KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS
STAT 416: Stochastic Processes for Actuaries (251)

Instructor: Dr. Boubaker Smii

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Office Hours: UT 8:20 am – 09:00 am & 09:00 to 09:45 am and
R: 09:00 to 09:45 am
or by appointment

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Textbook: Introduction to Probability Models, 11-th edition by Sheldon M. Ross (2014)

Additional References:

T. Mikosch. Elementary Stochastic Calculus with Finance in View. World Scientific Publishing Co. Pte. Ltd. 1998.

Rick Durrett, Essentials of Stochastic Processes (1999) ISBN 0-387-98836-X

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Course Description:
Basic classes of stochastic processes. Poisson (regular, compound, compound surplus, and non-homogenous) and renewal processes with applications in simple queuing systems and Actuarial Science. Discrete and continuous time Markov chains. Birth-Death and Yule processes. Branching models of population growth processes. Actuarial risk models, simulation. Arithmetic and geometric Brownian motions, and applications of these processes such as in computation of resident fees for continuing care retirement communities, and pricing of financial instruments.

Assessment for this course is based on class activities (attendance & homework & Quizzes), a midterm exam and a comprehensive final exam, as described in the following table: Assessment

Grading Policy:

	Date	Time	Place	Materials	Percentage
Exam I	TBA	TBA	TBA	(Chapters 1,2,3,4)	25%
Exam II	TBA	TBA	TBA	(Chapters 5,6,7)	25%
Final Exam	TBA	TBA	TBA	Comprehensive	35%
Attendance (02)& Participation(03)	More or equal than 4 absences (full mark is deducted). less or equal than 3 absences (1 mark is deducted)				5%
Class Work	It is based on quizzes, class tests or other class activities determined by the instructor.				10%

Communication:

- For regular announcements, students are advised to check Blackboard regularly.

Academic Integrity: All KFUPM policies regarding ethics and academic honesty apply to this course.

Important Attendance Notes:

- In accordance with University rules, **9 (NINE) unexcused absences** or **12 (TWELVE) excused-unexcused absences** will automatically result in a grade of **DN**.
- Attendance on time is very important. Mostly, attendance will be checked within the first five minutes of the class. Entering the class after that, is considered as one late, and every two times late equals to one absence. The student has to be available until the end of the class.

Cheating in Exams:

Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in a grade of **DN** in the course along with reporting the incident to the higher university administration. Cheating in exams includes (but is not limited to)

- Looking at the papers of other students
- Talking to other students
- Using mobiles or any other electronic devices **including Smart Watch**

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), she/he must bring an official excuse from Students Affairs. Otherwise, she/he will get zero in the missed exam.

The Usage of Mobiles in Class: Students are not allowed to use mobiles for any purpose during class time. Students who want to use electronic devices to take notes must take permission from their instructor. Violations of these rules will result in a penalty decided by the instructor.

Syllabus

Week #	Date	Chapter	Material
1	Aug 24 – 28	Chapter 1 Chapter 2 Chapter 3	Introduction to Probability theory (review) Random variables (review) Density, Expectation and variance of random variables
2	Aug. 31 – Sep.4	Chapter 1 Chapter 2 Chapter 3	Probability density function of a random variable Conditional Probability and Conditional Expectation (review)
3	Sep.7-Sep.11	Chapter 2	Limit Theorems Stochastic processes
4	Sep. 14 – 18	Chapter 4	Discrete Markov Chains Some applications
5	Sep. 21 – 25	Chapter 4	Chapman Kolmogorov Equation Limiting probabilities
	National Holiday: September 23rd		
6	Sep.28-30	Chapter 4	Limiting probabilities(cont.) Branching Processes
7	Oct. 5 – 9	Chapter 5	The Exponential distribution The Poisson Processes (cont.)
8	Oct. 12 – 16	Chapter 5	The Poisson Processes
9	Oct. 19 – 23	Chapter 6	Continuous-Time Markov Chains Birth and Death Processes
Midterm Break: October **26-30**			
10	Nov. 2 – 6	Chapter 6	The Transition Probability function Limiting Probabilities
11	Nov.9 – 13	Chapter 7	Distribution of N(t) Limit theorems and their applications
12	Nov. 16 – 20	Chapter 7	Renewal Process Reward Process
13	Nov. 23 – 27	Chapter 10	Brownian motion Hitting Times Variations on Brownian motion
14	Nov. 30– Dec.4	Chapter 10	Geometric Brownian motion
15	Dec.7-Dec.11	Chapter 10	Pricing Stock Options The Black-Scholes option pricing formula White noise Gaussian processes
16	Dec. 14		Catch-up and Review