ATTACHMENT 5.

T6. COURSE SPECIFICATIONS (CS)

هيئة تقويم التعليم
Education Evaluation Commission

Course Specifications

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

A. Course Identification and General Information

1. Course title and code:Lab Actuarial Mathematics ACTU. 484
2. Credit hours:1(0+0+2)
3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
Actuarial and Financial Mathematics Program
4. Name of faculty member responsible for the course: Pr. Dr. Mhamed Eddahbi
5. Level/year at which this course is offered:8/4
6. Pre-requisites for this course (if any): All ACTU courses
7. Co-requisites for this course (if any):
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. traditional classroom	X	What percentage?	80
b. blended (traditional and online)	X	What percentage?	15
c. e-learning	X	What percentage?	5
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course?

The aim of this Lab is to provide students with computational aspects of actuarial science, in the R environment. The course assumes that students arehave studied the courses Actuarial mathematical models I and II.
The objectives of this Lab are:

- To educate students of actuarial sciencesto perform risk-theoretical and financial analysis in life and non-life insurance and related areas.
- This Lab provides computational aspects of actuarial science. Using simple R code, the Lab helps students to understand the algorithms involved in actuarial computations. Computational facets of life insurance, including life contingencies calculations and prospective life tables.

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 MLC 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
1. Get started with R program especially in actual sciences (package installation), a. R for Actuarial Science (From Actuarial Science to Computational Actuarial Science) b. The R Environment c. Vectors and Matrices in Actuarial Computations d. R Packages, R Codes and Effiency	1	2

2. Importing and Creating Various Objects, and Datasets in a. Simple Objects in R and Workspace b. More Complex Objects in R (Vectors, Matrices and Arrays, Lists) c. Reading csv or txt Files, Importing Excel Files d. Characters, Factors and Dates with R	1	2
3. Standard Statistical Inference, a. Probability Distributions in Actuarial Science b. Parametric Inference c. Measures of Adequacy d. Linear regression and Aggregate Loss Distribution	1	2
4. Life Contingencies a. Working with Life Tables b. Pricing Life Insurance c. Reserving Life Insurances d. Health Insurance and Markov Chains	2	4
5. Prospective Life Tables a. Smoothing Mortality Data b. Lee--Carter and Related Forecasting Methods c. Other Mortality Forecasting Methods d. Coherent Mortality Forecasting e. Life Table Forecasting f. Life Insurance Products	1	2
6. Prospective Mortality Tables a. Notation, Data, and Assumption b. The Methods c. Method 1: Approach Involving One Parameter with the SMR d. Method 2: Approach Involving Two Parameters with a e. Semiparametric Relational Model f. Method 3: Poisson GLM Including Interactions with Age and Calendar Year g. Method 4: Nonparametric Smoothing and Application of the Improvement Rates	1	2

7. Validation a. First Level: Proximity between the Observations and the Model b. Second Level: Regularity of the Fit c. Third Level: Consistency and Plausibility of the Mortality Trends d. Operational Framework e. Computation of the Observed Statistics and Importation of the Reference f. Execution of the Methods g. Process of Validation h. Completion of the Tables	2	4
8. Survival Analysis a. Data Importation and Some Statistics b. Building the Appropriate Database c. Some Descriptive Statistics d. Survival Distribution Estimation e. Hoem Estimator of the Conditional Rates f. Kaplan--Meier Estimator of the Survival Function	1	2
9. Regularization Techniques a. Parametric Adjustment b. Semiparametric Adjustment: Brass Relational Model c. Nonparametric Techniques: Whittaker--Henderson Smoother d. Application	1	2
10. Modeling Heterogeneity a. Semiparametric Framework: Cox Model b. Additive Models c. Validation of a Survival Model	1	2
11. Claims Reserving and IBNR a. Development Triangles b. Deterministic Reserving Methods c. Chain-Ladder Algorithm	1	2
12. Stochastic Reserving Models a. Chain-Ladder in the Context of Linear Regression b. Mack Model c. Poisson Regression Model for Incremental Claims d. Bootstrap Chain-Ladderrap Chain-Ladder	1	2
13. Computational actuarial science, Portfolio optimization	1	2

14. Quantifying Reserve Risk a. Ultimo Reserve Risk b. One-Year Reserve Risk	1	2

2. Course components (total contact hours and credits per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical (visit to companies)	Other:	Total
Contact Hours	Planed		30				30
	Actual		30				30
Credit	Planed		3				3
	Actual		3				3

