

**COURSE OUTLINE: BA3202 Actuarial Statistics**

<b>Academic Year</b>	AY2021	<b>Semester</b>	1
<b>Course Coordinator</b>	Wenjun Zhu		
<b>Course Code</b>	BA3202		
<b>Course Title</b>	Actuarial Statistics		
<b>Pre-requisites</b>	BA2203 Statistical Modelling		
<b>No of AUs</b>	4		
<b>Contact Hours</b>	52		
<b>Proposal Date</b>	June 15, 2022		

**A) Course Aims/Description**

The aim of this course is to furnish an extensive coverage of advance actuarial statistical knowledge to solve actuarial problems in general insurance. It helps students develop the necessary judgmental and professional skills to apply actuarial principles to practical circumstances. This course is suitable for actuarial science students, as well as students of other majors, such as mathematics, statistics, and data science, who plan to work in the risk management and insurance profession. The course will give a solid grounding for understanding actuarial modeling techniques which will be needed in later studies. This course provides students appropriate tools and techniques that are useful in their future actuarial practice. This course will also cover some principles of actuarial professionalism by introducing professional and statutory requirements that will benefit the students' future career.

**B) Intended Learning Outcomes (ILO)/Objectives**

By the end of this course, you should be able to:

1. Interpret the key concepts, models, and theories in statistical modeling in general insurance.
2. Choose appropriate advanced statistical models for insurance data sets.
3. Estimate the advanced statistical models for insurance data sets.
4. Propose possible improvements to existing models with critical analysis possible improvements.
5. Design statistical tests to solve actuarial problems with a hypothesis.
6. Evaluate solutions in different scenarios with simulations.

**C) Course Content**

The topics covered include Bayesian statistics, decision theory, loss distributions, risk models, reinsurance, credibility theory, time series models, generalized linear models, introduction to copulas, extreme value theory and introduction to machine learning.

**D) Assessment (includes both continuous and summative assessment)**

Component	ILO Tested	NBS Learning Goal (Refer to Appendix 1 for list)	Weightage	# Team/Individual	Assessment Rubrics (attach rubrics in appendix)
1. Final Examination	ILO3, ILO4, ILO5	Acquisition of knowledge	70%***	Individual	N.A.
2. Coursework: Participation	ILO1, ILO2, ILO3, ILO4, ILO5, ILO6	Communication; Acquisition of knowledge; Problem Solving & Decision Making	10%	Individual	Communication Rubric; Problem Solving & Decision Making Rubric
3. Coursework: Presentation	ILO1, ILO2, ILO3, ILO4, ILO5, ILO6	Communication; Acquisition of knowledge; Problem Solving & Decision Making	10%	Individual	Communication Rubric; Problem Solving & Decision Making Rubric
4. Coursework: Mid-term quiz	ILO1, ILO3, ILO4, ILO5	Communication; Acquisition of knowledge	10%	Individual	N.A.
Total			100%		

\*\*\* The 70% weightage for final is required by the accreditation agreement with the IFOA.

**E) Formative feedback**

You will receive verbal feedback through in-class discussion to your course participation. You will receive written summative feedback on the mid-term quiz. You will receive summative group feedback on the exam following the conclusion of the module.

**F) Learning and Teaching approach**

Approach	How does this approach support you in achieving the learning outcomes?
Seminars	Key concepts introduced in this module will be explained in detail in the seminars supported with examples and exercises. The seminars provide opportunities for open discussion on the conceptual questions, which allow you to think critically and share your ideas with the class. The seminars involve the interaction between the instructor and the entire class, making sure that the targeted learning outcomes could be successfully achieved.
In-Class activities	In-class activities, including questions & answers, going through tutorial questions, discussions, etc., provides you hands-on experience to apply materials and concepts introduced in this module to practice of the risk management and insurance practice. Such in-class activities guarantee that learning outcomes could be satisfyingly achieved.

**G) Reading and References****Basic Reading**

- Course notes.

**Readings and References**

- CS1 – Actuarial Statistics 1.
- CS2 – Actuarial Statistics 2.
- Study material and relevant curriculum information can be found at <http://www.actuaries.org.uk/>.

**H) Course Policies and Student Responsibilities****(1) General**

You are expected to attend all seminar classes punctually and take all scheduled assignments and tests by due dates. All course related materials will be uploaded on NTULearn. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for seminar sessions. You are expected to participate in all seminar discussions and activities.

**(2) Absenteeism**

Absence from class without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. If you miss a lecture, you must inform the course instructor via email prior to the start of the class.

**I) Academic Integrity**

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

**J) Course Instructors**

Instructor	Office Location	Phone	Email	Consultation Hours
Wenjun Zhu	S3-B1B-71	65921859	wjzhu@ntu.edu.sg	Wednesday 4-5 pm

