KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS
STAT 416: Stochastic Processes for Actuaries (211)

Instructor: Dr. Kroumi Dhaker

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Office Hours: MW 2:00 PM – 4:00 PM or by appointment
Time: UTR 2:00 PM – 3:00 PM
Place: Building 59 – Room 1010

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

Additional References: 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 nonhomogenous) 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%
Absences+Homeworks					2+5%
Class Work	It is based on quizzes, class tests or other class activities determined by the instructor.				8%

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.

Suggested Problems:

- ✓ Suggested problems will be posted on the BLACKBOARD towards the end of each chapter.

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.

Grading:

Your course grade will be based on the total of points accumulated on class work two major exams, and Final Exam. The following scale gives the cut-off points for the course grades.

Letter grade	A+	A	B+	B	C+	C	D+	D	F	DN
Cut-off	90%	85%	80%	75%	67%	60%	55%	50%	<50%	≥ 9

Syllabus – A rough weekly guideline

Week #	Date	Section	Material	Notes
1	Aug 28 – Sep 01	Chapter 1 Chapter 2 Chapter 3	Introduction to Probability theory (review) Random variables (review) Conditional Probability and Conditional Expectation (review)	
2	Sep 04 – Sep 08	4.1 4.2 4.3	Introduction, Chapman – Kolmogorov Equation Classification of States	
3	Sep 11 – Sep 15	4.3 4.5 4.6	Limiting Probabilities Some applications Mean time Spent in Transient States	
4	Sep 18 – Sep 22	4.7 4.8	Branching Processes Time Reversible Markov Chains,	

	Sep 22		Thursday, National Day Holiday	
5	Sep 25 – Sep 29	5.1 5.2 5.3	Introduction The Exponential distribution The Poisson Process	
6	Oct 02 – Oct 06	5.3 5.4	The Poisson Processes (cont.) Generalization of the Poisson Processes	**1st Major Exam (chapters 1,2,3,4)**
7	Oct 09 – Oct 13	6.1 6.2 6.3	Introduction Continuous-Time Markov Chains Birth and Death Processes	
8	Oct 16 – Oct 20	6.4 6.5 6.6	The Transition Probability Limiting Probabilities Time Reversibility	
9	Oct 23 – Oct 27	7.1 7.2 7.3	Introduction, Distribution of N(t) Limit Theorems and their Applications	.
10	Oct 30 – Nov 03	7.4 7.5 7.6 7.7	Renewal Reward Processes Regenerative Processes Semi-Markov Processes The Inspection Paradox	
11	Nov 06 – Nov 10	7.8 7.9 7.10	Computing the Renewal Function Applications to Patterns The Insurance Ruin Problem	
12	Nov 13 – Nov 17	8.1 8.2 8.3	Introduction Preliminaries Exponential Models	**2-nd Major Exam (chapters 5, 6, 7)**
13	Nov 20 – Nov 24	8.4 8.5 8.6 8.7	Network of Queues The System M/G/1 Variation on the M/G/1 Model G/M/1	
14	Dec 04 – Dec 08	10.1 10.2 10.3	Brownian Motion Hitting Times Variations on Brownian Motion	
15	Dec 11 – Dec 15	10.4 10.5	Pricing Stock Options The Maximum of Brownian Motion with Drift	
16	Dec 18		Revision	**Normal Thursday Class**
	Final Exam (Comprehensive): As posted on the Registrar Website			