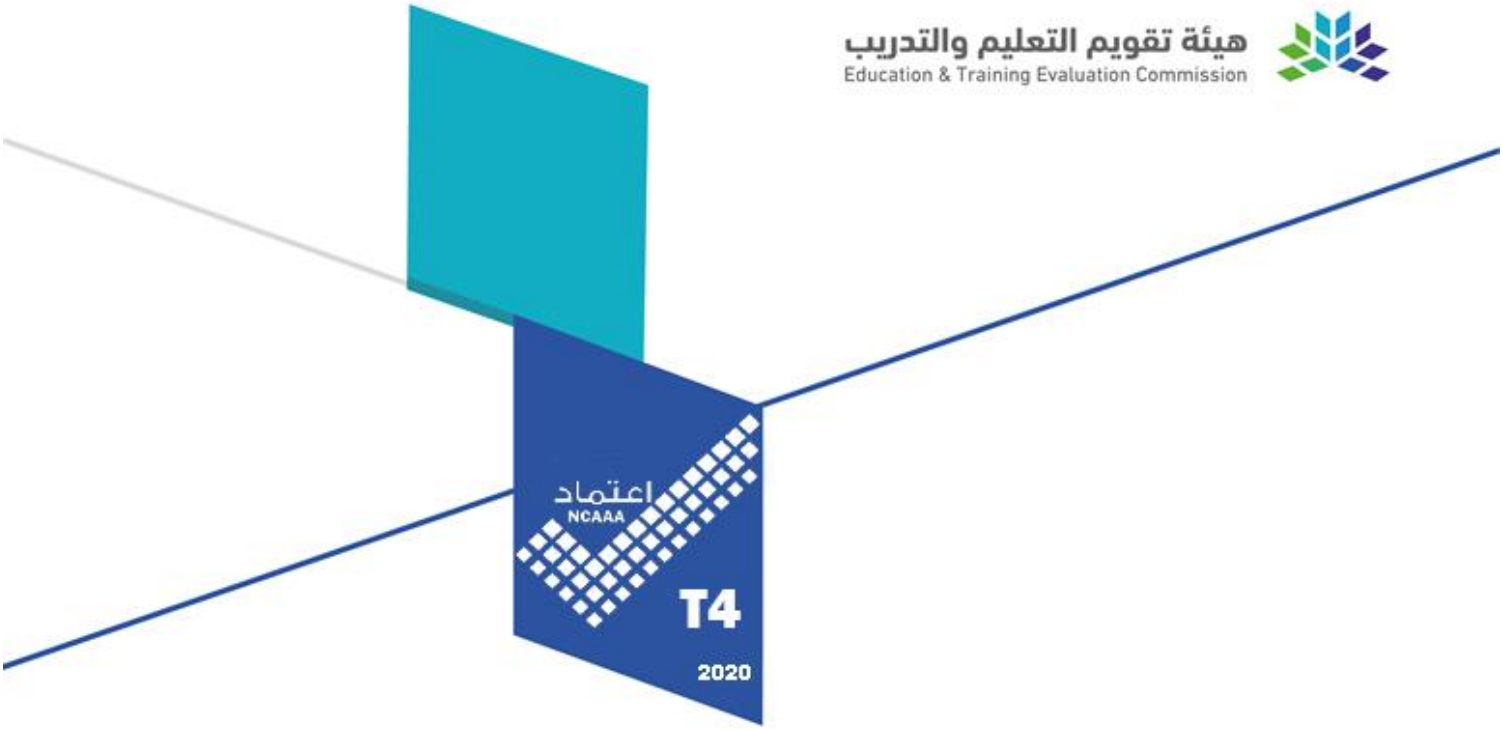
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	Credibility Theory and Loss Distributions
Course Code:	ACTU 475
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Math. Dept.
College:	College of Science
Institution:	King Saud University

Table of Contents

A. Course Identification

1. Credit hours:	4(3+2+0)
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	8/4
4. Pre-requisites for this course (if any)**:**	ACTU 474 (Risk Theory)
5. Co-requisites for this course (if any)**:**	None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom** √		
2	**Blended**		
3	**E-learning**		
4	**Distance learning** √	60	100%
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	36
2	**Laboratory/Studio**	
3	**Tutorial**	24
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction: Modeling, Random Variables, Key Functions, and Four Models and Basic Distributional Quantities. Characteristics of Actuarial Models, Creating New Distributions, Selected Distributions, and Their Relationships and The Linear Exponential Family. Frequency and Severity with Coverage Modifications. Aggregate Loss Models. Mathematical Statistics: Moments, and Percentile Estimation, Maximum Likelihood Estimation (MLE) and Bayesian Estimation. Construction of Empirical Models and Model Selection. Limited Fluctuation Credibility and Greatest Accuracy Credibility. General Applications in Credibility Theory and Loss Distributions.

