PIA5605: DATA ANALYTICS FOR PUBLIC POLICY AND MANAGEMENT

Effective Term
Semester B 2025/26

Part I Course Overview

Course Title
Data Analytics for Public Policy and Management

Subject Code
PIA - Public and International Affairs
Course Number
5605

Academic Unit
Public and International Affairs (PIA)

College/School
College of Liberal Arts and Social Sciences (CH)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

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).

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Gain basic knowledge and skills of Python and/ or R.			x	
2	Gain a conceptual understanding of the main approaches in data analytics & visualization for public policy and management.			x	
3	Gain a conceptual understanding of big data and related concepts especially in the context of public policy and management.			x	
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.		x	x	x
5	Gain the ability to communicate data related information (in both written and oral form) to stakeholders inside and outside the team/ organization.		x	x	

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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Introduce key concepts and approaches in programming language (Python/R) and data analytics and visualisation.	1, 2, 3, 4, 5	
2	Class exercise/quiz	By completing specific tasks in class, students transform theoretical knowledge into actionable skills in practice.	1, 2, 3, 4, 5	
3	Problem set	Give students specific problem sets to complete in order to deepen their understanding of the knowledge and skills gained in class, and to develop lasting abilities through repeated practice.	1, 2, 4, 5	
4	Test	During the semester, there is a paper-based or computer-based test. This motivates students to continue to work hard throughout the semester.	1, 2, 3	
5	Project and Presentation	After completing one semester of study, use the acquired knowledge and skills to complete a specific project and present it.	1, 2, 3, 4, 5	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Attendence, Participation, Class Exercise/Quiz	1, 2, 3, 4, 5	20	-	No
2	Problem Sets	1, 2, 4, 5	30	-	Yes
3	Test	1, 2, 3	20	-	No
4	Final Project and Presentation	4, 5	30	-	Yes

Continuous Assessment (%)

100

Assessment Rubrics (AR)

Assessment Task

Attendence, Participation, Class Exercise/Quiz (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Engagement with lectures, readings, and in-class activities; Python/R basic knowledge and skills; Data analytics and visualization knowledge and skills; "ABCs" of big data

Excellent

(A+, A, A-) Excellent level of engagement with lectures and reading materials, with active and consistent participation in class discussions and activities. Excellent mastery of basic Python/R programming knowledge and skills. Excellent ability to identify appropriate approaches for sourcing, acquiring, and organising data for public affairs, and to apply data management techniques for data preparation and analytics. Excellent understanding of key big data concepts and related foundational knowledge.

Good

(B+, B, B-) Good level of engagement with lectures and reading materials, with regular participation in class discussions and activities. Good mastery of Python/R programming knowledge and skills. Good ability to identify appropriate data sourcing and organisation approaches and to apply data management techniques. Good understanding of key big data concepts.

Fair

(C+, C, C-) Satisfactory engagement with lectures and reading materials, with below-average participation in class discussions and activities.Satisfactory mastery of Python/R programming knowledge and skills. Satisfactory ability to identify data sourcing approaches and apply data management techniques. Satisfactory understanding of key big data concepts.

Marginal

(D) Poor engagement with lectures and reading materials, with minimal participation in class discussions and activities. Basic mastery of Python/R programming knowledge and skills. Limited ability to identify data sourcing approaches or apply data management techniques. Basic understanding of key big data concepts.

Failure

(F) Failure to maintain even minimal engagement with lectures, reading materials, or class activities. No mastery of Python/R programming knowledge or skills. No ability to identify appropriate data sourcing approaches or apply data management techniques. Failure to understand key big data concepts.

Assessment Task

Problem Sets (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Data analytics and visualization knowledge and skills; Application of methods and tools; Critical thinking and analysis

Excellent

(A+, A, A-) Very clear understanding of key concepts and learning materials. Excellent critical thinking and analytical skills, with excellent ability to select and apply appropriate quantitative, programming, or analytical tools to solve open-ended problems.

