



DTC – Applied Data Analysis and Research Methodology

Applied Data analysis & Research Methodology

Course 1: Quantitative Research

OBJECTIVES

The course is targeted for beginners and advanced level researchers who want to:

- Gain insights into quantitative research
- Know various types of research
- Have ideas about various types of research designs

TARGET GROUP

- Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to quantitative research methodology.

PREREQUISITES

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of quantitative research that is perfectly okay but you should have strong convictions on what it is, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Introduction to Research Methodology

- Deductive reasoning
- Inductive reasoning
- Concepts of Research Problem
- IMRaD format

2. Types of research:

- Basic research (Fundamental research/Traditional research)
- Applied research: Action research, Implementation research, Evaluation research (Needs assessment, Formative evaluation, Summative evaluation, Cost-benefit evaluation), Experimental research, Operations research
- Descriptive research
- Correlational research
- Exploratory research (Feasibility study/Pilot study)

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- Explanatory research
- Quantitative research
- Qualitative research
- Mixed research

3. Research variables:

- Dependent (Outcome/Response) variables
- Independent (Predictor/Explanatory) variables
- Confounding (Confusing/Disturbing) variables
- Importance of the recognition of Dependent, Independent and Confounding variables
- Effects of Confounding variables

4. Research Designs-I: Observational study

- Case study
- Case series
- Cross-sectional study
- Time series study
- Ecological study (Analysis of secular trend)

5. Research Designs-II: Analytical study

- Case-control study
- Cohort study

6. Research Designs-II: Meta-analysis and Systematic reviews

7. Research Designs-III: Experimental research

- Randomized controlled trials (RCTs): Single-blinded/masked, double-blinded, triple-blinded, open label
- Quasi experimental study
- Pre-experimental study (pretest-post test)

Course 2: Qualitative Research and Mixed Research

OBJECTIVES

The course is targeted for beginners and advanced level researchers who want to:

- Gain insights into qualitative and mixed research
- Develop concept of data collection in qualitative research
- Have ideas about Cresswell and Clark's model of mixed research

TARGET GROUP

Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to qualitative and mixed research methodology.

PREREQUISITES

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of qualitative and mixed research that is perfectly okay but you should have strong convictions on what these are, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Qualitative research:

- Ethnography
- Phenomenology
- Grounded theory
- Epistemology
- Ontology
- Methodology

2. Concept of data collection in qualitative research:

- Focus Group Discussion (FGD)
- Concepts of data saturation point
- Rapid rural appraisal (RRA)
- Participatory rural appraisal (PRA)

3. Mixed Research:

- Concept of triangulation of qualitative and quantitative research designs
- Cresswell and Clark's model:
- Convergent parallel mixed research
- Exploratory sequential mixed research
- Explanatory sequential mixed research
- Transformative mixed research
- Embedded mixed research
- Multistage mixed research

4. Practice on reputed journal articles

Course 3: Basic and Intermediate SPSS Data Analysis

OBJECTIVES

The course is targeted for beginners and advanced level data analysts who want to:

- Gain insights into data analysis procedure in SPSS
- Develop concept of statistical tests with SPSS (Theory and application)
- Have ideas about data analysis to make their articles publishable in reputed journals

TARGET GROUP

Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to statistical analysis with SPSS.

PREREQUISITES

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of statistics that is perfectly okay but you should have strong convictions on what statistical tests are, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Introduction:

- Familiarity with the Statistical Package for Social Sciences (SPSS) environment
- Data entry in SPSS, Data import from Excel file
- Exploring SPSS sample files

2. Concepts of variables:

- Dependent (Outcome/Response) variables
- Independent (Predictor/Explanatory) variables
- Confounding (Confusing/Disturbing) variables
- Importance of the recognition of Dependent, Independent and Confounding variables
- Effects of Confounding variables
- Scales of measurement: Nominal, ordinal, interval and ratio

3. Normality checking of the samples:

- Normal distribution (Bell-shaped curve/Gaussian curve) and non-normal distribution
- Choice of parametric and non-parametric tests
- Concepts of p value and confidence interval and their implications
- Data transformation of the non-normally distributed data: Logarithmic or inverse or square root transformation

4. Concepts of hypothesis testing and implications:

- Null hypothesis (H_0)
- Alternative hypothesis (H_1)
- Concepts of One-tailed/sided (Right-tailed and Left-tailed) and two-tailed tests
- Choice of One-tailed/two-tailed tests

5. Concepts of sampling errors and power of the study:

- Type I error (Alpha error)
- Type II error (Beta error)
- Concepts of Level of significance and Power of the study

