Math 423: Stochastic Processes

CATALOG DESCRIPTION
Sequences and classes of random variables. Applications to physical, biological, social and management sciences. Topics include Markov chains, branching processes, the Poisson process, queuing systems and renewal processes.

Prerequisites: Math 238 and Math 318

GOALS OF THE COURSE
(1) To develop an understanding of the logical structure and style of mathematics and probability by:
   (a) Using reason in an orderly, cogent fashion.
   (b) Writing clear, well organized solutions to problems.
   (c) Evaluating critically and using mathematical definitions.

(2) To develop the ability to use mathematical tools to solve problems and to transfer this knowledge to analogous situations by:
   (a) Using tools of linear algebra (matrix multiplication and eigensystems) to answer questions about probabilities and expectation of stochastic processes.
   (b) Using function operations (e.g., composition and convolution) to answer questions about probabilities and expectations of stochastic processes.
   (c) Using calculus (differentiation and integration) to answer questions about probabilities and expectation of stochastic processes.

(3) To develop computational and modeling skills such as:
   (a) Writing a computer simulation of stochastic processes and collection of relevant data.
   (b) Applying a stochastic model for a relevant physical process and interpreting probabilistic analysis in terms of that process.
   (c) Written communication of mathematical ideas in the context of a physical application.

(4) To develop an understanding of the theory of stochastic processes:
   (a) The application of conditional probability and conditional expectation.
   (b) The theory of Markov chains, Poisson processes, branching processes and queuing processes.
   (c) The theory of limit theorems in stochastic processes.
REQUIRED MATERIALS

In addition to the hard copy book, there is an Amazon Kindle version of both editions, and the 3rd edition has a rental option that is very economical. The 4th edition also has an electronic edition through CourseSmart.com using the following link:

http://www.coursesmart.com/IR/1931417/9780123814166?__hdv=6.8

**Technology:**
We will be using the open-source R programming language. This is available in many campus laboratory computers and is also available as a free download through the following link:

http://www.r-project.org/

INSTRUCTOR INFORMATION
Dr. Brian Walton
Office: Roop 110
Phone: 540–568–6387
E-mail: waltondb@jmu.edu

Website: Walton's JMU faculty website (with links to various webapps)
Blogs: Walton's JMU Math Blog
IM: Google, Skype, AIM all using dbrianwalton (but only by appointment)

**Drop-In Office Hours:** (no appointment necessary)
Mondays 9:00–10:00
Tuesdays 9:00–11:00 and 3:30–4:30
Wednesdays 9:00–10:00
For other times, please contact me in advance for an appointment.

MEETING INFORMATION
Classes will meet every Monday, Wednesday and Friday at Burruss 32
10:10am–11:00am.

IMPORTANT DATES
January 11: No class meeting (conference)
January 15: Last day to drop a class without withdraw
January 21: Martin Luther King, Jr. Day. No classes
March 4–8 Spring Break
Fri, March 15: Last day to withdraw from a class
Fri, May 3: Final Exam 8:00am–10:00am
GRADING POLICIES
Course grades will be based on a weighted average of grades in a variety of different grading categories.

- Participation = 5%
- Homework = 30%
- Midterm Take–Home Exam = 20%
- Final Project = 15%
- Final Exam = 30%

The weighted score at the end of the semester will determine the letter grade based on the percentages:

90–100% = A, 80–90% = B, 70–80% = C, 60–70% = D, 0–60% = F.

Pluses and minuses may be rewarded.

HONOR CODE POLICY
The JMU Honor Code ([http://www.jmu.edu/honor/code.shtml](http://www.jmu.edu/honor/code.shtml)) emphasizes that every action we undertake represents our own, personal contribution, honestly obtained and submitted. It is important that you do your own work and that work you submit represents only your own work.

DISABILITY ACCOMMODATIONS
Students with disabilities who require reasonable accommodations to meet course requirements must register with the Office of Disability Services ([http://www.jmu.edu/ods/](http://www.jmu.edu/ods/)) and contact me to discuss access issues. You will be respected and your confidentiality will be maintained.

ADDITIONAL JMU POLICIES