Course title: Quantitative Approaches and Methods for Development Practice

Course code: MPD 115	**No. of credits:** 3	**L-T-P:** 34-6-10	**Learning hours:** 45

Pre-requisite course code and title (if any):

Department: Department of Policy and Management Studies

Course coordinator(s): Dr Chandan Kumar	**Course instructor(s):** Dr Chandan Kumar

Contact details: chandan.kumar@terisas.ac.in

Course type: Compulsory Core	**Course offered in:** Semester 1

Course description

This course is designed and implemented to help students develop and strengthen their ability to understand the importance and scope of quantitative approaches and methods in development-related investigations. The course aims to create a firm base on basic statistical tools and techniques, their appropriate application in development research and to help students build perspectives based on robust analytical approaches.

Learning objectives:

- To provide students with a basic ability to design a quantitative study.
- To enable students to draw inferences from the data.
- To help students make the optimal decision on the selection of appropriate statistical methods for quantitative data analysis.

Course content

Module	Topic	L	T	P
1	**Gains and Fundamentals of Quantitative Approaches in Development Inquiry** This module aims to orient students towards the need and application of statistical tools and quantitative approaches in the development sector. Since the students pursuing the MA-SDP programme come from diverse disciplines' backgrounds and they might not have sufficient exposure to statistics during their undergraduate courses, example-based introduction to statistical techniques and their applications is emphasized. This module will include discussion and practices on: a) Importance and Examples of Quantitative Approaches in Development Inquiry b) Statistical Thinking c) Types of Data	4		
2	**Quantitative Study Design and Process of Data Collection** The focus of this module would be on describing in detail the strategies a practitioner would use to collect data, making a note of how they will address the primary issues associated with the method they are employing to investigate development-related inquiries. The details included in this module are: a) Experimental Research Design: pre-experimental, true experimental, and quasi-experimental study design b) Non-Experimental/Observational/Survey Research Design: Cross-Sectional Design, Longitudinal Study Design c) Population, Sampling, and Subjects: concept of population and sample, various approaches to the sampling, central limit theorem, issues in sample size selection, and basic sampling designs d) Preparation of Survey Instrument: Questionnaire Construction – two-column-table-approach	8	2	2
3	**Quantitative Data Analysis and Assessment** This module will focus on describing the methods of quantitative data analysis, including the descriptive and inferential statistical tests. Discussion would also encompass the measures the practitioners should take to increase the validity and reliability of their results. The details included in this module are: a) Descriptive statistics: Frequencies, Measures of Central tendency, Measures of Dispersion b) Inferential statistics: introduction to hypothesis testing, type of statistical errors, level of significance, confidence interval, statistical vs. practical significance, and some commonly used statistical tests. c) Evaluating quantitative research: Validity and Reliability d) Bivariate analysis; Concept of Correlation and Regression (OLS) e) Concept of weighting survey data	14	2	6

4	**Introduction to Multivariate Analysis** The focus of this module is to provide students with an orientation on select multivariate regression models and their applications in different contexts of development inquiry, such as: a) Correlation Matrix and Multivariate Linear Regression method: application and fundamental assumptions/considerations; examples taken from different analyses carried out in the domain of the development sector; basic nuances including the method of ordinary least squares, regression coefficients, R^2 and adjusted R^2 b) Multivariate Logistic Regression Model: application and prerequisites; examples taken from different analyses carried out in the domain of the development sector c) Other popular multivariate models: application and prerequisites; examples taken from different analyses carried out in the domain of the development sector	6	2	
5	**Outlining, Interpreting and Discussing Quantitative Analysis** This module would focus on orienting the students to layout, interpret, present (including visual depictions of the data), and document the results of a quantitative research study. Major discussion would be around: a) Organization/presentation of quantitative data into meaningful tables b) Graphical presentation c) Interpretation and Discussion of results d) Acknowledging limitations of a quantitative study	2		2
	Total	**34**	**6**	**10**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test 1:** Written Test (20%); as a part of a mid-course evaluation under each Programme by the University in terms of intermediary minor tests, the students will be evaluated based on a written test. The structure of the minor test usually follows short-answer-type questions, which would cover the initial two modules of the course. This minor test would share one-fifth of the total marks required for evaluating the candidates under this course. The test will be conducted after 8 weeks of lectures or after the completion of modules 1-2.
- **Minor Test 2:** Submission of Assignment (30%); the students are required to submit a set of three assignments based on the statistical exercises conducted in the classroom. The preparation of this assignment would be made during the tutorial/practical classes and will be submitted and presented after the completion of relevant sections of the course or as suggested by the Course Instructor. One of those assignments could be the preparation of a structured questionnaire on their area of inquiry.
- **Major Test:** Presentation and submission of a quantitative study proposal (50%); the students are required to select any development inquiry which is quantitative in nature (based on the study objective), and develop a research proposal, which will be submitted and presented as a part of the major/final test. The structure of the research proposal for a quantitative research study includes:
  - Introduction
  - Research Questions
  - Objectives
  - Methodology: Research hypothesis; Study setting; Study design; Reference and study population; Sample size; Sampling method; Exclusion criteria (if any); Specify the measures/variables; Study tools/instruments; Technique/Process of using the instruments and making the measurements; Pilot study, Data analysis plan
  - Expected Outcomes
  - Study Timeline

  Indicators for evaluation: (a) Identification of research problem; (b) Framing research questions, objectives and hypothesis (if any); (c) Description of components under methodology section; (d) Conceptualizing expected outcomes and timeline; (d) Content, language, clarity; (e) Reference style and number of references cited

Learning outcomes

1. Upon completion of the course, candidates would be able to use basic statistical tools, learn ways to present quantitative data and get the ability to draw useful inferences from analysed data.
2. Knowledge of statistical tools and their usage will help students appropriately apply such techniques in the research that they'll carry out in the following semesters as well as in future.
3. Students would get the ability to develop a research proposal based on objective(s) which require(s) investigation using quantitative approaches and methods.