6. Statistical tests with SPSS (Theory and application):

- Choice of statistical tests
- Chi square test, Fisher's exact test
- Concepts of Yate's correction
- t-test (independent, paired), Mann-Whitney U test, Wilcoxon rank-sum test
- Correlation (Pearson, Spearman rho, Kendall's tau, partial)

Course 4: Advanced SPSS Data Analysis

OBJECTIVES

The course is targeted for advanced level data analysts who want to:

- Gain insights into advanced data analysis procedure in SPSS
- Develop concept of advanced level statistical tests with SPSS (Theory and application)
- Have ideas about advanced data analysis to make their articles publishable in reputed journals

TARGET GROUP

Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to advanced level statistical analysis with SPSS.

PREREQUISITES

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of statistics that is perfectly okay but you should have strong convictions on what advanced level statistical tests are, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Statistical tests-I (Theory and application):

- Linear Regression: Simple and multiple
- Logistic regression: Binary and multinomial

2. Statistical tests-II (Theory and application):

- Analysis of variance (ANOVA): one-way, repeated-measures
- Kruskal–Wallis test, Friedman’s test
- Analysis of covariance (ANCOVA)
- Multivariate analysis of variance (MANOVA)

3. Statistical tests-III (Theory and application):

- Mixed designs
- Factorial designs, exploratory factor analysis (EFA), principal component analysis (PCA)
- Loglinear analysis

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4. Statistical tests-IV (Theory and application):

- Multilevel linear models (MLM)
- Survival analysis (Kaplan Meier, survival curve), receiver operating characteristic (ROC) curve, Cox regression

5. Common mistakes in choice and applications of the statistical tests

6. Practice with the reputed journal articles having applications of the statistical tests

Course 5: Research Proposal Development

OBJECTIVES

The course is targeted for basic and advanced researchers who want to:

- Gain insights into research proposal development for their career or grant purpose
- Develop concept of Gantt chart development
- Have ideas about budget preparation

TARGET GROUP:

- Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to research proposal development.

PREREQUISITES:

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of research proposal that is perfectly okay but you should have strong convictions on what this is, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Concepts of research proposal and research protocol
2. Components of research proposal: IM
3. Guidelines to write Introduction properly
4. Guidelines to write Methodology properly
5. Data collection tool development
6. Gantt Chart preparation
7. Budget preparation

Course 6: Research title, objectives, hypothesis and research questions

OBJECTIVES

The course is targeted for basic and advanced researchers who want to:

- Gain insights into various types of research titles as given by Hartley
- Develop concept of research hypothesis, objectives and their relations with research titles
- Have ideas about research abstract development

TARGET GROUP

Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to research title, objectives, hypothesis and their implications.

PREREQUISITES

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of research title, objectives, hypothesis that is perfectly okay but you should have strong convictions on what these are, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Research title/topic:

- Attributes of good Title
- Various types of research titles

2. Procedure of writing Title:

- Checklist for finalizing title for a research article

3. Research Title and Objectives:

- Different types of Research title (topic)
- Types of research objectives: General and specific
- Choice of terms in specific objectives: simple and higher-order

4. Research Hypothesis and implications:

- Null hypothesis (H₀)
- Alternative hypothesis (H₁)
- Concepts of One-tailed/sided (Right-tailed and Left-tailed) and two-tailed tests
- Choice of One-tailed/two-tailed tests

5. Abstract: Advertisement of your article

- Components of Abstract
- Word limit on the Abstract
- Qualities of good abstract
- Types of Abstract
- Abstract should NOT contain ...
- Common Mistakes in an Abstract
- Things to consider in the Abstract

Course 7: Literature review and referencing

OBJECTIVES

- The course is targeted for basic and advanced researchers who want to:
- Gain insights into scientific literature review process
- Develop concept of referencing and citation styles
- Have ideas about Open Researcher and Contributor ID (ORCID)

TARGET GROUP

Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to literature review and referencing.

