RESEARCH METHODOLOGY AND COMPUTER APPLICATION – 1

Core Group (100 Marks)

1. **Introduction:** Meaning, Process and Types of Research. Research Design: Types of research design, Exploratory Studies, Descriptive Studies, Causal studies, constructing an appropriate Research Design. Hypothesis; types and criteria of a statistics. Testing of hypothesis.

No. of Classes - 4

2. **Source of Data:** Stimulus-Response Relationship, Forms of communication and data collection method, Nature of data under various settings. Maintaining the Data Quality under various Settings. Informal setting with written or verbal mode of communication, The Advantage and Disadvantage of the oral verbal method of communication, Content analysis, Observation, Secondary data. Errors in Data: Measurement Error Introduction, Error identification , Problem of Outlier, Sources of Non sampling Error, Response and Non-Response error, Other checks on data.

No. of Classes - 6

3. **Experimental Technique:**

Types of Experiments, Settings for Experiments, Errors in Experiment, Experimental Design Notation, Application of experimental Design

No. of Classes - 4

4. **Methods of Data Collection:** Different methods of data collection. Questionnaire Method, Questionnaire, Types of Questionnaire, Wording of Questions, Observation, Verbal Testing

No. of Classes - 2

5. **Measurement and Scaling Techniques:**

Introduction, Measurement scales, Scaling of Techniques, More on Specialized Scales – Ordinal scale and Thurstone Scale'

No. of Classes - 4

6. **Sampling Methods:** Sample survey and Complete Enumeration, Cost effective and optimum size, Sampling: The basic framework and Different Methods of sampling.

7. **Probability:** Probability, conditional probability and independence, theorem of total probability, Bayes' Theorem, formulating and solving simple probability problems

No. of Classes - 4

8. **Probability distributions:** binomial, poisson, multinomial, geometric, hypergeometric, negative binomial, normal, exponential, gamma

No. of Classes - 6

9. **Estimation and testing:** concepts of unbiasedness / consistency / efficiency /

sufficiency, introduction to various methods of estimation like method of moments / maximum likelihood / least squares, concepts of linear models and BLUE, error of estimates, point and interval estimation, concepts of tests of hypotheses, power of tests, type I and type II errors, NP lemma, most powerful and UMP tests, examples of test design – tests of equality of means / standard deviation / rates / proportions / goodness of fit tests etc.

No. of Classes - 8

10. **Nonparametric Tests:** sign test, rank sum test, run test, Mann- Whitney U test. Goodness of fit tests using KS, AD etc. Concepts of binomial tests, Techniques of probability plotting.

No. of Classes - 6

10. **Contingency Tests:** Contingency tables, tests of independence, χ^2 analysis

No. of Classes - 4

11. **Computer Application:** Outlier Detection, Preparing Panel data, Scaling – Ordinal to Intercial Scale (Application of Thurststone Scale). Other statistical methods.

No. of Classes - 21

(Total No of Classes;   75 =   5 credit points)

RESEARCH METHODOLOGY AND COMPUTER APPLICATION – II

Core Group: 100 Marks

1. **Bivariate Data:** Analysis and presentation of bivariate data, Correlation and regression techniques.

No. of Classes - 4

2. **Multiple regression analysis:** Model building, validation and interpretation using split samples, identification of influential observations using Cook's distance etc. Usage of dummy variables. Model validation through residual analysis, concepts of measurement of serial correlation of errors through DW statistic, concepts of VIF

No. of Classes - 6

3. **Analysis of variance:** one way classified data, two way classified data, concept of homoscedasticity

No. of Classes - 4

4. **Associations and contingency tables:** Construction of contingency tables, conditional probability, odds ratio, relative risk, χ^2 tests of independence, continuity correction, concepts of confounders and effort modifiers, Mantel-Haenszel method, ordered contingency tables, log-linear models.

No. of Classes - 4

5. **Logistic regression:** Binary logistic regression, polytomous logistic regression, ordinal logistic regression, analysis of matched samples, model validation and assessment of goodness of fit.

No. of Classes - 6

6. **Poisson regression:** Model building, validation and interpretation. **Cox regression (proportional hazard model):** Concept of censored data, concepts of survival data analysis, comparison of survival distribution, introduction to hazards, Kaplan – Meier method, building proportional hazard model, validation and interpretation of model.

No. of classes - 6

3

7. **Multivariate analysis :** Factor Analysis, Discriminant analysis, Conjoint Analysis

No. of Classes - 8

8. **Time series : Basic concepts** – trend, seasonality, cyclic patterns, random component

Moving averages, exponential smoothing, double exponential smoothing, advanced methods like Winter's and Holt's methods.

No. of Classes - 6

9. **Box Jenkins & other Methods:** Concepts of auto correlation, partial autocorrelation, autoregressive models, DW statistics, integrated models, concepts of stationarity – DF tests, augmented DF tests, Lung Box tests, Box Jenkins models (AR / MA / ARMA / ARIMA models) including techniques of model identification and validation. Special methods like ARCH, GARCH and Vector Autoregressive models. Beysian GARCH models.

No. of Classes - 6

10 **Dynamic regression models**: combining explanatory variables and AR / MA / ARMA model using GLM, Kyock models, rational lag models.

No. of Classes - 4

11 **Computer Applications**.

No. of Classes - 21

(Total No of Classes;   75 =   5 credit points)

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