Course Syllabus
MTH 66: Stochastic Processes
Fall Semester 2008

Course:
Title: MTH660 – Stochastic Processes
Section: 101
CRN: 3418
Classes: Lectures – TR 6:30 – 7:45 PM; SH 509

Instructor:
Dr. Alfred Akinsete
Morrow Library – ML105
Phone number 696 3285
Email address – akinsete@marshall.edu

Office Hours:
TR 9:00 AM – 12:00 Noon
Any other time by appointment

Course Description, Objectives, Credits, and Prerequisites:
Description: The course starts with a review of probability theory, random variables and conditioning. We focus mainly on the following: Markov Chains, Exponential Distribution and Poisson Process, Continuous – Time Markov Chains, and Queuing theory. And depending on the availability of time, we may discuss any or all of renewal theory, reliability and Brownian motion.

Objective: The course aims at the applications of stochastic processes to natural and physical phenomena.
Credit Hours: 3
Prerequisite: MTH 445/545, or any equivalent course approved by the instructor.

Text Information:

Coverage:
Here is a tentative schedule and order of topics which will be covered.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Period</th>
<th>Ending Date</th>
<th>Cum. Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of Probability: Chapters 1 – 2</td>
<td>(1 week)</td>
<td>08/28/08</td>
<td>01</td>
</tr>
<tr>
<td>Conditioning – Probability and Expectation: Chapter 3</td>
<td>(2 weeks)</td>
<td>09/11/08</td>
<td>03</td>
</tr>
<tr>
<td>Markov chains: Chapter 4</td>
<td>(3 weeks)</td>
<td>10/02/08</td>
<td>06</td>
</tr>
<tr>
<td>Poisson Process: Chapter 5</td>
<td>(2 weeks)</td>
<td>10/16/08</td>
<td>08</td>
</tr>
<tr>
<td>Continuous – Time Markov Chains: Chapter 6</td>
<td>(2 weeks)</td>
<td>10/30/08</td>
<td>10</td>
</tr>
<tr>
<td>Queuing Theory: Chapter 8</td>
<td>(2 weeks)</td>
<td>11/13/08</td>
<td>12</td>
</tr>
<tr>
<td>Any topic(s) of interest (if there is time)</td>
<td>(1 week)</td>
<td>11/20/08</td>
<td>13</td>
</tr>
<tr>
<td>Review for final and seminar presentation</td>
<td>(1 week)</td>
<td>12/04/08</td>
<td>14</td>
</tr>
<tr>
<td>Seminar presentation</td>
<td>(1 day)</td>
<td>12/09/08</td>
<td>14.5</td>
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Attendance
Students are expected to attend all scheduled classes. It is the student’s responsibility to find out what was discussed in a missed class. Although, attendance records will not be used to compute grades (except possibly in borderline cases), however, missing class can be expected to significantly reduce your chances
of success. Note also that it is the student’s responsibility to present approved notice of any absence that would be excused under the terms and regulations stipulated by the university.

**Plagiarism**

Note that plagiarism (the submission as one’s own work of any oral, graphic, or written material wholly or in part created by another), is a form of academic dishonesty. Sanctions for academic dishonesty shall be imposed in accordance with university’s guidelines on such matter.

**Homework**

Homework problems will be collected and graded. Make it a habit to do your homework the same day they are assigned. Ensure to submit your homework as at when due. Submission within 24 hours from when it is due will be based on 80% of full credit. No late submission will be accepted after 24 hours from when it is due. You are welcome to collaborate with other students on homework, although you must turn in your own work, and written in your own style and words. Solutions to problems must be made clear and neat. In cases where solutions require explanation and derivation, a one-number solution will not be accepted. Homework exercises assigned on a Tuesday (Thursday) shall be due for submission the following Thursday (Tuesday).

**Examination**

The final grade will be based on the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Tests</td>
<td>200</td>
</tr>
<tr>
<td>Homework</td>
<td>100</td>
</tr>
<tr>
<td>Final Project*</td>
<td>100</td>
</tr>
<tr>
<td>Final Examination</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
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</table>

* A final project will require you to explore a topic of your choice, with the view of making a theoretical or/and applied presentation. See the attached for more details.

The semester grade will be based on the percentage of the 500 total possible points, using the following scale.