Good

(B+, B, B-) Clear understanding of key concepts and learning materials. Very good analytical skills and effective application of appropriate tools.

Fair

(C+, C, C-) Adequate understanding of key concepts and learning materials. Good analytical skills and reasonable application of appropriate tools.

Marginal

(D) Marginal understanding of key concepts and learning materials. Some analytical ability, with limited capacity to select or apply appropriate tools.

Failure

(F) Little or no understanding of key concepts and learning materials. Failure to apply appropriate analytical or technical tools.

Assessment Task

Test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Understanding and application of concepts and methods; Responding to questions; Ability to reflect

Excellent

(A+, A, A-) Responses very clearly stated and excellently argued. All important concepts, cases, and learning materials are very clearly understood. Excellent critical thinking and analytical skills, with excellent ability to select and apply appropriate econometric tools to answer any given question. Excellent ability to reflect on learning experiences, course content, and application of methods.

Good

(B+, B, B-) Responses clearly stated and well argued. Clear understanding of important concepts, cases, and learning materials, with very good analytical skills and appropriate use of econometric tools. Clear ability to reflect on learning experiences and course content.

Fair

(C+, C, C-) Responses satisfactorily stated and adequately argued. Adequate understanding of important concepts and learning materials, with satisfactory analytical skills and basic application of econometric tools. Satisfactory reflective ability.

Marginal

(D) Responses weakly stated and only adequately argued. Marginal understanding of concepts and learning materials, with limited analytical skills and limited ability to apply econometric tools. Limited reflective ability.

Failure

(F) Responses unstated or poorly argued. Little or no understanding of concepts, cases, or learning materials, with failure to apply appropriate econometric tools. No evidence of reflective ability.

Assessment Task

Final Project and Presentation (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Content; Application of data analytics and visualization; Python/R operations; Q&A

Excellent

(A+, A, A-) Excellent ideas and concepts supported by clear, coherent, and articulate data analytics and visualization. Excellent familiarity with Python/R operations. Excellent ability to explain analytical choices and results, with excellent responses to audience questions.

Good

(B+, B, B-) Good ideas and concepts supported by clear data analytics and visualization. Good familiarity with Python/R operations. Good ability to explain analytical choices and results, with good responses to audience questions.

Fair

(C+, C, C-) Satisfactory ideas and concepts supported by adequate data analytics and visualization. Satisfactory familiarity with Python/R operations. Adequate explanation of analytical choices and results, with satisfactory responses to audience questions.

Marginal

(D) Basic ideas and concepts with limited analytical support. Basic familiarity with Python/R operations. Limited ability to explain analytical choices and results, with limited responses to audience questions.

Failure

(F) Inadequate ideas or concepts, inadequate analytical support, and no effective use of Python/R operations. Inability to explain analytical choices or results and failure to respond appropriately to audience questions.

Assessment Task

Attendence, Participation, Class Exercise/Quiz (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Python/R basic knowledge and skills; Data analytics and visualization knowledge and skills; “ABCs” of big data; Engagement with lectures, readings, and in-class activities

Excellent

(A+, A, A-) Excellent mastery of basic Python/R programming knowledge and skills. Excellent ability to identify appropriate approaches for sourcing, acquiring, and organising data for public affairs, and to apply data management techniques for data preparation and analytics. Excellent understanding of key big data concepts. Excellent level of engagement with lectures and reading materials, with active participation in class discussions and activities.

Good

(B+, B) Good mastery of Python/R programming knowledge and skills. Good ability to identify appropriate data sourcing and organisation approaches and to apply data management techniques. Good understanding of key big data concepts. Good engagement with lectures and reading materials, with regular participation in class discussions and activities.

Marginal

(B-, C+, C) Adequate mastery of Python/R programming knowledge and skills. Adequate ability to identify data sourcing approaches and apply data management techniques. Adequate understanding of key big data concepts. Limited or inconsistent engagement with lectures and reading materials, with below-average participation in class discussions and activities.

