

STAT 111 – Fall 2012
SYLLABUS AND OTHER INFORMATION

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Homeworks Homeworks will be handed out on Fridays in recitation classes, and answers will be due in a week later (also in recitation classes). More details will be given in lectures.

Exams There will be one mid-term exam, to be given on October 29, 6 - 8 pm. The final exam is on December 18, 3 - 5 pm. More details as to where these exams will be held will be given later. The timing of both exams is set by the university and cannot be changed.

Assessment The assessment in this course is by homeworks (20%), the mid-term exam (30%) and the final exam (50%).

Textbook The textbook for the course is Downing and Clark, “E-Z Statistics”, Barron, 2009, ISBN 13: 978-0-7641-3978-9.

JMP The course will be given in association with use of the statistical package JMP 10. You should either install this package on your computer or learn use the Wharton computers that have it installed. It might help you to buy a copy of the JMP manual “JMP Start Statistics”, SAS. We won’t use JMP much, but it is useful to get used to the idea of using statistical packages.

Course description The content of this course falls into two broad categories, namely probability theory and statistics. The reason why we discuss probability theory will be given in the first lecture. A more detailed list of the topics covered within these two categories is given in the syllabus below. References to corresponding material in Downing and Clark for these topics are given in parentheses (...). **Note however that some material in the course is not covered by Downing and Clark, that the approach taken in class to some topics differs from that in Downing and Clark, and that some material given in class contradicts the (sometimes incorrect) corresponding material in Downing and Clark, so these references to Downing and Clark are no more than a rough general guide to the material that will be covered in class.**

SYLLABUS

1. Probability theory

- 1.1 The relation between probability theory and Statistics. Deductions (implications) and inductions (inferences).
- 1.2 Events and their probabilities. (DC 32–34)
- 1.3. Unions, intersections and complements of events and their probabilities. (DC 34–40).
- 1.4 Independence of events. (DC 38).
- 1.5 Conditional probabilities. (DC 75–86).
- 1.6 Discrete random variables and their probability distributions. (DC 87–106).
- 1.7 The fair die example.
- 1.8 The (identical) concepts of the mean μ and the expected value of a discrete random variable. The mean as a “balance point”. (DC 93–95).
- 1.9 The expected value of a function of a random variable. (DC 95).
- 1.10 Examples in the “fair die” case.
- 1.11 The variance and standard deviation of a discrete random variable. (DC 95–99).
- 1.12 Various rules concerning variances. (DC 98–99).
- 1.13 *Into the unknown*. The thumbtack example. The concept of a parameter and the binomial parameter θ . The binomial distribution. (DC 107–118).
- 1.14 The mean and variance of a binomial random variable. (DC 116).
- 1.15 The proportion of successes in the binomial context. The mean, variance and standard deviation of this proportion.
- 1.16 Many *iid* random variables whose distribution is known. The mean and variance of a sum and an average of many random variables. Examples in the “fair die” case. The mean and the variance of the sum of, and difference between, two independent random variables. (DC 180).
- 1.17 *Into the unknown again*. Many *iid* random variables whose distribution is unknown. Examples from the “unfair die” case.
- 1.18 Continuous random variables and their density functions. (DC 131–140).
- 1.19 The mean and variance of a continuous random variable. The mean as a “balance point”. (DC 138–140).
- 1.20 The normal distribution. (DC 143–155).
- 1.21 The “Z” transform and the standard normal distribution. The use of normal distribution charts. (DC 147–151).
- 1.22 The “one- and two- standard deviation rules”. (DC 149).
- The central limit theorem and its uses. (DC 192–198).
- 1.23 Approximating the binomial distribution by the normal distribution. (DC 193).

2. Statistics

2.1 *Estimation*

2.1.1 Estimation of the binomial parameter θ and the precision of this estimate. The “margin of error”. (DC 265–268).

2.1.2 The average (\bar{y}) as an estimate of the mean μ . The “unfair die” case again. (DC 205–207).

2.1.3 s^2 as an estimate of a variance. (DC 209).

2.1.4 s^2/n as an estimate of the variance of \bar{Y} .

2.1.5 An approximate 95% confidence interval for the mean. (DC 213–215).

2.1.6 Regression. (DC 289–300).

2.2 *Hypothesis testing* (227–245)

2.2.1 General principles of hypothesis testing. (DC 13–17, 227–230).

2.2.2 The concept of the p -value. (DC 230).

2.2.3 The one-sample t test. (DC 164–166, 231–235, 398).

2.2.4 Testing hypotheses about the binomial parameter θ . (DC 235–236).

2.2.5 2×2 table testing for association (= testing for the equality of two binomial parameters). (DC 240–243).

2.2.6 Further examples of hypothesis testing. (DC 236–240, 243–245, 277–284, 289–304)

2.2.7 Practical considerations. (DC 271–274)