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| Course title: Quantitative Analysis for Development Practice | | | | |
| Course code: MPD 111 | | No. of credits: 3 | L-T-P: 20-12-10 | Learning hours: 42 |
| Pre-requisite course code and title (if any): | | | | |
| Department: Department of Policy Studies | | | | |
| Course coordinator(s): Dr.Chandan Kumar | | | Course instructor(s): Dr.Chandan Kumar | |
| Contact details: chandan.kumar@terisas.ac.in | | | | |
| Course type: Core | | | Course offered in: Semester 1 | |
| Course description This course is designed and implemented to help students develop and strengthen their ability to statistical-thinking. The course aims to create a firm base on basic statistical tools and techniques, their appropriate application in students' research and helping students build perspectives based on robust analytical approaches. | | | | |
| Learning objectives: | | | | |
| <ul style="list-style-type: none"> • To provide students a basic ability to describe an event or a phenomenon under observation. • To enable students draw inferences from the data. • To help students make the optimal decisions on a set of hypotheses. | | | | |
| Course content | | | | |
| Module | Topic | L | T | P |
| 1. | Introduction to Statistics and Statistical Thinking This module aims to orient students towards need and application of statistical tools and approaches in development sector. Considering the fact that the students pursuing MA-SDP programme come from diverse disciplines' background and they might not have sufficient exposure to statistics during their under-graduate courses, example-based introduction to statistical techniques and their applications is emphasized. This module will include discussion and practices on: a) Statistical Thinking b) Types of Data c) Collection of Sample Data | 4 | | 4 |
| 2. | Descriptive Statistics The basic aim of this module is to help students build knowledge and understanding on methods of descriptive statistics, i.e., describing, exploring and comparing data. This module includes the following topics: a) Frequency Distributions b) Histogram c) Statistical Graphics: Frequency Polygon, Ogive, Dotplots, Stemplots, Bar Graphs, Pareto Charts, Pie Charts, Scatterplots d) Measures of Center e) Measures of Variation/Dispersion, Skewness and Kurtosis f) Measures of Relative Standing and Boxplots | 2 | 2 | 2 |
| 3. | Probability The important concept of probability is discussed using real life examples. The specific topics include: a) concepts of random variables and probability distributions b) concept of expectation and variance c) Binomial, Poisson and Normal distribution | 2 | 2 | 2 |
| 4. | Sampling and Sample Survey Designs The details included in this module are – concept of a sample, various approaches to the sampling, drawing inferences from a sample – central limit theorem, issues in sample size selection, and basic sampling designs. Subsequently, students apply their knowledge in carrying out a small survey as a part of the Research Methodology course, offered simultaneously in the first semester. | 2 | 2 | 4 |
| 5. | Confidence Intervals and Hypothesis Tests This module aims to help students learn formulating and testing hypotheses using | 4 | 2 | 2 |

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| | examples taken from development sector. The specific topics under discussion include – introduction to hypothesis testing (null and alternative hypothesis), type of statistical errors, level of significance, confidence interval, statistical vs. practical significance, some commonly used tests. | | | |
| 6. | Correlation and Regression This module focuses on making inferences from two dependent samples, with each value of one sample somehow paired with a value from the other sample. Correlation and Regression methods are discussed at length using examples taken from the development sector. Basic nuances include – introduction to modelling, the method of ordinary least squares, regression coefficients, R ² and adjusted R ² , ANOVA in regression. Students get opportunity to carry out linear regression model analysis using statistical software and interpret the output accurately. | 4 | 2 | 4 |
| 7. | Statistical Inference for Frequency and Ranked Data This module focuses on making statistical inferences by analyzing nominal and ordinal data, which is profoundly used in behavioural/social sciences. <ul style="list-style-type: none"> a) Application of Pearson’s Chi-Square Statistic: Testing Goodness-of-fit, Testing Independence, Testing Equality of two or more population proportions b) Assumption-Freer Tests <ul style="list-style-type: none"> o Mann-Whitney <i>U</i> test for two independent samples o Wilcoxon <i>t</i> test for dependent samples c) Comparison of Parametric tests and Assumption-Freer tests for Ranked Data | 2 | 2 | 2 |
| | | 20 | 12 | 20 |
| Evaluation criteria: Course grades will be based on the following criteria: <ul style="list-style-type: none"> • 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 candidates will be evaluated attending 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’ lectures or after the completion of modules 1-2. • Test-2: Submission of Assignment (20%); the candidates are required to submit an assignment 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. • Test-3: Written Test (10%); same as Test-1, which would cover modules 3-5. • Test-4: Written Test (50%); after the completion of the full syllabus, the final written test will be conducted. The structure of the major/final test will follow both short- and long-answer type questions. | | | | |
| Learning outcomes <ol style="list-style-type: none"> 1. Upon completion of the course, candidates would be able to use basic statistical tools, learn ways to present quantitative data and get 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 over different semesters as well as in future. | | | | |
| Pedagogical approach Classroom lectures, statistical software’s based applications for tutorial, interesting TED Talk from renowned development specialists i.e., Rose Hansling, who uses Gap-minder software to bring data alive, and invited talks from guest faculty members who extensively apply statistics for their research. The students will be encouraged to apply their knowledge in statistics, sampling techniques for carrying out the group practicum exercise under Research Methodology course, offered simultaneously in the first-semester. | | | | |

Suggested Readings

Module 1:

- Gupta SP (2005). *Statistical Methods*. New Delhi: Sultan Chand & Sons Educational Publishers
- 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:

- 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]

Module 3:

- Peck R, Olsen C, Devore JL (2016). *Introduction to Statistics and Data Analysis, 5th Edition*. Boston, MA, USA: Cengage Learning.
 - Chapter -6: Probability [pp. 283-351]
 - Chapter -7: Random Variables and Probability Distributions [pp. 352-436]
- Woodbury G (2002). *An Introduction to Statistics, 8th Edition*. Pacific Grove, CA, USA: Duxbury.
 - Chapter -4: Discrete Probability Distributions [pp. 169-213]
 - Chapter -5: Normal Probability Distributions [pp. 215-258]

Module 4:

- Roy TK, Acharya R, Roy AK (2016). *Statistical Survey Design and Evaluating Impact*. Delhi: Cambridge University 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 5:

- 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]
- Peck R, Olsen C, Devore JL (2016). *Introduction to Statistics and Data Analysis, 5th Edition*. Boston, MA, USA: Cengage Learning.
 - Chapter -10: Hypothesis Testing Using a Single Sample [pp. 505-560]

Module 6:

- 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 -13: Simple Linear Regression and Correlation: Inferential Methods [pp. 662-701]

Module 7:

- 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]
- Peck R, Olsen C, Devore JL (2016). *Introduction to Statistics and Data Analysis, 5th Edition*. Boston, MA, USA: Cengage Learning.
 - Chapter -12: The Analysis of Categorical Data and Goodness-of-Fit Tests [pp. 624-661]

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

Student responsibilities

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

Course reviewers

1. Prof. G. Krishnamurthi, Dean, Faculty of Management Studies, Charotar University of Science and Technology (CHARUSAT)
2. Dr. Anand Venkatesh, Professor (Economics), Institute of Rural Management Anand (IRMA)