Failure

(F) No mastery of Python/R programming knowledge or skills. No ability to identify appropriate data sourcing approaches or apply data management techniques. Failure to understand key big data concepts. Failure to maintain even minimal engagement with lectures, readings, or class activities.

Assessment Task

Problem Sets (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Understanding of concepts and learning materials; Application of methods and tools; Critical thinking and analysis

Excellent

(A+, A, A-) Very clear understanding of all important concepts and learning materials. Excellent critical thinking and analytical skills, with excellent ability to select and apply appropriate quantitative, programming, or analytical tools to solve open-ended problems.

Good

(B+, B) Clear understanding of important concepts and learning materials. Very good analytical skills and effective application of appropriate tools to solve given problems.

Marginal

(B-, C+, C) Adequate understanding of important concepts and learning materials. Some analytical ability, with limited or uneven application of appropriate tools.

Failure

(F) Little or no understanding of key concepts or learning materials. Failure to apply appropriate analytical or technical tools to solve problems.

Assessment Task

Test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Responding to questions; Ability to reflect; Understanding and application of concepts and methods

Excellent

(A+, A, A-) Responses very clearly stated and excellently argued. All important concepts, cases, and learning materials are very clearly understood. Excellent critical thinking and analytical skills, with excellent ability to select and apply appropriate econometric tools to answer given questions. Excellent reflective ability.

Good

(B+, B) Responses clearly stated and well argued. Good understanding of important concepts, cases, and learning materials, with appropriate use of econometric tools. Clear reflective ability.

Marginal

(B-, C+, C) Responses adequately stated and argued. Adequate understanding of concepts and learning materials, with limited or uneven application of econometric tools. Some reflective ability.

Failure

(F) Responses unstated or poorly argued. Little or no understanding of concepts, cases, or learning materials. Failure to apply appropriate econometric tools and no evidence of reflection.

Assessment Task

Final Project and Presentation (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Content; Application of data analytics and visualization; Python/R operations; Q&A

Excellent

(A+, A, A-) Excellent ideas and concepts supported by clear, coherent, and articulate data analytics and visualization. Excellent familiarity with Python/R operations. Excellent ability to explain analytical choices and results, with excellent responses to audience questions.

Good

(B+, B) Good ideas and concepts supported by clear data analytics and visualization. Good familiarity with Python/R operations. Good ability to explain analytical choices and results, with good responses to audience questions.

Marginal

(B-, C+, C) Adequate ideas and concepts with basic analytical support. Adequate familiarity with Python/R operations. Limited explanation of analytical choices and results, with basic responses to audience questions.

Failure

(F) Inadequate ideas or concepts, inadequate analytical support, and no effective use of Python/R operations. Inability to explain analytical choices or results and failure to respond appropriately to audience questions.

Part III Other Information

Keyword Syllabus

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

Reading List

Compulsory Readings

	Title
1	Imai, K. (2018). Quantitative Social Science: An Introduction. Princeton University Press.
2	Wickham, H. & Grolemund, G. (2023). R for Data Science: Import, Tidy, Transform, Visualize, and Model Data. O'Reilly
3	Gelman, A., Hill, J., and Vehtari, A. (2020). Regression and Other Stories. Cambridge University Press
4	VanderPlas, J. (2023). Python Data Science Handbook. (2nd ed.). O’ Reilly Media, Incorporated.
5	Nelli, F. (2018). Python data analytics#: with Pandas, NumPy, and Matplotlib (Second edition.). Apress.
6	Chen, D. Y. (2018). Pandas for everyone#: Python data analysis. Addison-Wesley.
7	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

Additional Readings

	Title
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.
8	Angrist, J. D., and Pischke, J. (2008). Mostly Harmless Econometrics: An Empiricist's Companion. Princeton University Press.
9	Freedman, D. A., Pisani, R., and Purves, R. A. (2007). Statistics. 4th edition. New York: W .W . Norton & Co