KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS

STAT 515: Stochastic Processes

Instructor: Dr. Brahim Mezerdi

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Office Hours: UT 3:00 PM – 5:00 PM or by appointment
Time: UTR 2:00 PM – 2:50 PM
Place: Building 59 – Room 1015

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

Additional References:

- **Rick Durrett**, Essentials of Stochastic Processes (1999) ISBN 0-387-98836-X
- **Bernt Øksendal** Stochastic Differential Equations: An Introduction with Applications. 6th Edition. Springer 2010.

Course Description:

Basic classes of stochastic processes. Poisson processes. Renewal processes. Regenerative processes. Markov chains. Stochastic population models and branching processes. Queuing processes. Applications of Stochastic process models.

Prerequisites

- **STAT 501: Probability and Mathematical Statistics**
  - **Not to be taken with courses**
  - EE 570: Stochastic Processes
  - ISE 543: Stochastic Processes - I

Course Objectives

1. Enable students to describe the properties of Poisson processes
2. Enable students to describe the properties of discrete and continuous Markov chains
3. Enable students to use Stochastic process models to real applications.

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

Grading Policy:

	Date	Time	Place	Materials	Percentage
Midterm Exam	TBA	TBA	TBA	TBA	30 %
Final Exam	TBA	TBA	TBA	Comprehensive	40 %
Project					15 %
Class Work	It is based on quizzes, class tests or other class activities determined by the instructor.				15 %

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

Important Attendance Notes:

- In accordance with University rules, **20 % , 6 unexcused absences** or 33.3 %, **10 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.

Syllabus – A rough weekly guideline

Week #	Date	Section	Material	Notes
1	Aug 28 – Sep 01	Chapt 1	Introduction to Probability theory Discrete and continuous random variables	
2	Sep 03 – Sep 07	Chapt 2	Expectation, variance, random vectors, covariance, independence of random variables Conditional probability and conditional expectation	
2	Sep 03 – Sep 07	Chapt 4	Markov chains Chapman – Kolmogorov Equation Classification of States	
3	Sep 10 – Sep 14	Chapt 4	Limiting Probabilities Some applications Mean time Spent in Transient States	

4	Sep 17 – Sep 21		Branching Processes Time Reversible Markov Chains,	
	Sep 24	**Thursday, National Day Holiday**		
5	Sep 25 – Sep 28	Chapt 5	The Exponential distribution The Poisson Process	
6	Oct 01 – Oct 05	Chapt 5	The Poisson Processes Generalization of the Poisson Processes	
7	Oct 08 – Oct 12	Chapt 6	Continuous-Time Markov Chains Birth and Death Processes	
8	Oct 15 – Oct 19	Chapt 6	The Transition Probability Limiting Probabilities	
9	Oct 22 – Oct 26	Chapt 7	Renewal theory and applications	.
10	Oct 29 – Nov 02	Chapt 7	Regenerative Processes Semi-Markov Processes	
11	Nov 05 – Nov 09	Chapt 8	Queuing Theory Exponential Models	
12	Nov 12 – Nov 16	Chapt 8	The System M/G/1 The System M/G/1 Model G/M/1	
	Nov 19 - Nov 23	**Midterm Break**		
13	Nov 26 – Nov 30		Option pricing for discrete models The binomial model in finance	
14	Dec 03 – Dec 07	Chapt 10	Brownian Motion Geometric Brownian motion Continuous time processes	
15	Dec 10 – Dec 14	Chapt 10	Pricing European Options The Black Scholes equation and formula	
16	Dec 17		Revision	**Normal Thursday Class**
	Final Exam (Comprehensive): As posted on the Registrar Website			

Communication:

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