City University of Hong Kong
Course Syllabus

offered by College/School/Department of Information Systems
with effect from Semester A 2023 / 2024

Part I   Course Overview

Course Title: Data Visualization

Course Code: IS6335

Course Duration: One Semester

Credit Units: 3

Level: P6

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 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.

The goal of this course is to learn how to use visualization tools for data interpretation under the business context. We will explore ways to organize and derive meaning from vast amounts of data, with interesting visual examples from different application areas. Students will learn concepts, methods, and applications of data visualization methods. Students will also learn visualization tools from GUI-based Tableau software to more advanced programmable visualization packages in R and Python. They will be guided in creating engaging and interactive visualizations, as well as experiencing virtual reality applications. Students will apply the concepts and skills to designing a final project.

The course has no prerequisite of programming background, although prior experience with coding languages will be helpful.

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.	40%	✓	✓	
2.	Acquire and innovatively apply skills in using GUI-based Tableau software to create compelling visual report and analysis.	20%	✓	✓	✓
3.	Acquire and innovatively apply skills in using programmable visualization tools (R and Python packages) to create flexible visual presentations. Use visualization to augment machine learning and statistical analysis in applications.	40%	✓	✓	✓
		100%			

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.			Hours/week (if applicable)
		1	2	3	
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 Tableau, R, and Python packages.	✓	✓	✓	1 Hour/Week
TLA2: Tutorial	Tutorials will provide hands on experiences to use the visualization tools of Tableau, R, and Python 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.			Weighting	Remarks
	1	2	3		
Continuous Assessment: 100%					
AT1: Class Participation 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%	
AT4: Individual Project Students will be assessed via an individual project, with innovative applications of visualization concepts and designs learned in class. Project will be individual based, in a written report format.	✓	✓	✓	40%	
				100%	

5. Assessment Rubrics

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

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
AT1: Class Participation	CILO 1-3 Demonstrate evidence of active learning through participating in 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: Individual Project	CILO 1-3 Demonstrate good understanding of visualization design principles and master the skills required for innovative visualization designs.	High	Significant	Moderate/Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
AT1: Class Participation	CILO 1-3 Demonstrate evidence of active learning through participating in 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: Individual Project	CILO 1-3 Demonstrate good understanding of visualization design principles and master the skills required for innovative visualization designs.	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, R: Data Analysis and Visualization, Packt Publishing, 2016.
2.	Mario Dobler and Tim Gromann, Data Visualization with Python: Create an Impact with Meaningful Data Insights Using Interactive and Engaging Visuals, Packt Publishing, 2019.

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

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