

**COURSE OUTLINES: BR3214 Financial and Risk Analytics II**

<b>Academic Year</b>	2022/2023	<b>Semester</b>	2		
<b>Course Coordinator</b>	Pengyu Wei				
<b>Course Code</b>	BR3214				
<b>Course Title</b>	Financial and Risk Analytics II				
<b>Pre-requisites</b>	BR2211				
<b>No of AUs</b>	3				
<b>Contact Hours</b>	3 hrs x 13 weeks = 39 hrs				
<b>Proposal Date</b>	22/06/2022				
<b>A) Course Aims</b>					
As a continuation of BR2211, this course aims to introduce advanced data analytics models in the context of finance and risk management. It discusses how these models work, how and when they can be used, and how they should be interpreted, exemplified with real-world applications, such as predicting insurance losses, assessing credit quality, etc. At the end of the course, you will be able to apply various data analytics techniques to solve practical problems in finance and risk management. The course uses the open-source software R.					
<b>B) Intended Learning Outcomes (ILO)/Objectives</b>					
By the end of this course, you should be able to:					
<ol style="list-style-type: none"> <li>1. Describe various data analytic models</li> <li>2. Formulate business problems in the data analytic framework</li> <li>3. Analyse real-world datasets with data analytic techniques</li> <li>4. Evaluate the performance of different data analytic models</li> <li>5. Explain the results of different data analytic models</li> </ol>					
See <a href="#">Annex F</a> for learning objective taxonomy.					
<b>C) Course Content</b>					
<ul style="list-style-type: none"> <li>• Regression: linear and generalized linear models, nonlinear models</li> <li>• Classification</li> <li>• Resampling and cross-validation</li> <li>• Model selection and regularization</li> <li>• Tree-based models: decision tree, random forests, and boosting</li> <li>• Support vector machines</li> <li>• Neural networks</li> <li>• Unsupervised learning</li> <li>• Case study</li> </ul>					
<b>D) Assessment (includes both continuous and summative assessment)</b>					
<b>Component</b>	<b>ILO Tested</b>	<b>NBS Learning Goal (Refer</b>	<b>Weighting</b>	<b>Team/Individual</b>	<b>Assessment Rubrics</b>  <b>(Please insert rubrics as Appendix)</b>

		to Annex D for list)			
1. Midterm quiz	ILO1-5	Critical Thinking, Acquisition of Knowledge	30%	Individual	NA
2. Individual project (written report and in-class presentation)*	ILO1-5	Problem Solving and Decision-making, Acquisition of Knowledge, Oral & Written Communication	60%	Individual	See Annex B
3. Class participation	ILO1-5	Critical Thinking, Oral Communication	10%	Individual	See Annex C
Total			100%		

**Important Notes:**

\* You will complete a project that involves real-world datasets. The marks will be based on the report and the presentation.

**E) Formative feedback**

You will receive verbal feedback from me about your presentations. You will receive summative feedback on the exam and project following the conclusion of the module.

**F) Learning and Teaching approach**

Approach	How does this approach support you in achieving the learning outcomes?
Lectures	The interactive lecture session explains key concepts in detail, supported by illustrating examples. The lectures provide ample opportunities for open discussion on the conceptual questions raised in the class, which allow you to think critically and share your ideas with the class. The interaction between the instructor and the entire class ensures that the targeted learning outcomes can be achieved.
In-Class activities	Interactions are encouraged in class to enhance critical thinking and class engagement. Instant feedback will be provided to in-class participation to ensure the learning goals can be attained.

**G) Reading and References**

## Basic Text

Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani. An Introduction to Statistical Learning with Applications in R, Second Edition, 2021.