3. Additional private study/learning hours expected for students per week. 6

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	Manipulate R and manage Datasets with R	Traditional lecture classroom	Quizzes Midterm and final exams
1.2	Analyze Statistical data and estimate parameters	Traditional lecture classroom	Quizzes Midterm and final exams
2.0	**Cognitive Skills**		
2.1	Work with Life Tables using R Price Life Insurance policies Estimate Reserves for Life Insurance contracts	Problem solving	Quizzes Midterm and final exams

2.2	SmoothMortality Data using: • Lee--Carter and Related Forecasting Methods • Other Mortality Forecasting Methods • Coherent Mortality Forecasting	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.3	Describe Life Table Forecasting	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.4	Describe Prospective Mortality Tables • Approach Involving One Parameter with the SMR • Approach Involving Two Parameters with a Semiparametric Relational Model • Poisson GLM Including Interactions with Age and Calendar Year • Nonparametric Smoothing and Application of the Improvement Rates	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.5	Validate models • Level 1: Proximity between the Observations and the Model • Level 2: Regularity of the tit • Level 3: Consistency and Plausibility of the Mortality Trends	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.6	Compute observed statistics and importation of the Reference, then complete tables	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.7	• Build Appropriate Database • Estimate Survival Distribution • Use Kaplan--Meier Estimator of the Survival Function	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.8	• Parametric Adjustment • Semiparametric Adjustment: Brass Relational Model • Nonparametric Techniques: Whittaker--Henderson Smoother	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.9	• Apply in Semi-Parametric Framework: • Apply Additive Models	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams

	• Validate Survival Models		
2.10	Implement Claims Reserving and IBNR calculation methods • Development Triangles • Deterministic Reserving Methods • Chain-Ladder Algorithm	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.11	Describe further methods • Chain-Ladder in Linear Regression framework • Mack Model • Poisson Regression Model for Incremental Claims • Bootstrap Chain-Ladderrap Chain-Ladder	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.12	Optimization portfolio techniques	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
2.13	Quantify Reserve Risk 1. Ultimo Reserve Risk 2. One-Year Reserve Risk	Problem solving, projects, flipped classroom	Quizzes Midterm and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Study, learn and work independently.	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	Exchange with others, notions and methods on fitting data and credibility theory both in oral and written form clearly and in a well-organized manner	Encourage students to: - Register and pass C exam of SOA/CAS - use department and college computing facilities. - use e-mail, LMS internet, college and department websites,	
4.2	Use IT facilities of the university to exchange ideas around the world		
4.3	Use SDL (libraries) to get updated with new developments about the course		

		and KSU central library.	
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	4	5%
2	Group project	8	25%
3	Tests, Quizzes	10	5%
4	Group project	12	25%
5	Final	15 or 16	40%

D. Student Academic Counseling and Support

1. 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)

Office hours, exchange questions and answers by email: **10 hours per week**

E Learning Resources

1. List Required Textbooks
   1. Computational Actuarial Science with R, First Edition,Kindle Edition byArthur Charpentier(Editor)(2016)(Chapman & Hall/CRC The R Series)
   2. Rob Kaas, Marc Goovaerts, Jan Dhaene, Michel Denuit- Modern Actuarial Risk Theory Using R (2009), Springer

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, Virtual classroom, TeamViewer
2. Technology resources (AV, data show, Smart Board, software, etc.) Smart Board, LMS (Bb), TeamViewer, Email, Kahoot
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 1. Evaluation sheets to be completed by students at the end of each semester. 2. Take the students' opinion about the course under consideration. 3. Revise course syllabus with instructors who teach the same course (if any).
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department 1. The level of the students in solving homework and quizzes 2. Colleagues' opinions about students' performance in this course.
3. Processes for Improvement of Teaching 1. Encouraging students to get involved in the lecture. 2. Getting the use of tutorial classes. 3. 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) 1. Common Examination 2. Team grading. 3. Exchanging experience by comparing students' results in other departments. 4. Studentswho 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 textbook content. 2. Providing a discussion for the course subject by a specialized committee. 3. Compare the program with other well-known established universities. 4. Consulting some course specialists for course evaluation.
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Name of Course Instructor: ___Prof. Dr. Mhamed ED DAHBI _____

Signature: _____ _____ Date Specification Completed: March 11, 2018

Program Coordinator: _____

Signature: _____Date Received:_____