Stat 410 – Statistical Applications in Insurance
Spring 2015
(3 Credit Hours – MWF 3:10pm – 4:00pm)

Prerequisite: The prerequisite for the course is MATH 443 or STAT 443.

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Office Hours: MWF 11:30am-12:30pm or by appointment

Textbooks:

Risk and Insurance by Judy Feldman Anderson, FSA and Robert L. Brown, FSA. This is study note available from the Society of Actuaries website

Risk Models and Their Estimation by Stephen G. Kellison, FSA, MAAA and Richard L. London, FSA. The text may be purchased at the student bookstore on online at www.actexmadriver.com.

Foundations of Casualty Actuarial Science, 4th Edition, by the Casualty Actuarial Society. This text is available from the Casualty Actuarial Society website.

Topic in Credibility by C.G. Dean. This is a study note available from the Casualty Actuarial Society website.

Calculator: Texas Instruments calculator TI30-Xa (this is what you will need for the actual actuarial exam. You may use any calculator you wish in the coursework).

Description: Statistics Applications in Insurance provides an introduction to the application of mathematics and statistics to the insurance field.

Core Areas: Critical and Creative Thinking; Quantitative Reasoning

Course objectives: In the course, we will introduce the students to insurance and risk terminology; demonstrate applications of discrete distributions to estimate claims frequency; demonstrate applications of continuous distributions to estimate claims severity; combine frequency and severity models to obtain aggregate claims models; study methods related to how much credibility should be given to observed data versus expected values; demonstrate how to adjust those distributions to reflect deductibles and policy limits; determine the percent discount that should be applied to properly rate a deductible (loss elimination ratios); learn how to estimate parameters of a selected distribution based on observed data. This course is designed to supplement the material from Stat 443 to finish preparation for the Society of Actuaries professional Exam P (Probability). Additionally, this course will lay the groundwork for preparation for the Society of Actuaries professional Exam C (Construction and Evaluation of Models). As this is course on the use and application of statistics to insurance problems and requires students to analyze and interpret data, all of the objectives and outcomes relate to Critical and Creative Thinking and Quantitative Reasoning. These objectives will be tested through homework and exams.

Upon Completion of this course, students will:	Relevant Material	Evaluation Methods
Understand insurance terminology relating to claims, deductibles and policy limits and be able to apply those concepts in determining expected outcomes of insured events.	Weeks 3-4, 12-13	Homework, Exams
Be able to use prior estimates, conditional probability and observed data to revise estimates of expected outcomes of insurance events	Week 3-4, 6-8	Homework, Exams
Be able to analyze a set of data representing claims counts and determine the appropriate discrete distribution to model the frequency of the occurrence of insurance events	Week 9	Homework, Exams
Be able to analyze a set of data representing claims amounts and determine the appropriate continuous distribution to model the severity of the claims distribution.	Weeks 11	Homework, Exams
Be able to analyze a set of data representing total aggregate claims and determine the appropriate distribution to model the aggregate claims distribution.	Week 12	Homework, Exams
Be able to calculate the Loss Elimination Ratios associated with deductibles and/or coinsurance clauses.	Weeks 12-13	Homework, Exams
Be able to use observed date to fit a parametric model to claims frequency, claims severity and aggregate claims	Week 14	Homework, Exams

Homework will be given on a regular basis and will be similar to examples worked in class and previous Exam P and C questions. The homework may include online assignments and printed assignments. The number of points will vary by assignment. The points from all homework assignments will be combined and adjusted to a weight of 20% of your final grade. Late homework will be accepted if submitted within 5 days of the due date. A penalty of 10% per day will be applied to late homework (e.g. an assignment that is 3 days late will receive a 30% reduction for being late in addition to any points deducted for incorrect work. If an assignment is more than 5 days late, it will not be accepted. If there are extenuating circumstances, such as an extended illness, the instructor, at their discretion may choose to waive the penalty and accept the homework after the 5 day period. That decision will made on a case-by-case basis.

