City University of Hong Kong
Course Syllabus

Department of Public and International Affairs
with effect from Semester A 2024/25

Part I Course Overview

Course Title:	**Data Analytics for Public Policy and Management**
Course Code:	**PIA5605**
Course Duration:	**One semester**
Credit Units:	**3**
Level:	**P5**
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

This introductory course is designed to provide future public sector practitioners with basic knowledge of data analytics and visualization in Python/R, in the field of public policy and management. It covers:

1) entry-level skills of programming language Python/R,

2) data analytics and visualization for public policy and management by using Python/R, and

3) "ABCs" of big data, especially in the context of public policy and management.

In this course, students are not required to become programmers/data-experts but have opportunities to understand the language and thinking patterns programmers/data-experts use. In this way, students are expected to be equipped as future managers, administrators, or public policymakers who are capable to employ basic data tools to fulfil job responsibilities and support decision-makings, as well as communicate and collaborate smoothly and effectively with data-related parties, such as professional programmers/ data-experts/ data-focused organizations (e.g. data outsourcing companies/ data and IT departments of government).

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.	Gain basic knowledge and skills of Python and/or R.			✔	
2.	Gain a conceptual understanding of the main approaches in data analytics & visualization for public policy and management.			✔	
3.	Gain a conceptual understanding of big data and related concepts, especially in the context of public policy and management.			✔	
4.	Gain practical skills in data analytics and visualization, and be able to deal with real-world problems of entry-level to intermediate-level difficulty, in the field of public policy and management.		✔	✔	✔
5.	Gain the ability to communicate data related information (in both written and oral form) to stakeholders inside and outside the team/organization.		✔	✔	
		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 real-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. Learning and Teaching Activities (LTAs)

(LTAs designed to facilitate students' achievement of the CILOs.)

LTA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5		
Lecture	Introduce key concepts and approaches in programming language (Python/R) and data analytics and visualisation.	✔	✔	✔	✔	✔		
Class exercise	By completing specific tasks in class, students transform theoretical knowledge into actionable skills in practice.	✔			✔	✔		
Assignments	Give students specific tasks to complete after class. Encourage students to make full use of the time after class to deepen their understanding of the knowledge and skills gained in class, and to develop lasting abilities through repeated practice.	✔	✔		✔	✔		
Quiz	Mini pen-and-paper Q&A in class. Timely examination of students' learning outcomes to help students deepen understanding of their learning so that they can adjust strategies in time, and to promote students' accurate mastery of knowledge and skills.	✔	✔	✔				
Test	Towards the end of the semester, there is a one-hour paper-based Q&A. This motivates students to continue to work hard throughout the semester.	✔	✔	✔				
Project and Presentation	After completing one semester of study, use the acquired knowledge and skills to complete a specific project and present it.	✔	✔	✔	✔	✔		

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	4	5			
Continuous Assessment: _100_%								
Class participation	✔	✔	✔	✔	✔		5%	
Class exercise and quiz	✔	✔	✔	✔	✔		20%	
Assignments	✔	✔		✔	✔		5%	
Test (one hour)	✔	✔	✔				30%	
Group Project and Presentation				✔	✔		40%	
Examination: ____% (duration: , if applicable)								
							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 before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Class participation, exercise, quiz and assignments	Python/R basic knowledge and skills	Excellent mastery of basic programming knowledge and skills.	Good mastery of basic programming knowledge and skills.	Satisfactory mastery of basic programming knowledge and skills.	Basic mastery of basic programming knowledge and skills.	No mastery of basic programming knowledge and skills.
	Data analytics and visualization knowledge and skills	Demonstrate excellent ability in – Identify the approaches in sourcing, acquiring, and organising data for public affairs. - Apply techniques in data management for data preparation and analytics.	Demonstrate good ability in – Identify the approaches in sourcing, acquiring, and organising data for public affairs. - Apply techniques in data management for data preparation and analytics.	Demonstrate Satisfactory ability in – Identify the approaches in sourcing, acquiring, and organising data for public affairs. - Apply techniques in data management for data preparation and analytics.	Demonstrate basic ability in – Identify the approaches in sourcing, acquiring, and organising data for public affairs. - Apply techniques in data management for data preparation and analytics.	Demonstrate no ability in – Identify the approaches in sourcing, acquiring, and organising data for public affairs. - Apply techniques in data management for data preparation and analytics.
	"ABCs" of big data	Excellent understanding of relevant concepts and knowledge.	Good understanding of relevant concepts and knowledge.	Satisfactory understanding of relevant concepts and knowledge.	Basic understanding of relevant concepts and knowledge.	Fails to understand relevant concepts and knowledge.
2. Test	Responding to questions	Response very clearly stated and answer is excellently argued.	Response clearly stated and answer is argued well.	Response satisfactorily stated and answer is satisfactorily argued.	Response sufficiently stated and answer is adequately argued.	Response unstated and answer not argued.
	Ability to reflect	Excellently demonstrate ability to reflect on their own experience in the field.	Clearly demonstrate ability to reflect on their own experience in the field.	Satisfactorily demonstrate ability to reflect on their own experience in the field.	Demonstrate limited ability to reflect on their own experience in the field.	Fail to demonstrate ability to reflect on their own experience in the field.
3. Project and Presentation	Content	Excellent ideas/concepts supported by	Good ideas/concepts supported by good	Satisfactory ideas/concepts supported by	Basic ideas/concepts supported by basic and articulate	Fails to produce adequate ideas/concepts

