550.252 Fall 2011 Exam II Review Guide

GENERAL INFO: You are responsible for all the material covered from 09/30/11 to 11/11/11. This includes material from lecture, section, assigned reading, handouts, and Homeworks 5 through 8, and Case I. (It should be understood that you are expected to be familiar with ALL the material covered from 08/29/11 to 09/30/11.)

This exam is closed book, no calculator. You may bring a ONE sheet of notes (8.5x11 or smaller; front and back). Your notes may be typed or handwritten. Do NOT use photocopies of another student's notes or of the course text or material from this or a similar course.

This document details the material that was covered from 09/30/11 to 11/11/11. All of this is "fair game" for the exam unless an exception is noted.

Probability Concepts

1. Be able to compute the expected value of a continuous or discrete random variable.
2. Be able to compute the expected value of a function of a continuous or discrete random variable.
3. Be able to compute the variance of a continuous or discrete random variable: $Var(X) = E(X^2) - [E(X)]^2$.
4. Be able to compute the probabilities for certain events (e.g., complements, equal likelihood, independent events, mutually exclusive events)
5. Define: complement, mutually exclusive, collectively exhaustive, disjoint, cumulative distribution function, probability density function (pdf), probability mass function (pmf), mean, median, mode, variance, standard deviation
6. Be familiar with the following continuous probability distributions: triangular, normal, uniform, beta, exponential
7. Be familiar with the following discrete probability distributions: discrete uniform (i.e., equal probability), binomial, poisson
8. Computation of conditional probabilities

Chapter 5: Project Scheduling (Sections 5.1–5.3, 5.8–5.9, 5.11)

Note: Since many of the techniques listed below are calculation intensive, student may only be required to list a formula. If a complete calculation is required, it will be indicated on the exam.)

1. Key terms: activity, project, PERT, CPM, PERT/CPM Network, early start/finish times, late start/finish times, activity slack, critical path

2. Given a schedule of activities and their completion times, student should be able to draw the PERT/CPM network, compute ES, LS, EF, LF, and slacks for an activity, identify a critical path.

3. Probabilistic PERT: given best case, worst case, and most likely time estimates for an activity, student should be able to compute the expected value (mean), variance, and standard deviation for (the distribution of) an activity's completion time.

4. More Probabilistic PERT: Given ES, LS, EF, LF, μ, σ, and the slack for an activity, the student should be able to compute the mean and variance of the project's completion time. What is distribution we assume for the project's completion time?

5. More Probabilistic PERT: Be able to calculate the following:

$$P(\text{project completed in} \leq t \text{ days}),$$

$$P(\text{project completed in} \geq t \text{ days}),$$

$(1 - \alpha) \times 100\%$ confidence interval for project completion time.

6. Cost Analyses using EV approach

7. PERT/Cost: determine whether a project is on time and/or within budget or not.

Chapter 6: Decision Analysis (Sections 6.1–6.7)

Given a problem statement, the student should be able to use the techniques of decision analysis to determine the optimal alternative.

1. Decision making under uncertainty vs. decision making under risk; Which decision criteria are appropriate under which circumstances?

2. States of nature: what does the term mean? Given a problem, how would you define the states of nature for use in decision analysis?

3. Mutually exclusive and collectively exhaustive events (why are these properties important when using probability distributions?)

4. Be able to create a payoff table; clearly define the pieces of the table.
5. Decision making criteria for the pessimist / optimist / risk neutral / regretful (i.e., maximin, maximax, principle of insufficient reason, and minimax regret)
6. Expected value criterion (special considerations on use?)
7. Be able to define and calculate: Expected value of perfect information, Expected value of sample information, Efficiency.
8. Prior probability vs. posterior probability: What's the difference? Be able to use Bayes' rule to revise probabilities.
9. What is utility theory?
10. Utility functions: what does a risk averse, risk prone, or risk neutral curve look like.
11. Expected utility criterion
12. Decision Trees are EXCLUDED from this exam

Chapter 13: Nonlinear Optimization (Sections 13.6–13.8)
Be able to formulate simple problems involving a nonlinear objective function and/or constraints.

Chapter 9: Queuing Theory
This chapter is EXCLUDED from this exam.