“The first reflection is, that a wide difference must be made between two kinds of truths: one, which relates simply
ot the nature of things, and their unchangeable essence, independently of their existence; the other, which relates to
things existing, and especially to human accidents and events, which may or may not be, when we inquire about the
future, but which cannot be otherwise when we inquire about the past.”

— Antoine Arnauld and Pierre Nicole, La logique ou l’Art de penser, 1662

Course Goals

Neither Bayesian nor frequentist conceptions of probability give me any measure of security on the particular concern
of whether my car will be totaled by collision with a crazy driver on the way home from work this evening. An almost
shocking fact of mathematics is that we can, by bundling this one risk with millions of others like it, we can take
advantage of the law of large numbers and actually give a considerable measure of security.

This course will give you some of the basic tools to do that.

The course will focus on the so-called “short-term” risks generally encountered in property and casualty insurance
(e.g. auto, home, liability), as opposed to the “long-term” risks more typical of life insurance, pensions, and health
insurance.

No single university class is enough to thoroughly prepare for an actuarial exam, where the usual recommendation
is hundreds of hours of study. However, this course should make you familiar enough with the material of SOA Exam
FAM-S to constitute a major part of your preparation for that exam.

Of course, all of this has major applications outside the actuarial realm. Quite often in life we want to predict the
frequency and severity of events and how many individual uncertainties compose into something relatively predictable.
What you learn here will serve you well there, too.

Course Content

We will start with an axiomatic construction of risk and insurance, before beginning the mathematical core of the
course. This course consists of constructing models for the frequency and severity of events, models for “aggregate
risk” (that is, the risk of a large portfolio of individual risks), and the estimation of parameters for these models.

Of course, all models are wrong, and the first limitation is that a model must pass the test of good business sense.
We will take some account of this in our treatment of coverage modifications (which make insurance economically
viable) and credibility (which tells when to trust the general reasoning and when to trust the particular experience).

Finally, we will conclude with application of these models to ratemaking (pricing) and reserving (making sure
that the insurer has enough money available to meet its uncertain future obligations), including option pricing.

Course Activities

Homework will be assigned frequently, and will be due each week on Wednesdays (unless otherwise announced). The
most common thing in all of mathematics — I do it myself, as does every other mathematician I know — is to see
somebody else doing a problem and say, “Yes, yes, of course. I understand completely,” and then walk away and
realize that we had no idea at all what was going on. Homework is your guard against this. If you really understand
how to do the homework, you’re generally in pretty good shape. If you can’t, you’ve got plenty of time to figure it
out, ask me, ask a friend, or take whatever other action you see fit.

Homework will always be due at 4:30 on the appointed day. You are, of course, welcome to turn it in when you
come to class. If you wish, though, you may continue to work on it, and may deliver it to my office or my department
mailbox.

Cooperation on homework is strongly encouraged. There will almost certainly be problems on which it is necessary.
Talk with each other, talk with me, talk with friends, use any resource. It is important, however, to be sure that you
understand the solution you present. In designing the tests, I will assume thorough familiarity with all homework
problems due before the date of the exam.
You are also encouraged to visit me in my office (see note on office hours above) or to call or e-mail me. To be
more clear: It’s a hard class. I’d like to see you do well in it. I’d love to talk with you and to help you in any way
that I can.
The homework will often be hard. You will seldom be able to solve all of the problems in one setting. Plan your
time accordingly.
The class will meet on Monday, Wednesday, and Friday at 9:00am. A typical meeting will begin with a discussion
of any questions folks have, with procedural matters treated first. This will be followed by a discussion of new
material (often in the form of problems, on which students will work in groups) and typically an assignment of new
homework.
You should be in every class meeting, and should make sure that you are actively engaged. It goes without saying
that when a problem is assigned for group work, you must do it. If you wait for me to tell you how to do it, then by
the time I talk about the solution with the class, everybody else will understand it and will be ready to ask about
issues you haven’t encountered, and you will be lost. Don’t do this. You should be careful to ask any questions you
have. You should also feel free to be wrong. We all will be at some point in the class. That’s why we gather together,
instead of just reading the book on our own: we can help one another understand better, and we can try out ideas
on each other, even if we aren’t quite sure of them.
There will also be some exams. Exams will be given in the regularly scheduled class time and place on October
4 and November 1. In addition, there will be a final exam at a time and place to be determined. The final will test
your ability to do all of the things we have worked on in class, with particular emphasis on material covered since the
mid-term exams.
The general philosophy is that class sessions and homework will be very hard and tests will be pretty easy
(assuming, of course, that you’ve suffered through the class meetings and homework leading up to them). Again, my
goal with the homework is to help you to understand the material so well that you’re unhappy with me for giving
such a boring (easy) test.
In all activities for this class, make sure that you do something. It is depressing how often students who probably
know something relevant to a problem do absolutely nothing, allowing no opportunity to receive credit on the part
they actually know.