Pedagogical approach

Classroom lectures, excel-based data analysis, interesting TED talks from renowned development specialists e.g., Hans Rosling, who uses Gap-minder software to bring data alive, and invited talks from guest speakers, especially those working in the development sector who could provide exposure to different sorts of quantitative analysis carried out by them on real-world data.

Suggested Readings

Module 1:

- Peck R, Olsen C, Devore JL (2016). *Introduction to Statistics and Data Analysis, 5th Edition*. Boston, MA,USA: Cengage Learning.
  - Chapter -1: The Role of Statistics and the Data Analysis Process [pp. 1-28]
  - Chapter -2: Collecting Data Sensibly [pp. 29-79]
- Gravetter FJ, Wallnau LB (2014). *Essentials of Statistics for the Behavioral Sciences, 8th Edition*. Belmont:Thomson Wadsworth.
  - Chapter -1: Introduction to Statistics [pp. 4-29]

Module 2:

- Creswell JW, Creswell JD (2018). *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition*. California: SAGE Publication, Inc.
- Rosenbaum PR (2017). *Observation and experiment: an introduction to causal inference*. Massachusetts: Harvard University Press.
- Roy TK, Acharya R, Roy AK (2016). *Statistical Survey Design and Evaluating Impact*. Delhi: CambridgeUniversity Press.
  - Chapter -1: Introduction to Sample Survey Designs [pp. 1-12]
  - Chapter -2: Basic Sampling Designs [pp. 13-61]
- Kothari CR (2004). *Research Methodology: Methods and Techniques, 2nd Revised Edition*. New Delhi:New Age International Publishers.
  - Chapter -4: Sampling Design [pp. 55-68]

Module 3:

- Gupta SP (2005). *Statistical Methods*. New Delhi: Sultan Chand & Sons Educational Publishers
- Angrist JD, Pischke J-S (2015). Mastering 'Metrics: The Path from Cause to Effect. Princeton, New Jersey: Princeton University Press.
- Peck R, Olsen C, Devore JL (2016). *Introduction to Statistics and Data Analysis, 5th Edition*. Boston, MA,USA: Cengage Learning.
  - Chapter -5: Summarizing Bivariate Data [pp. 202-282]
  - Chapter -10: Hypothesis Testing Using a Single Sample [pp. 505-560]
  - Chapter -12: The Analysis of Categorical Data and Goodness-of-Fit Tests [pp. 624-661]
  - Chapter -13: Simple Linear Regression and Correlation: Inferential Methods [pp. 662-701
- Woodbury G (2002). *An Introduction to Statistics, 8th Edition*. Pacific Grove, CA, USA: Duxbury.
  - Chapter -6: The Central Limit Theorem and Confidence Intervals [pp. 263-309]
  - Chapter -7: One-Sample Hypothesis Tests [pp. 311-366]
- Kirk RE (2008). *Statistics: An Introduction, 5th Edition*. Belmont: Thomson Wadsworth.
  - Chapter -17: Statistical Inference for Frequency Data [pp. 468-497]
  - Chapter -18: Statistical Inference for Ranked Data [pp. 500-517]
- Gravetter FJ, Wallnau LB (2014). *Essentials of Statistics for the Behavioral Sciences, 8th Edition*. Belmont:Thomson Wadsworth.
  - Chapter -15: The Chi-Square Statistic: Tests for Goodness-of-Fit and Independence [pp. 509-534]

Module 4:

- Heeringa SG, West BT, Berglund PA (2010). Applied Survey Data Analysis. Chapman & Hall CRC Statistics in the Social and Behavioral Sciences Series. Boca Raton, FL: Chapman and Hall/CRC (Taylor &

Francis Group).

Module 5:

- Peck R, Olsen C, Devore JL (2016). *Introduction to Statistics and Data Analysis, 5th Edition*. Boston, MA,USA: Cengage Learning.
    - Chapter -3: Graphical Methods for Describing Data [pp. 80-151]
    - Chapter -4: Numerical Methods for Describing Data [pp. 152-201]

Additional information: Up to 5 candidates will be accommodated from other courses/disciplines after discussion with the course coordinator

Student responsibilities

Attendance: At least 75% attendance will be necessary to be able to appear for the final exam.

Prepared by: Dr. Chandan Kumar

Course reviewers

1. Dr. Mathew Gayman, Associate Professor, Department of Sociology, Georgia State University, Atlanta, Georgia, United States of America.
2. Dr. Baowen Xue, Researcher, Department of Epidemiology and Public Health, University College London (UCL), London, United Kingdom.

This Course outline was prepared by Dr Chandan Kumar and approved by the 53rd Academic Council Meeting on 26th August 2022 at TERI School of Advanced Studies, New Delhi.