

**ACT SCI 300 Fall 2011
ACTUARIAL SCIENCE METHODS I
Exam P (Probability) Review
SYLLABUS**

LEC 001: GRAINGER 1185, 16h00-18h00, Monday

LEC 002: GRAINGER 1175, 16h00-18h00, Tuesday

Faculty Responsible:

Professor E.W. (Jed) Frees

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4112 Grainger Hall

(608)262-0429

Office hours: by appointment

Instructor:

Marc-André Desrosiers

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Office hours:

Tentatively: Monday and Tuesday, 11h30-12h30

(in **Room 1290** Grainger Hall) or by appointment

Course Description:

The purpose of this course is to help you prepare for Exam P by reviewing (for some; for some, it will be learning) topics from probability theory and the supporting calculus. It is assumed that you have learned or are learning the material from courses such as "MATH 431: Introduction to the Theory of Probability" or "STAT 311: Intro to Mathematical Stat" or "STAT 309: Introduction to Math Statistics". One of these classes needs to be taken concurrently or have been taken in the past; that being said, you should expect that the pace of the class will either demand of you to review quickly the material or learn about it in anticipation of your concurrent class.

Structure of the Course:

1. Introduction of materials related to the topic of the week: I will usually show you typical problems and how they can be solved, introducing key theoretical concepts along the way
2. Problem solving: Two to three times in the semester, I will ask you (with two or three students forming a team) to prepare solutions to selected problems and share the solutions with the class
3. Practice problems: I will usually leave you some time in class to work on some targeted problems from the question bank
4. Twenty minutes quizzes (most weeks): nothing like practice
5. A mid-term exam aimed at checking that you can execute basic probability computations
6. An 'exam P dry run' to check your level of preparedness, so that you can tailor an action plan based on where you're at and where you think you need to be to pass

Teaching Philosophy and Expectation:

This class is fundamentally a participation class. I don't want you to feel there is undue pressure to get the right answer the first time around. I am expecting that you will be making many mistakes at that point of the learning process. I want you to become aware of the way you learn, what you succeed at, what you need to improve, *etc.* I will give a portion of the points to getting the right answer; but, if you participate well, you will not have a problem getting an excellent grade.

I do intend for you to have to make leaps on solving problems that you haven't seen before: this is a key actuarial skill. I don't intend to force you to learn formulas by heart: I'd prefer that you come to learn what formulas you'll need because you've been thoroughly acquainted with them. The subject at hand will force you to learn new notation: while I understand that some of you may prefer problems written in words, actuarial science is deeply connected with mathematics and learning new notation is both expected and unavoidable.

Required Textbooks:

1. *Schaum's Outlines Probability and Statistics*, 3rd Edition
(You can purchase this book from amazon.com or some other places.)
2. *Exam P: Question & Answer Bank*, BPP professional Education.
(You can purchase this required textbooks from Copy Center in Grainger.)

Optional Other Material:

1. *ACTEX P/1 Study Manual*, 2010 Edition
(<http://www.actexamdriver.com/productdetails.cfm?PC=1135>)

Tentative Class Schedule:

| Week *: weeks with quizzes | Date | Topics | Schaum Outline: <u>this material needs to be read and prepared for the class:: this includes reading up on the theory and looking at the associated solved problems</u> | Question Bank (focus problems - bold underlined : I will do some of them with you in class, and you will have time to attempt the others) |
|-------------------------------------|---------------|---|--|---|
| 1 | 09-12/13 | Introduction, Risk and Insurance, and Calculus Review | | |
| 2 * | 09-19/20 | Introduction to Probability and Counting Techniques | 1: Random Experiments, Sample Space, Events, The Concept of Probability, The Axioms of Probability, Some Important Theorems on Probability, Assignments of Probability, Combinatorial Analysis, Fundamental Principle of Counting: Tree Diagrams, Permutations, Combinations, Binomial Coefficient | 1-41 (<u>1</u> , <u>2</u> , <u>3</u> , <u>4</u> , <u>5</u> , <u>6</u> , <u>7</u> , <u>8</u> , <u>9</u> , <u>11</u> , <u>28</u>) |
| 3 * | 09-26/27 | Conditional Probability and Bayes' Theorem | 1: Conditional Probability, Theorems on Conditional Probability, Independent Events, Bayes' Theorem or Rule | 42-75 (<u>42</u> , <u>43</u> , <u>45</u> , <u>47</u> , <u>56</u> - - - <u>55</u> , <u>69</u>) |
| 4 * | 10-03/04 | Random Variables I | 2: Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Independent Random Variables + + + Conditional Distributions 3: Definition of Mathematical Expectation, Functions of Random Variables, Some Theorems on Expectation, The Variance and Standard Deviation, Some Theorems on Variance, Moments, Moment Generating Function, Some Theorems on Moment Generating Function | 76-133 (76, 77, 78, <u>80</u> , 81, 87, 97, 104, 106 - - - <u>84</u> , <u>89</u> , <u>90</u> , <u>92</u> , <u>95</u>) |
| 5 * | 10-10/11 | Random Variables II | 2: Continuous Random Variables, Graphical Interpretations, Convolutions 3: Other Measures of Central Tendency, Percentiles, Other Measures of Dispersion, Skewness and Kurtosis | 76-133 (<u>96</u> , <u>98</u> , <u>104</u> , <u>113</u> , <u>114</u> , <u>115</u>) |
| 6 | 10-17/18 | Mid-Term Exam | | |
| 7 * | 10-24/25 | Common Distributions I | 4: The Binomial Distribution, Some Properties of the Binomial Distribution, The Poisson Distribution, Some Properties of the Poisson Distribution, Relationship Between the Binomial and Poisson Distributions, Geometric Distribution, Pascal's or Negative Binomial Distribution | 134-218 (134, 135, 136, <u>138</u> , <u>150</u> , <u>151</u> , 152, 153, 175, 176, 181, 186, 188, 197 - - - <u>155</u> , <u>163</u> , <u>167</u> , <u>172</u>) |
| 8 * | 10-31 / 11-01 | Common Distributions II | 4: The Uniform Distribution, The Gamma Distribution, The Beta Distribution, The Chi-Square Distribution, Exponential Distribution | 134-218 (<u>175</u> , <u>176</u> , <u>178</u> , <u>180</u> , 181, <u>186</u> , 188, <u>190</u> , 197, <u>200</u>) |
| 9 * | 11-07/08 | Normal Distribution | 3: Standardized Random Variables, Chebyshev's Inequality, Law of Large Numbers 4: The Law of Large Numbers for Bernoulli Trials, The Normal Distribution, Some Properties of the Normal Distribution, Relation Between Binomial and Normal Distributions, Relationship Between The Poisson and Normal Distributions, The Central Limit Theorem | 219-265 (<u>220</u> , <u>223</u> , <u>224</u> , 228, <u>230</u> , <u>238</u> - - - <u>242</u> , <u>243</u>) |
| 10 * | 11-14/15 | Joint and Conditional Distributions I | 2: Joint Distributions, Conditional Distributions 3: Variance for Joint Distributions, Covariance, Correlation Coefficient, Conditional Expectation, Variance and Moments | 266-331 (266, 268, 269, 270, 271, <u>272</u> , 273, 276, 277, 278, 281, 282, 283, 284, 286, <u>287</u> , 288, 289, <u>290</u> , 292, 293, <u>294</u> , 295, 296, 298, <u>301</u> , 302, 305, <u>307</u> , 308, 309 - - - <u>274</u>) |
| 11 * | 11-21/22 | Joint and Conditional Distributions II | 4: The Bivariate Normal Distribution | 266-331 (<u>291</u> , <u>297</u> , <u>310</u> - - - <u>303</u> , <u>306</u> , <u>317</u> , <u>320</u> , <u>323</u> , <u>325</u> + + + <u>S.Q.</u> , <u>29</u> , <u>S.Q.</u> , <u>144</u>) |
| 12 | 11-28/29 | Exam P 'Dry Run' | | |
| 13 * | 12-05/06 | Transformation of Random Variables | 2: Change of Variables, Probability Distributions of Functions of Random Variables, Convolutions | 332-370 (333, 334, 335, 336, <u>337</u> , <u>338</u> , <u>339</u> , <u>340</u> , <u>341</u> , <u>342</u> , 343, <u>344</u> , 345, 346, 348, 349) |
| 14 | 12-12/13 | Review | | |

Course Assessment:

Your grade will be based on the following:

| | |
|--|-----|
| Attendance and Participation | 35% |
| Homework and Problem Solving Presentations | 25% |
| Quizzes | 20% |
| Mid-Term Exam | 10% |
| Exam P 'Dry Run' | 10% |

Attendance and Participation: Attendance will be taken at the beginning of each class period. Please come to class each week ON TIME. You may miss some important announcements if you are late. Each student is expected to actively participate in every class session.

Homework and Problem Solving Presentations: There may be a couple of classes where I ask you to complete a graded homework at the beginning of the next class. That being said, I will assign problems and material that I expect you to prepare for the next class. Some of this material will be challenging problems that some of you will be specifically assigned. Like mentioned above, two to three times during the semester, I will ask you to work with other students to prepare solutions that you will share with the class. It is expected that all students will have attempted to solve the problems, even if they don't have to present the solution to the class.

Quiz: You will have a 20-minute quiz, most weeks, before the end of the class. The quiz will include two problems based on the topics discussed in the previous week. Our policy is not to give make-up quizzes unless you have legitimate reasons or family emergencies. Quizzes will be discussed at the beginning of the following week.

Mid-Term Exam: The goal of the exam is to make sure you have absorbed the material of the first couple of weeks. The materials of this class build on one another quite naturally and this will be an occasion for you to identify what you master or need to improve on basic material.

Exam P 'Dry Run': We will have one week where we will simulate a professional examination environment. There will be no homework due at the beginning of the class; instead, you are asked to prepare a sheet of notes that you will be allowed to use during the exam. You will be expected to follow the instructions I will give. If you do not comply, then I can void your test. It will be important for you to follow instructions, just as it will be important in professional exam settings. Please make sure that you have one of the allowed calculators, as I will inspect them at the start of the exam. Your grade will be based on your attendance, your compliance with instructions, your attempting of the problems, your solutions, and your answers.

Useful Links:

Society of Actuaries website:

<http://www.soa.org>

Casualty Actuarial Society website:

<http://www.casact.org/>

Be an Actuary website (contains all Exam P registration information):

<http://www.beanactuary.org/exams/>

A website that contains many practice questions for Exam P:

<http://www.saab.org/actuarial.html>

An actuarial discussion forum for Exam P:

<http://www.actuary.com/actuarial-discussion-forum/forumdisplay.php?f=8>

Approved Calculators:

Only the following models of Texas Instruments calculators are approved:

- * BA-35
- * BA II Plus
- * BA II Plus Professional
- * TI-30Xa
- * TI-30X II (IIS solar or IIB battery)
- * TI-30XS MultiView (or XB battery)

UW Actuarial Club

Check out the Actuarial Club at <http://actclub.rso.wisc.edu/>, you can get a lot benefit from the club, including:

- Meet other actuarial students
- Learn more about the profession
- Find friends and study partners
- Exam reimbursement

For more information, check the club website.

*** Please update your information on Actuarial Program Online Database in a timely manner.

<https://secure.bus.wisc.edu/actuarialevent/>