Grading

Grades will be calculated from the following sources:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>200</td>
</tr>
<tr>
<td>In-class exam</td>
<td>200</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>600</strong></td>
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</tbody>
</table>

Failure to attend class regularly will certainly adversely affect your grades on each of these factors. For instance,
while I do not artificially lower grades for bad attendance, it has consistently held that almost all grades below C-
that have been achieved in classes that I have taught have been associated with significant attendance problems.

In like manner, you should not underestimate the impact of your homework. Not only does the experience of the
homework problems impact your test grades, but the homework itself is a considerable portion of the grade in the
class.

In all work done for this class, work is more important than answers. A correct answer without correct work (or
worse, with work that does not match the answer) is not worth much at all, while generally correct work with an
incorrect answer is almost as good as being completely right. Thus, getting the right answer does not guarantee a
good grade on the problem, and getting a wrong answer does not guarantee a bad one.

I will make the following guarantees about letter grades. I may decide to lower these criteria (i.e. give a higher
grade than the one shown here, if I see that the questions were hard enough that lower numbers more accurately
reflect my true standards), but will never raise them.

<table>
<thead>
<tr>
<th>Percent of total</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90–100</td>
<td>A</td>
</tr>
<tr>
<td>80–89</td>
<td>B</td>
</tr>
<tr>
<td>70–79</td>
<td>C</td>
</tr>
<tr>
<td>60–69</td>
<td>D</td>
</tr>
<tr>
<td>≤ 59</td>
<td>E</td>
</tr>
</tbody>
</table>
Catalog Description

This course examines loss models including severity models, aggregate loss, estimation, ratemaking and reserving, and estimation. This course prepares students for Exam FAM-S. Prerequisites: MATH 483 with C or better
SIU COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS): Mental health counseling services are available by calling CAPS at (618) 453-5371. CAPS offers confidential same-day services and ongoing counseling. For after hours crisis care, students are encouraged to call 988, 911, or present to their nearest emergency room.

WITHDRAWAL POLICY (Undergraduate Only): Students who officially register for a session must officially withdraw from that registration in a timely manner to avoid being charged as well as receiving a failing grade for those classes. An official withdrawal must be initiated by the student, or on behalf of the student through the academic unit, and be processed by the Registrar’s office. For the proper procedures to follow when dropping courses and when withdrawing from SIUC visit: http://registrar.siu.edu/students/withdrawal.php.

SIUC’s EARLY WARNING INTERVENTION PROGRAM (EWIP): Students enrolled in courses participating in SIUC’s Early Warning Intervention Program might be contacted by University staff during a semester. More information can be found at the University Core Curriculum’s Overview webpage: https://corecurriculum.siu.edu/for-faculty/.

EMERGENCY PROCEDURES: We ask that you become familiar with Emergency Preparedness at SIU. Emergency response information is available on posters in buildings on campus, on the Emergency Preparedness at SIU website, and though text and email alerts. To register for alerts visit: http://emergency.siu.edu/.

CATALOGS:
- catalog.siu.edu
- gradcatalog.siu.edu - Graduate policies often vary from Undergraduate policies. To view the applicable policies for graduate students, please refer to the graduate catalog.

CENTER FOR LEARNING AND SUPPORT SERVICES:
- Tutoring: https://clss.siu.edu/
- Math Labs: http://math.siu.edu/courses/course-help.php

WRITING CENTER: http://write.siu.edu/

PLAGIARISM: See the Student Conduct Code: http://srr.siu.edu/student-conduct-code/

INCOMPLETE POLICY (Undergraduate Only): http://registrar.siu.edu/grades/incomplete.php

REPEAT POLICY: http://registrar.siu.edu/students/repeatclasses.php

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ADVICE: http://advisement.siu.edu/

SIU ONLINE: https://online.siu.edu/

Need additional help with an issue? Visit SALUKI SOLUTION FINDER at http://solutionfinder.siu.edu/