ESI 4313: Operations Research 2

Spring 2017

Department of Industrial and Systems Engineering

University of Florida

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Class Meeting Times and Location: M, W 8-9 (3:00 PM – 4:55 PM), CSE E121

Course Catalog Description: ESI 4327C and STA 4321 with minimum grades of C

Required Course Materials

- "***Introduction to Probability Models,***" Author: Sheldon Ross, Academic Press: 11th edition, ISBN: 978-0124079489

Recommended Course Materials

- "***Introduction to Probability,***" Authors: Dimitri Bertsekas, John Tsitsiklis, Athena Scientific; 2nd edition, ISBN: 978-1886529236
- "***Operations Research: Applications and Algorithms***," Author: Wayne Winston, Cengage Learning; 4th edition, ISBN: 978-0534380588

Course Assessment

- Homework: 10%
- Midterm Exam 1: 30% (February 8, 2017 – 3:00 PM)
- Midterm Exam 2: 30% (March 22, 2017 – 3:00 PM)
- Final Exam: 30% (April 27, 2017 – 7:30 AM to 9:30 AM)

Course Objectives

This course teaches the basic concepts of stochastic modeling in operations research. Students will develop and enhance their ability to address various problems that involve randomness/uncertainty.

- Stochastic Modeling and Probability

- Markov Chains
- Queuing Analysis
- Stochastic Decision Making

Course Topics

1. **Review of Probability**: Axioms - Conditioning - Distribution functions - Exponential and Normal random variables - Independence - Expectation - Collections of random variables - Conditional expectation - Total Expectation Theorem - Derived distributions

2. **Poisson Processes**: Bernoulli processes - Multiple definitions of Poisson processes - Arrival times - A limit of a Bernoulli process - Merging/Splitting

3. **Markov Chains**: Definition and description - Modeling: states and transition probabilities - Classification of states - Chains with finite and infinite state spaces - Steady-state probabilities - Hitting times and absorption probabilities - Birth-death processes - Continuous-time Markov Chains - Generator Matrices - Transitions - Stationarity.
4. **Queuing Theory**: Notation - Little's law - M/M/1 - PASTA property - Multi-server models - Models with heterogeneous servers - Finite-source models - Exponential queues in tandem - Jackson networks.

5. **Reliability Theory**: Structure function – Reliability of systems of independent components – Bounds on the reliability function – System life as a function of component lives – Expected system lifetime – Systems with repair.
6. **Dynamic Programming (If time permits Additional Topic)**: Deterministic dynamic programming models and applications - Modeling - Optimality principle - Graphical representation - Examples: shortest-path, inventory, equipment replacement - Stochastic dynamic programming models - Markov decision processes.

7. **Brownian Motion (If time permits)**: Definitions - Variations of Brownian motion - Hitting times - Supremum of a Brownian motion with drift - Pricing stock options: Black-Scholes.

Exam Grading Appeals: every effort will be made to ensure that grading is as objective and fair as possible. If you believe that there is an error in the grading, please submit, in writing, an appeal within one week of your exam being returned. However, please be advised that if you submit such an appeal, the entire exam will be re-graded to ensure that all parts are properly graded. As such, your grade on the exam could increase or decrease based on the secondary grading.

Make-up Exam Policy: You are expected to be present without exception and to plan any travel around these dates accordingly. Medical emergencies are of course excluded if accompanied by a doctor's note. A note indicating that you were seen at the health center the day of the exam is not sufficient documentation of a medically excused absence from an exam. The note must say that you were medically unable to take the exam. If you fail to take the exam on the assigned day and do not have a valid excuse, there will be no make-up exam and you will be given a zero (0) on the exam. Employment interviews, employer events, weddings, vacations, etc. are not excused absences.

Honesty Policy: All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others. Any form of cheating will be penalized.

Accommodation for Students with Disabilities: Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation. UF Counseling Services: Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
- Career Resource Center, Reitz Union, 392-1601, career and job search services.

Software Use: All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Note: Please notify that the course syllabus is subject to change during the semester. Please make sure you follow the course announcements tentatively.