2. Course Main Objective

The goal of this course is introducing students to survival, severity, frequency and aggregate models, and learn them statistical methods to estimate parameters of such models given sample data. Students should at the end of the course to be able to identify steps in the modeling process, understand the underlying assumptions implicit in each family of models, recognize which assumptions are applicable in a given business application, and appropriately adjust the models for impact of insurance coverage modifications.

3. Course Learning Outcomes

	CLOs	Aligned-PLOs
1	**Knowledge and Understanding**	
1.1	Explain fundamental concepts of credibility theory and Construct collective and individual risk models that are related to insurance businesses.	K1
1.2	Describe different collective and individual models in insurance, competing risks, liability and survival analysis.	K2
1.3	Demonstrate the use of IT packages (Matlab) in actuarial models.	K3
2	**Skills:**	
2.1	Construct statistical loss models that are the best fit to data and also, estimate the greatest accuracy credibility.	S1
2.2	Evaluate and solve complex problems in loss models and credibility theory.	S2
3	**Values:**	
3.1	Demonstrate commitment to academic values and exhibit ethical behavior and respect different points of view.	V2
3.2	Qualify students to pass in the STAM exam of SOA	V3

C. Course Content

No	List of Topics	Contact Hours
1	Introduction: Modeling, Random variables, Key Functions, and Four Models and Basic Distributional Quantities. Characteristics of Actuarial Models, Creating New Distributions, Selected Distributions, and Their Relationships and The Linear Exponential Family. Frequency and Severity with Coverage Modifications. Aggregate Loss Models.	20
2	Mathematical Statistics: Moments, and Percentile Estimation, Maximum Likelihood Estimation (MLE) and Bayesian Estimation. Construction of Empirical Models and Model Selection.	15
3	Limited Fluctuation Credibility Theory, Full Credibility and Partial Credibility.	10
4	Greatest Accuracy Credibility: Conditional Distributions and Expectation, The Bayesian Methodology, The Credibility Premium, The Bühlmann Model, The Bühlmann-Straub Model and Exact Credibility.	10
5	General Applications in Credibility Theory and Loss Distributions.	5
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Explain fundamental concepts of credibility theory and Construct collective and individual risk models that are related to insurance businesses.	Lecture strategy	• homework assignments. • quizzes, mid-term exams and final exam.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Describe different collective and individual models in insurance, competing risks, liability and survival analysis.		
1.3	Demonstrate the use of IT packages (Matlab) in actuarial models.		
2.0	**Skills:**		
2.1	Construct statistical loss models that are the best fit to data and then, estimate the greatest accuracy credibility.	Problem solving strategy	• assignments • quizzes, mid-term exams and final exam
2.2	Evaluate and solve complex problems in loss models and credibility theory.	Lecture and problem solving strategy	
…			
3.0	**Values:**		
3.1	Demonstrate commitment to academic values, exhibit ethical behavior, and respect different points of view.	Discussions & Dialogue	Performance level through multi-discussions
3.2	Qualify students to pass in the STAM exam of SOA	Problem solving strategy	mid-term exams and final exam

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments	Weekly	10%
2	Mid-term exam. I	6	25%
3	Mid-term exam. II	12	25%
4	Final exam.	16	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

• Office hours: 10 hrs/week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Loss Models: From Data to Decisions, (Fifth Edition), 2019, by Klugman, S.A., Panjer, H.H. and Willmot, G.E., John Wiley & Sons, ISBN: 978-1-119-52378-9.
Essential References Materials	

Electronic Materials	http://fac.ksu.edu.sa/eelmahdy// www.math.uiff.edu/matlabhttp:// http://www.khayma.com/education-technology/ http://www.siam.org/ http://www.math.psu.edu/mathlists/contents,htm//
Other Learning Materials	An Introductory Guide in the Construction of Actuarial Models, 2017, Arkansas Tech University, by Marcel B. Finan.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	A classroom which accommodates 25 students equipped with usual blackboard and smart board connected with internet.
Technology Resources (AV, data show, Smart Board, software, etc.)	SPSS- MATLAB- MAPLE-MINITAB- SCIENTIFIC WORK PLACE (SWP)-MATHEMATICA-OFFICE- ANTIVIRUS
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Computer lab equipped with relevant software

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students, program leaders, chairman of the department and faculty deanship.	Direct through online student feedback: **EduGate System: Online Academic Portal**, and also from the annual assessment of faculty member.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Math. Dept.
Reference No.	
Date	22/11/2022

Course Coordinator: **Dr/ Emad E. Elmahdy** Signature: *Emad Elmahdy*