

COURSE OUTLINE

IOE 515

Stochastic Processes

Fall Term

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GSI: Li Yang

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COURSE DESCRIPTION:

This is a basic course in stochastic processes with emphasis on model building and probabilistic reasoning. The approach will be non-measure theoretic but otherwise rigorous. Topics to be covered include a review of elementary probability theory with particular attention to conditional expectation; the Poisson process; renewal theory; Markov chains; and some continuous state models including Brownian motion. Applications will be considered in queueing, reliability, and inventory theory.

REQUIRED TEXT:

Sheldon Ross, Stochastic Processes, 2nd edition, Wiley, 1996.

RECOMMENDED SUPPLEMENTARY TEXT:

Sheldon Ross, Introduction to Probability Models, Academic Press, latest.

REFERENCES:

Cinlar, E., Introduction to Stochastic Processes, Prentice-Hall, Englewood Cliffs, New Jersey, 1975 (same level).

Feller, W., Introduction to Probability Theory and Its Applications, Vols. 1 and 2, Wiley and Sons, 1967. (higher level).

Heyman D., and Sobel, M., Stochastic Models in Operations Research, (Vol. 1), McGraw-Hill, 1982 (same level).

Karlin, S., and Taylor, H., A First Course in Stochastic Processes, 2nd Edition, Academic Press, 1975 (higher level).

Parzen, E., Stochastic Processes, Holden Day, 1962 (same to slightly higher level).

Wolff, R., Stochastic Modeling and the Theory of Queues, Englewood Cliffs, NJ, 1989 (same level).

GRADING:

Midterm Exam (Wed Nov 3)	30%
Homework	30%
Final Exam (Thurs Dec 16 ^{**})	40%

<u>Week</u>	<u>Date</u>	<u>Topic</u>	<u>Reading</u> (Text)	<u>Homework*</u> (Text/Handout)
1	9/8	Introduction		
2	9/13	Review of Probability	1.1-1.4; 1.6, 1.8	1.1,1.7,1.8, 1.13,1.15,/36
3	9/20	Conditional Expectation/ <u>Stochastic Processes</u> , Independent and Stationary Increments	1.5; 1.8	1.18,1.19,1.25 /1,3,7
4	9/27	<u>Poisson Processes</u> -Definition and Characterizations	2.1	2.4,2.5,2.9, 2.14/37
5	10/4	Interevent and Event Time Distributions	2.2-2.3	2.1,2.2,2.13 /11,14,15
6	10/11	<u>Compound and Nonhomogeneous Poisson Processes</u>	2.4-2.5	-----
7	10/20	<u>Renewal Processes</u> -Definition and Examples	3.1-3.2	2.7,2.20-2.22, 2.26
8	10/25	Long Run Behavior	3.3-3.4	2.30,2.32, 2.33/19,20,21

^{**} Final exam Thursday Dec 16 4:00pm to 6:00pm

^{*} Homework due Monday of the *following* week

9	11/1	Stopping Times, Wald's Equation, and the Key Renewal Theorem Midterm Exam (Wed Nov 2)	3.4	-----
10	11/8	Alternating Renewal Processes, Excess Life and Age Distributions	3.4-3.5	3.1-3.4,3.7,3.9 /27
11	11/15	<u>Delayed Renewal and Renewal Reward Processes</u>	3.5-3.6	3.11-3.16
12	11/22	<u>Markov Chains</u> -Definition and Examples	4.1	3.17(b),3.21, 3.28,3.29
13	11/29	Class Properties-Transience and Recurrence	4.2	4.2,4.3,4.8(a), 4.10/30,33
14	12/6	Long Run Behavior	4.3-4.4	4.12,4.13,4.14, 4.16,4.17/35
15	12/13	Long Run Behavior		-----

COURSE POLICIES AND PROCEDURES:

Homework:

Students are allowed to work in groups on homework. However each student is individually responsible for expressing their answers in their own terms. Also you may not acquire, read, or otherwise utilize answers from solutions handed out in previous terms. Homework is due at the beginning of class one week after it is assigned. Late homework will not be accepted.

Exams:

a) Please note the exam times above. Valid excuses for failing to meet an exam are personal illness or illness in your immediate family. You must observe the Honor Code (<http://www.engin.umich.edu/students/bulletin/rules/>) with respect to examinations and all other aspects of this course.

b) If you believe an exam question was graded in error and wish to have the exam regraded, you must submit the exam to the GSI together with a *written* explanation for requesting the regrade. This must be done within *one week* from the date the exam was returned. Be aware that an exam that is regraded may result in *all* of the graded problems being regraded so that you may lose or gain points by resubmitting.

CTools:

A course website has been set up for IOE 515 in CTools (<http://ctools.umich.edu/>). The GSI for the class will send out occasional announcements via e-mail to all registered students. In addition, a mailing list has been set up for the class. If you have questions about the material, you should send an e-mail to ioe515fall2010@ctools.umich.edu with your question. The GSI will respond to questions sent to the mailing list within 24 hours. Mail sent to the course mailing list will be sent to everyone in the class so please do not use it for private matters. Any private/confidential e-mails that need to be communicated directly to the GSI should be sent to youngli@umich.edu.