Part I   Course Overview

Course Title:	Data Visualization
Course Code:	IS4335
Course Duration:	One Semester
Credit Units:	3
Level:	B4
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II   Course Details

1.   Abstract
(A 150-word description about the course)

"A picture is worth a thousand words."   The human race is wired to perceive pictorial messages and discover patterns using intuitions.   In a data-driven business environment, the ability to convey hard messages with clever visualization is essential and valuable.

In this course, we will explore ways to organize and derive meaning from vast amounts of data by using visual presentation tools and techniques. Students will learn concepts, methods, and applications of data visualization methods.   The course will introduce interesting examples in different application areas. Students will also learn visualization tools from GUI-based software, to more advanced programmable visualization packages in R language.   They will be guided in creating engaging and interactive visualizations.

2.   Course Intended Learning Outcomes (CILOs)
(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Describe and gain insight into the theory of visual presentation and the use of visual report in business communication and analytics.	20%	✓	✓	
2.	Acquire and innovatively apply skills in using data visualization tools to create compelling visual report and analysis.	30%	✓	✓	✓
3.	Acquire and innovatively apply skills in using programmable visualization tools (R packages) to create flexible visual presentations.	50%	✓	✓	✓
		100%			

* *If weighting is assigned to CILOs, they should add up to 100%.*
[#] *Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.*

A1:   Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.
A2:   Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.
A3:   Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)
(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No. 1	2	3	Hours/week (if applicable)
TLA1: Lecture	Lectures will introduce the basic design theory for visual presentation and cases of innovative visualization applications. Lectures will also cover the basic programming techniques and use of packages.	✓	✓	✓	1 Hour/Week
TLA2: Tutorial	Tutorials will provide hands on experiences to use the visualization tools introduced in the lectures.		✓	✓	2 Hours/Week
TLA3: Group Project	Students apply the visualization tools to form an analytics report. They need to identify a data source and form a data driven story in the project.	✓	✓	✓	

4. Assessment Tasks/Activities (ATs)
(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No. 1	2	3	Weighting*	Remarks#
Continuous Assessment: 60%					
AT1: Continuous Assessment Students are encouraged to discuss and reflect on the materials covered in lectures and tutorials.	✓	✓	✓	10%	
AT2: Assignments Assignments will be given to assess student's ability to apply the tools learned.		✓	✓	30%	
AT3: Group Project A group project will be assigned. Students need to apply the visualization tools to form an analytics report. They need to identify a data source and form a data driven story in the project.	✓	✓	✓	20%	
Examination: 40% (duration: one 2-hour exam)					
AT4: Final Examination Students will be assessed via the examination on their understanding of concepts learned in class and reading materials, and their ability to apply subject-related knowledge.	✓	✓	✓	40%	
The weightings should add up to 100%.				100%	

Remark: Students must pass BOTH coursework and examination in order to get an overall pass in this course.

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task (AT)	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
AT1: Continuous Assessment	CILO 1-3 Demonstrate evidence of active learning through participating in the class discussion, asking critical questions and completing extra-credit activities.	High	Significant	Moderate	Basic	Not even reaching marginal levels
AT2: Assignments	CILO 2-3 Demonstrate good understanding of course content and capability to apply the skills learned to create visual presentations.	High	Significant	Moderate	Basic	Not even reaching marginal levels
AT3: Group Project	CILO 1 Apply principle learned about the design theory of visual presentation.	High	Significant	Moderate	Basic	Not even reaching marginal levels
	CILO 2-3 Demonstrate capability to apply the tools (menu-based and programmable) to explore data set and create data driven story.	High	Significant	Moderate	Basic	Not even reaching marginal levels
AT4: Final Examination	CILO 1-3 Demonstrate good understanding of visualization design principle and master the skills required for effective visualization.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III   Other Information (more details can be provided separately in the teaching plan)

1. **Keyword Syllabus**
   (An indication of the key topics of the course.)

   Big Data; Visualization; Data Charts; Dashboard; Power View; Tableau; Infographics; Text Visualization; Social Network Visualization; Visualization on mobile devices.

2. **Reading List**
2.1 **Compulsory Readings**
   (Compulsory readings can include books, book chapters, or journal/magazine articles.   There are also collections of e-books, e-journals available from the CityU Library.)

1.	Tony Fischetti and Brett Lantz, <u>R: Data Analysis and Visualization</u>, Packt Publishing, 2016.

2.2 **Additional Readings**
   (Additional references for students to learn to expand their knowledge about the subject.)

1.	Nathan Yau, <u>Visualize This; The Flowing Data Guide to Design, Visualization, and Statistics</u>, Wiley, 2011.
2.	Stephen Few, <u>Show Me the Numbers: Designing Tables and Graphs to Enlighten</u>, Analytics Press, 2012.
3.	Hadley Wickham, <u>ggplot2</u>, Springer, 2016.
4.	Daniel G. Murray, <u>Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software</u>, Wiley 2016.
5.	Stephanie D. H. Evergreen, <u>Effective Data Visualization: The Right Chart for the Right Data</u>, SAGE Publication, 2016.