		excellent and articulate details/illustrations of data analytics and visualization. Demonstrate excellent familiarity to the operations of Python/R.	and articulate details/illustrations of data analytics and visualization. Demonstrate good familiarity to the operations of Python/R.	satisfactory and articulate details/illustrations of data analytics and visualization. Demonstrate satisfactory familiarity to the operations of Python/R.	details/illustrations of data analytics and visualization. Demonstrate basic familiarity to the operations of Python/R.	supported by adequate and articulate details/illustrations of data analytics and visualization. Fails to demonstrate familiarity to the operations of Python/R.
	Collaboration	Excellent team work collaboration.	Good team work collaboration.	Satisfactory team work collaboration.	Limited team work collaboration.	Unable to demonstrate adequate team work collaboration.
	Q&A	Excellent responds to audience questions.	Good responds to audience questions.	Satisfactory responds to audience questions.	Limited responds to audience questions.	Fails to adequately respond to audience questions.

Applicable to students admitted in Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Class participation, exercise, quiz and assignments	Python/R basic knowledge and skills	Excellent mastery of basic programming knowledge and skills.	Good mastery of basic programming knowledge and skills.	Adequate mastery of basic programming knowledge and skills.	No mastery of basic programming knowledge and skills.
	Data analytics and visualization knowledge and skills	Demonstrate excellent ability in – Identify the approaches in sourcing, acquiring, and organising data for public affairs. - Apply techniques in data management for data preparation and analytics.	Demonstrate good ability in – Identify the approaches in sourcing, acquiring, and organising data for public affairs. - Apply techniques in data management for data preparation and analytics.	Demonstrate adequate ability in – Identify the approaches in sourcing, acquiring, and organising data for public affairs. - Apply techniques in data management for data preparation and analytics.	Demonstrate no ability in – Identify the approaches in sourcing, acquiring, and organising data for public affairs. - Apply techniques in data management for data preparation and analytics.

	"ABCs" of big data	Excellent understanding of relevant concepts and knowledge.	Good understanding of relevant concepts and knowledge.	Adequate understanding of relevant concepts and knowledge.	Fails to understand relevant concepts and knowledge.
2. Test	Responding to questions	Response very clearly stated and answer is excellently argued.	Response clearly stated and answer is argued well.	Response adequately stated and answer is adequately argued.	Response unstated and answer not argued.
	Ability to reflect	Excellently demonstrate ability to reflect on their own experience in the field.	Clearly demonstrate ability to reflect on their own experience in the field.	Demonstrate some ability to reflect on their own experience in the field.	Fail to demonstrate ability to reflect on their own experience in the field.
3. Project and Presentation	Content	Excellent ideas/concepts supported by excellent and articulate details/illustrations of data analytics and visualization. Demonstrate excellent familiarity to the operations of Python/R.	Good ideas/concepts supported by good and articulate details/illustrations of data analytics and visualization. Demonstrate good familiarity to the operations of Python/R.	Adequate ideas/concepts supported by adequate and articulate details/illustrations of data analytics and visualization. Demonstrate adequate familiarity to the operations of Python/R.	Fails to produce adequate ideas/concepts supported by adequate and articulate details/illustrations of data analytics and visualization. Fails to demonstrate familiarity to the operations of Python/R.
	Collaboration	Excellent team work collaboration.	Good team work collaboration.	Adequate team work collaboration.	Unable to demonstrate adequate team work collaboration.
	Q&A	Excellent responds to audience questions.	Good responds to audience questions.	Responds to audience questions.	Fails to adequately respond to audience questions.

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.)

Python; R; Programming; Big data; Data analytics for public policy and management; Data visualization for public policy and management

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.	VanderPlas, J. (2023). Python Data Science Handbook. (2nd ed.). O'Reilly Media, Incorporated.
2.	Nelli, F. (2018). Python data analytics : with Pandas, NumPy, and Matplotlib (Second edition.). Apress.
3.	Chen, D. Y. (2018). Pandas for everyone : Python data analysis. Addison-Wesley.
4.	Stepanek, H. (2020). Thinking in Pandas How to Use the Python Data Analysis Library the Right Way (1st ed. 2020.). Apress. https://doi.org/10.1007/978-1-4842-5839-2

2.2 Additional Readings

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

1.	Rajagopalan, G. (2020). A Python Data Analyst's Toolkit: Learn Python and Python-Based Libraries with Applications in Data Analysis and Statistics. Apress L. P. https://doi.org/10.1007/978-1-4842-6399-0
2.	Beuzen, T., & Timbers, T. (2022). Python Packages. CRC Press. https://doi.org/10.1201/9781003189251
3.	Ramalho, L. (2022). Fluent Python. O'Reilly Media, Incorporated.
4.	Mailund, T. (2022). Beginning data science in R 4 : data analysis, visualization, and modelling for the data scientist (Second edition.). Apress Media, LLC. https://doi.org/10.1007/978-1-4842-8155-0
5.	Mailund, T. (2022). R 4 data science quick reference : a pocket guide to APIs, libraries, and packages (Second edition.). Apress. https://doi.org/10.1007/978-1-4842-8780-4
6.	Kabacoff, Robert I. (2011) R in Action. Shelter Island, NY: Manning Publications Co.
7.	Lantz, Brett. (2013) Machine Learning with R. Birmingham, UK: Packt Publishing Ltd.