkbox"/>	What percentage?	<input type="text"/>
f. other	<input type="checkbox"/>	What percentage?	<input type="text"/>
Comments:			

B Objectives

1. What is the main purpose for this course?

To provide an understanding of the fundamental concepts of financial mathematics, and how those concepts are applied in calculating present and accumulated values for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, asset/liability management, investment income, capital budgeting, and valuing contingent cash flows.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

Use LMS (Bb) or Webinar to interact with student (discussions, forums, virtual class room).
Use updated syllabus of FM and Exams from SOA/CAS website.

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
<p>1. Time Value of Money</p> <p>a. interest rate (rate of interest), simple interest, compound interest accumulation function, future value, current value, present value, net present value, equation of value.</p> <p>b. discount factor, discount rate (rate of discount), convertible m-thly, nominal rate, effective rate, inflation and real rate of interest, force of interest,</p>	2	10
<p>2. Annuities/cash flows with payments that are not contingent</p> <p>a. Level annuity, finite term</p> <p>b. Level perpetuity</p> <p>c. Non-level annuities/cash flows</p> <p>i) Arithmetic progression, finite term</p> <p>ii) Arithmetic progression, perpetuity</p> <p>iii) Geometric progression, finite term</p> <p>iv) Geometric progression, perpetuity</p> <p>v) Other non-level annuities/cash flows</p>	3	15

3. Loans a. Principal, interest, term of loan. b. Outstanding balance, final payment (drop payment, balloon payment). c. Amortization. d. Sinking fund.	2	10
4. Bonds a. Price of the bond, redemption value, par value/face value, yield rate, coupon, coupon rate, term of bond b. book value, amortization of premium, accumulation of discount, , c. callable/non-callable.	2	10
5. General Cash Flows and Portfolios Continuous Life Annuities a. Yield rate/rate of return, dollar-weighted rate of return, time-weighted rate of return, current value. b. Duration (Macaulay and modified), convexity (Macaulay and modified), portfolio, c. Spot rate, forward rate, yield curve, stock price, stock dividend.	2	10
6. Immunization Cash flow matching, immunization (including full immunization), Redington immunization.	1	5
7. Interest Rate Swaps a. swap rate, swap term or swap tenor, notional amount, b. market value of a swap, settlement dates, settlement period, counterparties, c. deferred swap, amortizing swap, accreting swap, interest rate swap net payments.	2	10
8. Determinants of Interest Rates Gross Premium a. real risk-free rate, inflation rate, default risk premium, b. liquidity premium, and maturity risk premium.	1	5

2. Course components (total contact hours and credits per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical (visit to companies)	Other:	Total
Contact Hours	Planned	45	30		None		75
	Actual	45	30		None		75
Credit	Planned	3	1		None		4
	Actual	3	1		None		4

3. Additional private study/learning hours expected for students per week.

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4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	Knowledge		
1.1	To be able to: <ol style="list-style-type: none"> 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. 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. 	Traditional lecture class room	Quizzes Midterm and final exams
1.2	To be able to define and recognize the definitions of 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.	Traditional lecture class room	Quizzes Midterm and final exams
1.3	To be able to define and recognize the definitions of the following terms: principal, interest, term of loan, outstanding balance, final payment (drop payment, balloon payment), amortization, sinking fund.	Traditional lecture class room	Quizzes Midterm and final exams
1.4	To be able to define and recognize the definitions of the following terms: price, book value, amortization of premium, accumulation of discount, redemption value, par value/face value,	Traditional lecture class room	Quizzes Midterm and final exams



	yield rate, coupon, coupon rate, term of bond, callable/non-callable.		
1.5	To be able to define and recognize the definitions of the following terms: yield rate/rate of return, dollar-weighted rate of return, time-weighted rate of return, current value, duration (Macaulay and modified), convexity (Macaulay and modified), portfolio, spot rate, forward rate, yield curve, stock price, stock dividend.	Traditional lecture class room	Quizzes Midterm and final exams
1.6	To be able to define and recognize the definitions of the following terms: cash flow matching, immunization (including full immunization), Redington immunization.	Traditional lecture class room	Quizzes Midterm and final exams
1.7	To be able to define and recognize the definitions of the following terms: swap rate, swap term or swap tenor, notional amount, market value of a swap, settlement dates, settlement period, counterparties, deferred swap, amortizing swap, accreting swap, interest rate swap net payments.	Traditional lecture class room	Quizzes Midterm and final exams
1.8	To be able to define and recognize the components of interest rates including: real risk-free rate, inflation rate, default risk premium, liquidity premium, and maturity risk premium.	Traditional lecture class room	Quizzes Midterm and final exams
2.0	Cognitive Skills		
2.1	Write the equation of value given a set of cash flows and an interest rate.	Problem solving	Quizzes Midterm and final exams
2.2	Give 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.	Problem solving	Quizzes Midterm and final exams
2.3	a. Given any four of term of loan, interest rate, payment amount, payment period, principal, calculate the remaining item. b. Calculate the outstanding balance at any point in time. c. Calculate the amount of interest and principal repayment in a given payment. d. Given the quantities, except one, in a sinking fund arrangement calculate the missing quantity. e. Perform similar calculations to a-d when refinancing is involved.	Problem solving	Quizzes Midterm and final exams
2.4	Calculate the any of the remaining items: a. Price, book value, amortization of premium, accumulation of discount b. Redemption value, face value	Problem solving	Quizzes Midterm and final exams