Midterm Exams: Each midterm exam will cover material from 2-4 chapters of material. You will be allowed one sheet of notes (at most 8.5 in x 11 in.). Depending on the amount of material and difficulty level of the exam (*i.e.* reasonableness of completing the exam in the allotted time), we may have between 2 and 4 mid-term exams. The combined points from all mid-terms will be adjusted to have a 40% weight in the final grade. The problems will be similar to homework, examples and previous exam P questions.

Final: The final will be comprehensive. The problems will be similar to homework, examples and previous exam P questions. The final exam will have a weight of 40% in the final grade.

Make-up Exams: Make-up exams will be allowed on a case-by-case basis and will on be given to accommodate university conflicts, illness with a doctor's note or other verifiable unforeseen emergencies.

Class Participation/Attendance: In order to properly prepare for the actuarial exam and to gain a working knowledge of the material, attendance and participation in class are a necessity. While this will not be graded, you are highly encouraged to attend.

Grade Distribution:

Midterm Exams	40%
Final Exam	40%
Homework	20%
Total	100%

Evaluation Criteria: The grading scale for this course will be as follows:
    A (93%-100%); A- (90%-93%); B+ (87%-90%); B (83%-87%) B- (80%-83%);
    C+ (77%-80%); C (73%-77%); C- (70%-73%) D+ (66%-70%); D (60%-66%); F(0%-60%)

Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

Statement Regarding Academic Integrity I encourage you to work with classmates on assignments. However, each student must turn in original work. No copying will be accepted. Students who violate WSU's Standards of Conduct for Students will receive an F as a final grade in this course, will not have the option to withdraw from the course and will be reported to the Office Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). It is strongly suggested that you read and understand these definitions:

Safety Statement: The Campus Safety Plan, which can be found at http://safetyplan.wsu.edu, and contains a comprehensive listing of university policies, procedures, statistics, and information relating to campus safety, emergency management, and the health and welfare of the campus community. Students should become familiar with the campus safety and emergency information provided at the safety plan web site and at. http://oem.wsu.edu/. Everyone should also become familiar with the WSU ALERT site (http://alert.wsu.edu/) where information about emergencies and other issues affecting WSU will be found. Students should also go to the myWSU portal at http://my.wsu.edu and register their emergency contact information for the Crisis Communication System (CCS).

Statement Defining Expectations for Classroom Conduct: Respect each other and treat others how you want to be treated. Please silence your cell phones and all other electronics and refrain from using these items during class. It's only a 50 – minute class, the text can wait. Do not disrupt the class, students are here to learn and cannot do so if others are being disruptive. If I feel you are disrupting the class or are disrespectful of anyone, I reserve the right to ask you to leave class for the day. Success in class requires reading the textbook, listening and asking questions in lectures, and doing all assigned work. Only you choose whether or not to succeed by doing these things.

Tentative Schedule of Events:

- Week 1: Risk and Insurance (Study Note)
- Week 2: Review of Bayes Theorem and using Bayes Theorem to update claims distributions based on observed data.
- Week 3: Deductibles and Policy Limits (capped insurance)
- Week 4: General Insurance problems involving joint distributions
- Week 5: Mid-term 1
- Weeks 6-8-: Credibility
    - Conditional Expectation and Variance
    - Buhlmann Credibility
    - Buhlman-Straub Credibility
    - Bayesian Credibility
    - Conjugate priors in Bayesian analysis
    - Empirical Bayesian methods in non-parametric and semi-parametric cases
- Week 9: Frequency Models
- Week 10: Mid-term 2
- Week 11: Severity Models
- Week 12-13: Aggregate models
    - Deductibles, Limits and Co-insurance
    - Loss Elimination Ratios
    - Inflationary effects
- Week 14: Construction and selection of parametric models
- Week 15: Review for Final
- Week 16: Final Exam

Disclaimer: The schedule and procedures outlined in this syllabus are subject to change in the event of circumstances beyond the instructor's control or in response to ongoing assessment of learning.