**K) Planned Weekly Schedule**

Week	Topic	ILO	Readings/ Activities
1	Decision Theory Bayesian Statistics	ILO1-ILO6	Handouts & Practice Question Sets
2	Loss distributions	ILO1-ILO6	Handouts & Practice Question Sets
3	Reinsurance	ILO1-ILO6	Handouts & Practice Question Sets
4	Credibility Empirical Bayes Credibility Theory	ILO1-ILO6	Handouts & Practice Question Sets
5	Generalized linear models	ILO1-ILO6	Handouts & Practice Question Sets
6	Risk models	ILO1-ILO6	Handouts & Practice Question Sets
7	Time series models (I)	ILO1-ILO6	Handouts & Practice Question Sets
8	Recess		
9	Midterm Quiz	ILO1-ILO6	
10	Time series models (II)	ILO1-ILO6	Handouts & Practice Question Sets
11	Extreme value theory	ILO1-ILO6	Handouts & Practice Question Sets
12	Copulas	ILO1-ILO6	Handouts & Practice Question Sets
13	Machine learning	ILO1-ILO6	Handouts & Practice Question Sets
14	Final Revision	ILO1-ILO6	Handouts & Practice Question Sets

**ANNEX A: COMMUNICATION RUBRIC (ORAL)**

**Learning Objective:** The ability to communicate well with others verbally so that it clearly expresses the intended message and is understandable and useful to the receiving party.

Traits		Performance	
<b><u>Communication Outcome</u></b>	<ul style="list-style-type: none"> <li>Has a clear message for audience</li> <li>Maximizes likelihood of audience accepting the message</li> </ul>	<b>Not Yet</b> Central message is not explicitly stated in the presentation. Main points are not clearly identified, audience unsure of the direction of the message.	<b>Substantially Developed</b> Central message is precisely stated; main points are clearly identified.
	Evaluation: Not Yet <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>10</u> Substantially Developed		
<b><u>Design Factors</u></b>	<b><u>Structure</u></b> <ul style="list-style-type: none"> <li>Organises content coherently</li> <li>Signals transitions between points</li> </ul>	<b>Not Yet</b> Organizational pattern (specific introduction and conclusion, sequenced materials within the body, and transitions) is not observable.	<b>Substantially Developed</b> Organizational pattern is clearly and consistently observable and makes the content of the presentation cohesive.
	Evaluation: Not Yet <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>10</u> Substantially Developed		
	<b><u>Verbal</u></b> <ul style="list-style-type: none"> <li>Speaks at appropriate speed and volume</li> <li>Uses correct grammar and pronunciation</li> </ul>	<b>Not Yet</b> Grammar, pronunciation and word choice are deficient. Vocal delivery is too soft or too fast to understand; gap-fillers interfere with expression.	<b>Substantially Developed</b> Free of errors in grammar and pronunciation; good choices of word enhance clarity of expression. Vocal delivery is varied and dynamic. Speech rate, volume, and tone facilitate audience comprehension. Minimal gap fillers.
	Evaluation: Not Yet <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>10</u> Substantially Developed		
	<b><u>Non-Verbal</u></b> <ul style="list-style-type: none"> <li>Establishes eye contact</li> <li>Uses gestures and movement to convey energy and confidence</li> </ul>	<b>Not Yet</b> Eye contact, posture, gestures, movement and facial expressions are inappropriate and significantly distracting.	<b>Substantially Developed</b> Eye contact, posture, gestures, movement and facial expressions make the presentation compelling, and speaker appears polished and confident.
	Evaluation: Not Yet <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>10</u> Substantially Developed		

**ANNEX B: LIST OF NBS LEARNING GOALS**

LEARNING GOAL	LEARNING OBJECTIVE	CHECK
<b>TASK SKILLS</b>		
<b>Acquisition of Knowledge</b>	The key concepts, models, methodologies and theories in property and liability insurance	<input checked="" type="checkbox"/>
<b>Ethical Reasoning</b>	The ability to recognize and understand ethical issues, and apply sound ethical reasoning.	<input type="checkbox"/>
<b>Critical Thinking &amp; Creative Thinking</b>	The ability to define, examine, evaluate, analyze and synthesize various arguments and knowledge to form independent judgment.	<input type="checkbox"/>
	The ability to provide insight in an innovative way characterized by high degree of adaptiveness.	<input type="checkbox"/>
<b>Problem Solving &amp; Decision Making</b>	The ability to identify problem, generate a plan to solve problem, implement and evaluate the plan and make sound business decision.	<input checked="" type="checkbox"/>
<b>Planning &amp; Execution</b>	The ability to set clear priorities and plans of action for the task and define task objectives to fulfill goals within a planned schedule for execution.	<input type="checkbox"/>
<b>PEOPLE SKILLS</b>		
<b>Oral Communication &amp; Written Communication</b>	The ability to communicate well with others verbally so that it clearly expresses the intended message and is understandable and useful to the receiving party.	<input checked="" type="checkbox"/>
	The ability to communicate well with others in writing so that it clearly expresses the intended message and is understandable and useful to the receiving party.	<input type="checkbox"/>
<b>Negotiation</b>	The ability to systematically plan and prepare for negotiation and apply negotiation skills in personal and professional practice.	<input type="checkbox"/>
<b>Cultural Intelligence</b>	The ability to function effectively in situations characterized by cultural diversity.	<input type="checkbox"/>
<b>Teamwork &amp; Interpersonal Skills</b>	The ability to work effectively with others in a group setting.	<input type="checkbox"/>
<b>Motivation &amp; Development of Self &amp; Others</b>	The ability to develop a better understanding of one's strengths and weaknesses, and learn to view others and mistakes positively as sources of personal and professional development.	<input type="checkbox"/>

Please write to NBS Accreditation office ([nbsaccro@ntu.edu.sg](mailto:nbsaccro@ntu.edu.sg)) for sample rubrics.