	<p>c. Yield rate d. Coupon, Coupon rate e. Term of bond, point in time that a bond has a given book value, amortization of premium, or accumulation of discount</p>		
2.5	<p>To be able to: a. Calculate the dollar-weighted and time-weighted rate of return. b. Calculate the duration and convexity of a set of cash flows. c. Calculate either Macaulay or modified duration given the other. d. Use duration to approximate the change in present value due to a change in interest rate. i. Using 1st-order linear approximation based on modified duration. ii. Using 1st-order approximation based on Macaulay duration. e. Calculate the price of a stock using the dividend discount model.</p>	Problem solving	Quizzes Midterm and final exams
2.6	<p>a. Construct an investment portfolio to fully immunize a set of liability cash flows. b. Construct an investment portfolio to match present value and duration of a set of liability cash flows. c. Construct an investment portfolio to exactly match a set of liability cash flows.</p>	Problem solving	Quizzes Midterm and final exams
2.7	<p>a. Calculate the swap rate in an interest rate swap, deferred or otherwise, and with either constant or varying notional amount. b. Calculate the market value of an interest rate swap, deferred or otherwise, and with either constant or varying notional amount.</p>	Problem solving	Quizzes Midterm and final exams
2.8	<p>a. Identify the real interest and the nominal interest rate in the context of loans with and without inflation protection and calculate the effect of changes in inflation on loans with inflation protection. b. Explain how the components of interest rates apply in various contexts, such as commercial loans, mortgages, credit cards, bonds, government securities. c. Explain the roles of the Federal Reserve and the FOMC in carrying out fiscal policy and monetary policy and the tools used by the Federal Reserve and the FOMC including targeting the Federal Funds rate, setting reserve requirements, and setting the discount rate. d. Explain the theories of why interest rates differ by term, including liquidity preference</p>	Problem solving	Quizzes Midterm and final exams

	(opportunity cost), expectations, preferred habitat, and market segmentation. d. Explain how interest rates differ from one country to another (e.g., U.S. vs. Canada).		
3.0	Interpersonal Skills & Responsibility		
3.1	Study, learn and work independently.	<ul style="list-style-type: none"> -Encourage students to: - participate in class discussion. - participate in college and university activities. - be members of department committees and college committees. 	
3.2	Work effectively in teams.		
3.3	Meet deadlines and manage time properly.		
3.4	Exhibit ethical behavior and respect different points of view.		
4.0	Communication, Information Technology, Numerical		
4.1	Present financial mathematics to others, both in oral and written form clearly and in a well-organized manner	<ul style="list-style-type: none"> Encourage students to: - obtain the FM exam of SOA/CAS - use department and college computing facilities. - use e-mail, lms, internet, college and department websites, and central library. 	
4.2	Use IT facilities as an aid to mathematical processes and for acquiring available information		
4.3	Use library to locate mathematical information.		
4.4	Use Financial Calculator machine		
		Giving financial calculator group assignment	
5.0	Psychomotor		
	Not applicable	Not applicable	Not applicable

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Tests, Quizzes	3	5%
2	First Midterm exam	6	25%
3	Tests, Quizzes	9	5%
4	Second Midterm exam	12	25%
5	Final	15 or 16	40%

D. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

1. 10 office hours weekly.
2. Encouraging students to get in touch with the instructor via e-mail.

E Learning Resources

1. List Required Textbooks

1. Kellison, S.G., *The Theory of Interest (Third Edition)*, 2009, Irwin/McGraw-Hill, ISBN: 125921544X or 978-1259215445.
2. ACTEX FM Study Manual with StudyPlus+ Spring 2018, by: Johnny Li, Ph.D., FSA, Andrew Ng, Ph.D., FSA

2. List Essential References Materials (Journals, Reports, etc.)

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

1. <https://www.soa.org>
2. <http://www.casact.org/>

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

LMS (Bb), Webinars, TeamViewer, google apps, virtual classroom.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Classrooms
2. Technology resources (AV, data show, Smart Board, software, etc.) AV, data show, Smart Board, LMS (Bb)
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching Surveys, Exams, quizzes <ol style="list-style-type: none"> An evaluation sheet for the course to be filled by the students at the end of each semester. Take the students' opinion about the course under consideration. Discussing the course with instructors who teach the same course.
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department <ol style="list-style-type: none"> The level of the students in solving homework and quizzes Colleagues' opinions about students' performance in this course.
3. Processes for Improvement of Teaching <ol style="list-style-type: none"> Encouraging students to get involved in the lecture. Getting the use of tutorial classes. Encouraging the students to read about the subject.
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) <ol style="list-style-type: none"> Common Examination Team grading. Exchanging experience by comparing students' results in other departments. Students who believe they are under graded can have their papers checked by a second reader.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

1. Providing reviews to develop the assigned book content.
2. Providing a discussion for the course subject by a specialized committee.
3. View other math departments in well-known universities and getting help from them.
4. Consulting some course specialists for course evaluation.

Name of Course Instructor: Prof. Dr. Souhail Mohsen Chebbi

Signature:



Date Specification Completed: 1/02/2016

Program Coordinator: Prof. Dr. Souhail Mohsen Chebbi

Signature



Date Received: 1/02/2016