- 90 -100% -- A
- 80 - 89% -- B
- 70 - 79% -- C
- 60 - 69% -- D
- 0 - 59% -- F

**FINAL EXAMINATION: Tuesday December 16 [6:30 PM – 8:30 PM]**

**A short summary of my teaching philosophy**

The following is a short form of my teaching philosophy. It is intended to inform you of my teaching style and what I expect from you in the course of our teaching and learning.

My teaching philosophy is guided by the axiom ‘Tell me, I’ll listen, show me, I’ll understand, involve me and I’ll learn’, which elevates involvement and participation as key issues in the learning process. Reflecting on my teaching, I recognize the magnitude of the impact I am to my students. As a faculty, my primary goals are to provide qualitative teaching, nurtured by quality research and other services to the university and the community within their respective foci and mandates. In the discharge of this responsibility, especially in the teaching of mathematical sciences courses, I see the learners as the focus, the teacher as facilitator, resource, organizer, participant and assessor, while the classroom becomes part of the rich learning environment, where learners are assisted to develop those skills that promote life long
learning in their various vocations. Over the years, I have seen myself teaching students, rather than only teaching them mathematics and statistics.

I have embraced learner centeredness in the course of my teaching profession, through the use of tasks and activities that promote learner autonomy and encourage students to become problem solvers as these have beneficial influence on learning as well as the dynamics of the classroom itself. The beauty of the learner centered approach is that it allows the teacher to understudy each group of learners and also offers the teacher the benefit of switching smoothly between the roles of facilitator, resource, organizer and participant in order to enhance learning, rather than being the focus in the classroom. I therefore see it with utmost responsibility to organize my courses and conduct myself in a manner that allows students to benefit immensely from this approach. I fervently believe that different levels of teaching and different categories of learners place before the teacher different demands and challenges. Ultimately however, students who are encouraged to take responsibility for their learning by effective participation and involvement in class through direct interaction with instructors and course-mates emerge matured and independent, and they are capable of navigating successfully through challenges in their work place. I have found out that students are generally willing to participate as long as they are made to understand the significance of the process, and not a way to uncover their ignorance, if any.

Obviously, some students initially are negatively disposed to this approach particularly in a learning culture that reveres the teacher as a repository of knowledge. Also learners who are timid may readily not adjust to this method. With counseling, persuasion and perseverance, such students soon realize that the whole essence of learning itself is the development of the learner through interaction and involvement and they too become very comfortable as they readily blend with others in the class. I encourage my students to interact with one another and work in small groups. This affords the students the opportunity to engage in interpersonal relationship, be more relaxed, and ultimately benefit from one another.

One of the great attributes of being an excellent teacher is to also be teachable. An individual is not an island of knowledge, and there are great and many ideas and resources that one could learn from others. To this end, I solicit feedback from my students in the middle of the semester, rather than having to wait for the usual end of semester evaluation. I also meet regularly with class representatives on what are needful to be addressed to ensure that a healthy environment is created and maintained for learning. This self assessment allows me to address any problems that might have arisen in the course of teaching and learning.

**Additional Resource Materials**

The following are other resource materials. Let me know if you are interested in any of them, and I would be glad to let you have it for a period of time.


More on Final Projects

Following the earlier information on the final project, I provide below some suggestions you may wish to follow for your final project. Note that you are not bound to adopt any of the topics or areas from the list, howbeit, you should consult with me on your choice of topics.

1. **Card Shuffling.** This is an important topic in modern Markov chains. The problem is to determine reasonable hypotheses to be imposed on the shuffling process that would imply thorough mixing. See if you can get the following papers:

2. **Self-organizing lists or Ordering.** Imagine you have a stack of folders on your desk. Each time you need a folder, you find it, use it, and then put it on the top of the stack when you are done with it. In other words, this stack organizes itself.

3. **Markov Chain Monte Carlo (MCMC) – the Hastings-Metropolis Algorithm.** This is an important and elegant algorithm that is found useful in modeling. The aim is to simulate from an unknown probability distribution, by constructing a Markov chain whose stationary distribution is the distribution of interest, and then running the chain long enough to get close to the target distribution.
   - See Chapter 4 of our text for this course: (Ross, S. M. *Introduction to Probability Models*).

4. **Martingales.** This is a fundamental topic in probability and stochastic processes, leaning heavily on condition expectation.
   - And a host of many other books and journal articles.

5. **You may also want to choose from any of the following, but more general topics:**
   - Random Walk
   - Branching Processes
   - Queueing Theory
   - Renewal Processes
   - Game Theory