Casualty & Health Insurance Mathematics
ACTSC 625, Winter 2017

Instructor:	Ruodu Wang, M3 3122, ext. 31569, wang@uwaterloo.ca
Lectures:	2:30 – 4:20 Mondays and Wednesdays, M3 2134.
Office hours:	4:30 – 5:30 Mondays and Wednesdays, or by appointment.
	You are welcome to drop by my office at any time,
	and if I am not occupied I will be happy to answer your questions.

Reference

The primary source of materials is the course slides/note which will be available on the Learn. The main reference is *Loss Models*, by Klugman, Panjer and Willmot (Wiley, fourth edition).

Homework

I plan to set three individual assignments. The assignments will be equally weighted. All assignments will contribute to your coursework grade. Assignments should be handed in to the instructor no later than the end of the lecture on the due day. Late assignments are not acceptable.

Midterm

Two midterms are planned. Tentative schedule:

(1) lecture time on Monday, February 13th (12th lecture), 2017.

(2) lecture time on Wednesday, March 15th (19th lecture), 2017.

Course Evaluation Breakdown

(1) Assignments 10%;

(2) Midterm 25% (12.5% each);

(3) Final Exam 65%.

Course Contents

Students are expected to learn

- standard features of non-life insurance and reinsurance policy design
- standard frequency and severity models for insurance losses
- standard distributional measures of risk
- the impact of deductibles and reinsurance on the models and estimation
- moments and probabilities for compound distributions, especially compound Poisson, compound binomial, and compound negative binomial
- Bayesian estimation to loss models
- Buhlmann-Straub and exact Credibility premiums
- principles of claims reserving for non-life insurance, using run-off triangle methods
- introductory ruin theory
- some additional and advanced topics.

This course has a focus on mathematical and statistical aspects.

CIA Mapping

This course is mapped to exam C/4 in CIA University Accreditation, together with ACTSC 632.

Tentative Schedule

	Lectures	Topics
Part I	1-7	**Basics of loss models**
		Introduction to P&C and health insurance
		Loss severity distributions
		Loss frequency distributions and processes
		Distributional measures of risk
Part II	8-11	**Aggregate claims models**
		Individual risk models
		Collective risk models
		Policy modification and reinsurance
Lecture 12: Midterm #1		
Part III	13-16	**Credibility theory**
		Basics of Bayesian statistics
		Bayesian premiums
		Other credibility premiums
Part IV	17-18	**Claim reserves**
		Runoff triangles
		Chain ladder and related methods
Lecture 19: Midterm #2		
Part V	20-21	**Ruin theory**
		Ruin theory
Part VI	22-23	**Selected additional topics**
		Comparison of risks
		Insurance premium principles
		Dependence in insurance models
Lecture 24: Final review		