

Course Information						
Year	AY 2025-2026		School	UNU-IAS		
Course Title	Environmental Statistics and Research Methods					
Instructor & Contact Information	Shengru Li, s.li@unu.edu					
Term/Day/Period	AY 2025 Autumn / Friday and Monday / Friday 9:30 – 13:00, Monday 9:30 – 13:00 and 14:00 – 15:40					
Category	Elective Course		Eligible Year	1 <sup>st</sup> year and above	Credits	2
Classroom	Lecture room, 6th floor in the UNU building		Campus	UNU-HQ, Tokyo, Japan		
Main Language	English					
Class Modality Categories	On-Campus					
Course Code	512024					
Level	Graduate-level		Types of lesson	Lecture		

Syllabus Information	
Subtitle	N/A
Course Description (Word limit: 200)	<p>The Environmental Statistics and Research Methods is a course designed to help postgraduate students to understand and apply quantitative research methods in their research activities. This course is focused on the application of relevant research methodology to address research problems that students are interested in solving. Thus, presentation and explanation of instructor is combined with discussion of practical issues related to the application of research methods. Individual consultation of students with professors is expected to take place during the semester. Considering that social science studies may consist various academic disciplines, and the research problems are complex, the course will serve as a primer on common statistical concepts that is fundamental to any social science research.</p> <p>The latter half of the course will focus on learning Python for Data Analysis. This portion of the course assumes no prior knowledge of computer science for students and is a primer of computer science with a particular focus on working with data in Python. The classes will require students to use their own computers in the classroom to practice programming along with the instructor. Students will be able to gain solid foundation in Python working environment, data structures, data wrangling, data plotting, modelling, and get exposed to popular libraries such as NumPy, pandas, matplotlib, Patsy among others. The aim of this learning opportunity is to provide students with an entry point to the world of computing and showcase the usefulness of Python in addressing real-world data analysis challenges.</p>
Objectives and Learning Goals (Bullet points)	<ul style="list-style-type: none"> <li>• Enhance students' understanding of the research process from idea formulation to data analysis and interpretation;</li> <li>• Enable students to use gained knowledge to design their own research on a topic of personal interest;</li> <li>• Improve students' ability to critically read and understand the research literature;</li> <li>• Improve students' confidence in applying selected research methods; and</li> <li>• Equip students with the foundational knowledge and practical skills necessary to effectively use Python for data analysis, including data cleaning and wrangling, visualization of data and modelling, through hands-on exercises and real-world examples.</li> </ul>

<div>Requirements</div> <div><i>This part should include the expected working hours.</i></div>	<div>All students are expected to participate actively in classes and complete two assignments.</div> <div><ul style="list-style-type: none"><li>Active class participation (30%, more than 80 % attendance is required)</li><li>Assignments (70%)<ul style="list-style-type: none"><li>Data analysis in Excel and IBM SPSS (35%)</li><li>Data analysis in Python (35%)</li></ul></li></ul></div>																																		
<div>Course Outline</div> <div><i>Detailed information could be provided on Moodle such as the information of the lecturers, etc.</i></div>	<table><tr><th>Lecture</th><th>Outline</th></tr><tr><td>1</td><td>The "Why" and "What" of Statistics: foundations &amp; scales of measurement</td></tr><tr><td>2</td><td>Describing Data: measures of central tendency, dispersion &amp; standardization</td></tr><tr><td>3</td><td>Sampling Strategies for Social Science: from populations to representative samples</td></tr><tr><td>4</td><td>The Building Blocks of Inference: probability, normal distribution &amp; the central limit theorem</td></tr><tr><td>5</td><td>Making Decisions with Data: hypothesis testing &amp; one-sample t-test</td></tr><tr><td>6</td><td>Comparing Two Groups: independent and paired samples t-tests</td></tr><tr><td>7</td><td>Comparing More Than Two Groups: Analysis of Variance (ANOVA)</td></tr><tr><td>8</td><td>Analyzing Relationships &amp; Planning Your Study: correlation, regression, and sample size</td></tr><tr><td>9</td><td>Python for Data Analysis: introduction, environment set-up, and language basics</td></tr><tr><td>10</td><td>Python for Data Analysis: built-in data structures, functions, and files</td></tr><tr><td>11</td><td>Python for Data Analysis: NumPy basics, arrays and vectorized computation</td></tr><tr><td>12</td><td>Python for Data Analysis: getting started with pandas</td></tr><tr><td>13</td><td>Python for Data Analysis: data loading, storage, cleaning and preparation, and data wrangling</td></tr><tr><td>14</td><td>Python for Data Analysis: plotting and visualization</td></tr><tr><td>15</td><td>Python for Data Analysis: introduction to modelling libraries and data analysis examples</td></tr></table>			Lecture	Outline	1	The "Why" and "What" of Statistics: foundations & scales of measurement	2	Describing Data: measures of central tendency, dispersion & standardization	3	Sampling Strategies for Social Science: from populations to representative samples	4	The Building Blocks of Inference: probability, normal distribution & the central limit theorem	5	Making Decisions with Data: hypothesis testing & one-sample t-test	6	Comparing Two Groups: independent and paired samples t-tests	7	Comparing More Than Two Groups: Analysis of Variance (ANOVA)	8	Analyzing Relationships & Planning Your Study: correlation, regression, and sample size	9	Python for Data Analysis: introduction, environment set-up, and language basics	10	Python for Data Analysis: built-in data structures, functions, and files	11	Python for Data Analysis: NumPy basics, arrays and vectorized computation	12	Python for Data Analysis: getting started with pandas	13	Python for Data Analysis: data loading, storage, cleaning and preparation, and data wrangling	14	Python for Data Analysis: plotting and visualization	15	Python for Data Analysis: introduction to modelling libraries and data analysis examples
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Course Readings	<div><div>1.</div><div>Statistics for the Behavioral and Social Sciences: A Brief Course, <a href="https://www.pearson.com/en-us/subject-catalog/p/statistics-for-the-behavioral-and-social-sciences-a-brief-course/P200000002707">https://www.pearson.com/en-us/subject-catalog/p/statistics-for-the-behavioral-and-social-sciences-a-brief-course/P200000002707</a></div></div> <div><div>2.</div><div>McKinney, W. (2022). Python for Data Analysis, 3rd Edition. O'Reilly Media, Inc. <a href="https://wesmckinney.com/book/">https://wesmckinney.com/book/</a></div></div>																																		
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