MATH 480: Probability, Stochastic Processes and Applications I,
Fall 2022, MWF 11-11:50, Agricultural 0152, Instructor: Dr. Olive

Text: Ross, Sheldon, M. (2014), *Introduction to Probability Models*, 11th ed., Academic Press, San Diego, CA. ISBN: 978-0124079489

(You may also use 4th – 10th editions, ≈ $10 at www.addall.com and www.amazon.com.)

Course Webpage: http://parker.ad.siu.edu/Olive/M480.html

The *prerequisite* for this class is Math 251, but I will let in students who have a C or higher in Math 250. Math 221–Linear Algebra, is useful for Markov chains. *R* software will be used.

email: dolive@siu.edu *Office hours: MWThF 1:00-2:30*

I am also available by appointment and on a walkin basis, e.g. after class. The course webpage will make some things available on the internet for students with covid concerns.

This course is an introduction to probability and stochastic processes. Topics include random variables, the central limit theorem, sums of independent random variables, moment generating functions, conditional probability, expectation, moments, Markov chains, Poisson processes, random walks, Brownian motion, renewal processes, and applications for random number generation and simulation. There is a overlap with the first 7 chapters of Math 483, Math 401-402 (probability for life contingencies (insurance)) and Math 403 (probability for loss models).

Actuaries put a price on risk, and this course is useful for the actuarial exam P (probability) as well as CAS Exam MAS-I (Modern Actuarial Statistics-I: section A Probability Models: Stochastic Processes and Survival Models uses sections 4.1-4.8, 5.2, 5.3, 5.4, 9.1-9.6, 11.1, 11.2). The text has material useful for CAS Exam MFE (Models for Financial Economics) and SOA exam IFM (Investment & Financial Markets).

Becoming an actuary is a potential option after you get your degree. You can be hired after receiving a Bachelor's degree and passing (1 or more likely) 2 exams (SOA Exam P = CAS Exam 1P=Probability exam Math 483 or 480, and the FM Exam Math 400 are common). From (https://www.dwsimpson.com/about/salary-survey/), in 2020 salary was roughly $46000-$56000 for one exam, $34000-$72000 for two exams, $47000-$87000 for three exams, and $50000 - $84000 for 4 exams with less than 1 year of actuarial experience. An ASA (Associate of the Society of Actuaries) makes about $75000-$120000 with 1-3 years of experience while an FSA (Fellow of the Associate of Actuaries) makes about $104000-$165000 with 3-5 years of experience. See (http://money.cnn.com/2013/04/25/news/economy/best-job-actuary/index.html). This course provides some insight on what an actuary does. Useful links are (www.soa.org), (www.casact.org), (www.actexmadriver.com) and (www.beanactuary.org).

Probability is useful for Statistics, Actuarial Mathematics, Financial Mathematics, and Stochastic Differential Equations. Some other good books (also see Probability and Statistics texts): Ash, C. (1993), *The Probability Tutoring Book: an Intuitive Course for Engineers and Scientists (and Everyone Else!)*, IEEE Press, Piscataway, NJ.

Ash, R.B. (2008), *Basic Probability Theory*, Dover, Mineola, NY. Online at (http://www.math.uiuc.edu/∼r-ash/).

Finan, M.B. (2018), *A Probability Course for the Actuaries: a Preparation for Exam P/1*, at (http://faculty.atu.edu/mfinan/actuarieshall/Pbook.pdf) (765 pages, 10 sample

exams, also see www.soa.org/Files/Edu/edu-exam-p-sample-quest.pdf and www.soa.org/Files/Edu/edu-exam-p-sample-sol.pdf)

Hassett, M.J., and Stewart, (2006), *Probability for Risk Management*, 2nd ed., ACTEX Publications, Winsted, CT.

Hoel, P.G., Port, S.C., and Stone, C.J. (1972), *Introduction to Stochastic Processes,* Houghton Mifflin, Boston, MA.

Ross, S. (1992), *Applied Probability Models with Optimization*, Dover, Mineola, NY.

Ross, S. (2012), *A First Course in Probability*, 9th ed., Pearson/Prentice Hall, Upper Saddle River, NJ.

Woodroofe, M. (1975), *Probability With Applications*, McGraw-Hill, New York, NY.

(Cumulative) Final: Wednesday, Dec. 14, 2:45-4:45.

The grading and schedule below are tentative. Last day to drop: office on Friday, Oct. 28, by internet Sunday, Oct. 30.

Students receive a WF if they stop attending class and fail. An INC is given if for reasons beyond their control, students engaged in *passing* work are unable to complete all class assignments. Two HWs may be turned in one class period late with no penalty and a 3rd with 25% penalty except for the last week of classes. I sometimes give grades like $A-$, $B+$, $B-$, and $C+$.

Grading: 1 HW and 1 Quiz will be dropped.

HW	300		Quizzes	100	
exam1	100	exam 2	100	exam 3	100
final	300			total	1000
min. grade	points	min. grade	points	min. grade	points
A	900-1000	B	800-899	C	700-799
D	550-699				

Week of	MON	WED	FRI
Aug 22	1.1, 1.2	1.3, 1.4	1.4
Aug 29	1.5, 1.6	1.6, HW1	1.6, Q1
Sept 5	no class	2.1,2.2,HW2	2.2,2.3, Q2
Sept 12	2.3	2.3,2.4, HW3	2.2, 2.4, Q3
Sept 19	2.4	2.4, 2.5, HW4	2.4, 2.5, Q4
Sept 26	2.4, 2.5	Exam 1	2.5
Oct 3	2.5,2.6	2.8, HW5	2.8, Q5
Oct 10	2.8	2.8,3.2,3.3, HW6	3.2, 3.3, Q6
Oct 17	3.4,3.5	2.9, 5.1,5.2,5.3, HW7	5.3, Q7
Oct 24	5.3, 5.4	5.3, 5.4, HW8	5.3, 5.4, Q8
Oct 31	5.4, 4.1	Exam 2	4.1,4.2,4.3,4.4
Nov 7	4.3,4.4	4.4, 10.1, 10.3, HW9,Q9	no class
Nov 14	10.2,10.3,10.8	10.2,10.3,10.8,HW10	10.8, 2.8, Q10
Nov 21	no class	no class	no class
Nov 28	2.8,11.1	11.1,11.2, HW11	11.2,11.4, Q11
Dec 5	11.4, 7.1	Exam 3	7.2?, 7.3?, review