**H) Course Policies and Student Responsibilities**

## (1) General

You are expected to complete all assigned pre-class readings and activities, attend all seminar classes punctually and take all scheduled assignments and tests by due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for seminar sessions they have missed. 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
Pengyu Wei	S3 B1A-03	6790 5728	pengyu.wei@ntu.edu.sg	By appointment via email

**K) Planned Weekly Schedule**

Week	Topic	ILO	Readings/ Activities
1	Introduction	1,2	Chapters 1-2
2	Regression	1-5	Chapter 3
3	Classification	1-5	Chapter 4
4	Resampling and Cross-validation	1-5	Chapter 5

5	Model Selection and Regularization	1-5	Chapter 6
6	Nonlinear Models	1-5	Chapter 7
7	Midterm Quiz	1-5	NA
Recess			
8	Tree-based Models	1-5	Chapter 8
9	Support Vector Machines	1-5	Chapter 9
10	Neural Networks	1-5	Chapter 10
11	Unsupervised Learning	1-5	Chapter 12
12-13	Course Project Presentation	1-5	NA

**ANNEX B: ASSESSMENT CRITERIA FOR INDIVIDUAL PROJECT**

Traits		Criteria			%
		Fail standard	Pass standard	High standard	
		(<40 %)	(40%-69%)	(70%-100%)	
Report	Problem Solving & Decision-Making	<p>The problem is not well-defined</p> <p>The problem is dealt with only a single method and its performance is not evaluated.</p> <p>Conclusions are not meaningful within a business context.</p>	In-between	<p>The problem is well-formulated.</p> <p>Various methods are used to analyse the dataset and their performances are evaluated and compared.</p> <p>Results are explained and insightful conclusions are made that are easy to understand in a business context.</p>	50
	Writing & Formatting	<p>The report is difficult to understand and there are clerical errors.</p> <p>Tables and figures are not used effectively.</p> <p>There is no reference to the source of information.</p>	In-between	<p>The report is well-structured and easy to understand. The writing is free of grammar errors.</p> <p>Tables and figures are used to support the main arguments.</p> <p>References to the source of information are provided whenever required.</p>	20
Presentation	Content	<p>Content is erroneous or irrelevant.</p> <p>References to the source of information are not provided.</p> <p>The material included is irrelevant or the amount of material is not appropriate.</p> <p>The presentation is too short or excessively long.</p> <p>Visual aids are not used effectively.</p>	In-between	<p>Content is attention-getting and provokes thinking and contains accurate information.</p> <p>References to the source of information are provided whenever required.</p> <p>The material included is relevant to the overall message/purpose. An appropriate amount of material is prepared.</p> <p>The length of the presentation is within the assigned time limits.</p> <p>Visual aids are well prepared, informative, and effective.</p>	20
	Communication	<p>The vocal delivery is poor and the speaker fails to maintain good eye contact with the audience.</p>	In-between	<p>The speaker speaks at appropriate speed and volume and maintains good eye contact with the audience.</p>	10

		The speaker cannot handle queries raised by the audience appropriately.		The speaker handles queries raised by the audience appropriately.	
Total Points					100

**ANNEX C: ASSESSMENT CRITERIA FOR CLASS PARTICIPATION**

Traits	Performance		
	1-2	3-4	5
Engagement (40%)	Student hardly focuses in class (e.g. using mobile phone).	Student occasionally engages in distracting activities (e.g. using mobile phone) in class.	Student engages fully in class.
Behavior (30%)	Student frequently displays disruptive and/or disrespectful behavior during class.	Student rarely displays disruptive or disrespectful behavior during class.	Student never displays disruptive or disrespectful behavior during class.
Contribution (30%)	Student never makes contributions or contributions are irrelevant.	Student occasionally makes contributions that are meaningful and relevant.	Student actively makes contributions that are constructive and insightful.

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

LEARNING GOAL	LEARNING OBJECTIVE	CHECK
<b>TASK SKILLS</b>		
<b>Acquisition of Knowledge</b>	Students should be able to demonstrate understanding of the various concepts and methods introduced in the module.	<input 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 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 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.