



Course Specifications

Course Title:	Stochastic Processes
Course Code:	MATH 380
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics Department
College:	College of Science
Institution:	King Saud University

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A. Course Identification

1. Credit hours: 4(3+2+0)	
2. Course type	
a. University <input type="checkbox"/>	College <input type="checkbox"/>
Department <input checked="" type="checkbox"/>	Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>
3. Level/year at which this course is offered: Level 6 / Year 3	
4. Pre-requisites for this course (if any): MATH 280, STAT 216	
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 <input checked="" type="checkbox"/>	75	100%
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	45
2	Laboratory/Studio	
3	Tutorial	30
4	Others (specify)	
	Total	75

B. Course Objectives and Learning Outcomes

<p>1. Course Description</p> <p>Basic probabilistic modelling in operations research and Applied Mathematics. Methods of problem formulation and solution. The course will cover basic stochastic processes such as simple random walk, Markov chains, Martingales, Brownian motion, and Poisson and Yule Processes.</p>
<p>2. Course Main Objective</p> <p>(1) Student knows the standard concepts and different methods of stochastic modeling</p> <p>(2) Student be able to illustrate the rich diversity of applications of stochastic processes in many applied sciences</p> <p>(3) Student can do more exercises in the application of simple stochastic analysis to appropriate problems</p>

3. Course Learning Outcomes

CLOs		Aligned-PLOs
1	Knowledge and Understanding	
1.1	Explain fundamental concepts advanced probability and stochastic processes and their applications life and nonlife insurance.	K1
1.2	Describe different models using stochastic processes in real life problems.	K2
2	Skills :	
2.1	Evaluate and solve problems of risks using Markov chains models.	S2
2.2	Model actuarial, financial and many life problems using applied mathematics concepts and stochastic processes.	S3
3	Values:	
3.1	Prepare partially student to Probability and LTAM OSA Exams.	V3

C. Course Content

No	List of Topics	Contact Hours
1	Definition of Stochastic Processes - Probability Review - Discrete Distributions - Continuous Distributions - Conditional Probability and Conditional Expectation.	25
2	Markov chains in discrete: Definitions, Transition Probability Matrices, and Some Markov Chain Models: Random Walks, Branching Processes, Long Run Behavior of Markov Chains and Poisson Processes.	25
3	Continuous Time Markov Chains: Birth and Death Processes, Wiener Process (Brownian Motion) and Poisson Processes with a Markov Intensity.	20
4	General Applications in Stochastic Processes.	5
Total		75

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 advanced probability and stochastic processes and their applications life and nonlife insurance.	Lecture strategy	quizzes, mid-term exams and final exam.
1.2	Describe different models using stochastic processes in real life problems.		
2.0	Skills :		
2.1	Model actuarial, financial and many life problems using applied mathematics concepts and stochastic processes.	Lecture strategy	quizzes, mid-term exams and final exam.
2.2	Evaluate and solve problems of risks using Markov chains models.	Problems solving	quizzes, mid-term exams and final exam
...			
3.0	Values:		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.1	Prepare partially student to Probability and LTAM OSA Exams	Problems solving	quizzes, mid-term exams and final exam

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes and homework.	weekly	10%
2	Mid-term exam. I	5	25%
3	Mid-term exam. II	10	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	
Essential References Materials	An Introduction to Stochastic Modeling, Mark A. Pinsky and Samuel Karlin, 4th ed. (2011), Academic Press, Elsevier Publishing Inc.
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	A First Course in Stochastic Processes, Howard M. Taylor and Samuel Karlin, 2nd ed. (1975), Academic Press, Inc.

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

Item	Resources
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	Actuarial and Financial Mathematics / Department of Mathematics
Reference No.	
Date	1/9/2022

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

Signature: *Emad Elmahdy*