KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
DEPARTMENT OF MATHEMATICAL SCIENCES

YEAR 2012-13, 1ST TERM

STAT 416
Stochastic Processes for Actuaries

Instructors: Drs. Boubaker Smii & Walid Sharbati

1. BOOKS:

 [1] Basic Stochastic processes, by Brzezniak.

 [2] Elementary Stochastic Calculus with Finance in View, by Mikoch.

Course Description: Basic classes of stochastic processes, Poisson 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. Matlab will be used for demonstrations and simulation.

Prerequisite: Stat 301

2. Syllabus

Week	Date	Section	Part I (Theory)
1	Sep. 1-5	1-2	Basic concepts from Probability theory (Review)
2	Sep. 8-12	6	6.1. Stochastic processes
3	Sep. 15-19	6	6.2 Poisson Process 6.2.1 Exponential distribution and Lack of Memory
			National Day: Sunday September 23, 2012
4	Sep. 22-26	6	6.3 Brownian motion 6.3.1 Definition and Examples
5	Sep. 29-Oct. 3	6	6.3.2 Increments of Brownian Motion 6.3.2 White noise and Gaussian processes 6.3.3 Brownian Sample Paths
6	Oct. 6-10	6	6.3.5 A simple version of the Itô Formula 7.1 The Itô Stochastic Integral for Simple Processes
7	Oct. 13-17	7-8	7.3 The Black-Scholes Option Pricing Formula 8.1 Markov chains: Definition and Basic properties
			Id al-Adha Vacation: Oct. 18- Nov. 2, 2012
8	Nov. 3-7	8	8.2 Transition matrix of a Markov Chain 8.3 Chapman - Kolmogorov equations 8.4 Classification of states
			Part II(Applications)
9	Nov. 10-14	6	6.1 Simulation of Brownian Sample Paths
10	Nov. 17-21	7	7.1 Branching processes 7.2 Time reversible Markov chains

11	Nov. 24-28	8	8.1 Analysis of Time Series (Probability Models) 8.2 Exponential Smoothing Method
12	Dec. 1-5	9	9.1 Actuarial Risk Model Formulation
13	Dec. 8-12	10	10.1 Birth-Death and Yule-Walker Processes 10.2 Autoregressive (AR) Processes
14	Dec. 15-19	11	11.1 Moving Average (MA) Forecasting 11.2 Autoregressive Integrated Moving Average Processes
15	Dec. 22-26	12	12.1 Applications and Computational Aspects 12.2 Simulation of The Black-Scholes Option Pricing Formula

Exams and Distribution of Marks

Exam I (**25%**)
Exam II (**25%**)

Homework and Attendance: **10%**

Final Exam **40%** (Comprehensive): The time and place of the Final Exam will be determined by the Office of the Registrar.

The DN Grade: According to the university regulation.