PREREQUISITES

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of literature review and referencing that is perfectly okay but you should have strong convictions on what these are, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Literature Review:

- Concepts of Theoretical and conceptual framework
- Types of Literature Review
- Purpose of Literature Review
- Elements of good literature review
- Things to consider before starting literature review

2. Literature review techniques:

- PubMed search, HINARI search, Science Direct search

3. Key words and MeSH terms

4. How to structure literature review

5. Writing a Literature Review:

- Literature Review Checklist

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6. Concept of grey literature

7. Concept of Open Researcher and Contributor ID (ORCID)

8. Referencing and citations:

- Referencing vs. bibliography
- Citation vs. referencing
- Reasons for referencing and citation

9. Reference styles:

- Vancouver style
- Harvard style
- APA style
- MLA style
- IEEE style
- ACS style
- AIP style
- Chicago style
- Oxford style

10. Concept of DOI:

11. Software for literature review and reference management:

- EndNote
- Mendeley
- Zotero
- Reference Manager

Course 8: Research Ethics and Plagiarism

OBJECTIVES

The course is targeted for basic and advanced researchers who want to:

- Gain insights into research ethics and plagiarism
- Develop concept of peer review process
- Have ideas about avoiding plagiarism in their manuscripts or articles

TARGET GROUP

Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to research ethics and plagiarism.

PREREQUISITES

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of research ethics and plagiarism that is perfectly okay but you should have strong convictions on what these are, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Research Ethics
2. Concepts of the Ethical Review Board (ERB) and Institutional Review Committee (IRC)
3. Concepts of Patient Informed Consent:
 - Informed consent process: verbal and written
 - Components of the informed consent form
 - Vulnerable groups
4. Concepts of Peer Review Process:
 - Single-blinded peer review
 - Double-blinded peer review

5 Concepts of Plagiarism:

- Detection of plagiarism
- Consequences
- How to avoid plagiarism

6. Concepts of data fabrication, falsification and splicing

7. Concepts of p-hacking, Researcher degree of freedom and HARKing

8. Authorship criteria

Course 9: Data collection, processing and statistical analysis

OBJECTIVES

The course is targeted for basic and advanced researchers who want to:

- Gain insights into data collection, processing and statistical analysis
- Develop concept of reliability and validity of research instruments
- Have ideas about sampling designs

TARGET GROUP

Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to data collection, processing and statistical analysis.

PREREQUISITES

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of data collection, processing and statistical analysis that is perfectly okay but you should have strong convictions on what these are, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Data Collection Methods:

- Observation:
- Interview schedule: Structured, semi-structured, unstructured
- Questionnaire: Structured, semi-structured, unstructured
- Techniques to choose appropriate data collection technique

2. Data Processing:

- Editing
- Coding/decoding
- Classification
- Tabulation

3. Reliability analysis of the tools:

- Test-retest reliability
- Equivalent form (alternate-form) reliability
- Intra-rater reliability
- Inter-rater reliability
- Internal consistency (Homogeneity) reliability

4. Validity analysis of the tools:

- Face validity
- Criterion validity
- Concurrent validity
- Construct (content) validity
- Internal and external validity

5. Sampling Design-I: Probability (random) sampling

- Simple random sampling (SRS)
- Stratified random sampling
- Cluster sampling
- Multistage sampling

6. Sampling Design-II: Non-Probability (Non-random) sampling

- Purposive sampling
- Quota sampling
- Convenience sampling
- Expert sampling
- Snowball sampling

7. Sampling Design-III: Mixed sampling

- Systematic sampling
- Techniques to choose appropriate sampling procedure
- Sampling errors: Type I error (Alpha error) & Type II error (Beta error)
- Sample size calculation
- Testing reliability of sample

8. Power of the study

9. Statistical analysis:

- Selection of appropriate statistical tests: parametric tests and non-parametric tests

Course 10: Article publication in scientific journals

OBJECTIVES

The course is targeted for basic and advanced researchers who want to:

- Gain insights into procedures and skills of article publication in scientific journals
- Develop concept of various platforms for scientific research presentation
- Have ideas about impact factor of journal

TARGET GROUP

Any undergraduate and postgraduate level students/professionals of any background who want to learn the theoretical and practical approach to article publication in scientific journals.

PREREQUISITES

- There is no prior educational level requirement for this course.
- If you just have a theoretical knowledge of article publication in scientific journals that is perfectly okay but you should have strong convictions on what these are, and what you hope to achieve from this class.

COURSE BREAKDOWN

1. Types of research articles:

- Original research article
- Review article
- Short communication
- Notes
- Rapid communication

2. Platforms for scientific research presentation:

- Conferences
- Congresses
- Symposiums
- Workshops
- Seminars
- Training

3. Components of Research Article:

- Abstract
- Keywords
- Introduction
- Methodology
- Results
- Discussion
- Conclusions
- References

4. Article publication:

- Importance
- Attributes of Good Manuscript
- Why to publish in high Impact Factor journal?
- Factors to consider before article submission
- Open access (OA) journals
- Reasons for early rejection

5. Impact factor (IF) of an academic journal:

- Calculation of “IF” of a journal