

Estimation of survival function - Actuarial Estimator, Kaplan - Meier Estimator, Estimation under the assumption of IFR/DFR.

Unit 4

12 Hrs

Tests of exponentiality against non-parametric classes - Total time on test, Deshpande test. Two sample problem - Gehan Test, Log rank test. Mantel - Haenszel Test, Tarone - Ware tests.

Unit 5

10 Hrs

Semi-parametric regression for failure rate - Cox's proportional hazards model with one and several covariates.

Books for Reference:

1. Cox, D.R. and Oakes, D. (1984). Analysis of Survival Data, Chapman and Hall, New York.
2. Gross, A. J. and Clark, V. A. (1975). Survival Distributions: Reliability Applications in the Biomedical Sciences, John Wiley and Sons.
3. Elandt - Johnson, R.E., Johnson, N.L. (1980). Survival models and Data Analysis, John Wiley and Sons.
4. Miller, R.G. (1981). Survival Analysis, Wiley.
4. Zacks, S. Reliability.

21STHCT2.4(b)	Sampling Theory	
Credits: L:4	Teaching: 4Hrs/week	Max. Marks: 100
	Total Teaching Hours : 56	C1: 15; C2: 15; C3: 70

Learning Objectives : This course gives an overview of sampling design and methodology and also discusses important statistical indicators used in national development. Several sampling techniques are part of this course and a comprehensive introduction to statistics for national development is also included in the course.

Course Outcomes : A person successfully completing the Course will acquire a very good knowledge of standard sampling designs and a comprehensive knowledge of Statistics used in study of National Development and the Course also has Practical problem solving and data analysis techniques.

Pedagogy : The course is taught using traditional chalk-and-talk method using problem solving through examples and exercises. Practical training in solving problems in the subjects is given as part of the Course. Students are encouraged to use text and video resources available on the web.

Assessment : The assessment is done through periodic written tests involving problem solving, oral quizzes, assignments and student seminars.

A. SAMPLE SURVEYS

Unit 1

10 Hrs

Basic finite population sampling techniques (SRS WR/ WoR, stratified, systematic), related problems of population mean estimation, allocation problems in stratified sampling.

Unit 2**10 Hrs**

Unequal probability sampling: PPS WR / WoR methods (including Lahiri's scheme) and related estimators of a finite population mean (Hansen-Hurvitz and Desraj estimators for a general sample size and Murthy's estimator for a sample of size 2).

Unit 3**8 Hrs**

Ratio and regression estimators based on SRS WoR method of sampling, two-stage sampling with equal. Number of second stage units, double sampling, cluster sampling.

B. STATISTICS'FOR NATIONAL DEVELOPMENT**Unit 4****10 Hrs**

Economic development: growth ip. per capita income distributive justice. Indices of development, Human Development Index. Estimation of National Income - product approach, income approach and expenditure approach. Population growth in developing and developed countries. Population projection using Leslie matrix. Labour force projection.

Unit 5**10 Hrs**

Measuring inequality of incomes, Gini coefficient, Theil's measure. Poverty measurement- different issues, measures of incidence and intensity, combined measures, eg. Indices due to Kakwani, Sen. etc.

C. WOMEN'S STATISTICS**Unit 6****8 Hrs**

Women's Empowerment Index: 1) Determinants of empowerment like education, employment, access to health, access to media, access to finance, involvement in decision making process at family and at office/organization . 2) Various measures of women's empowerment index based on sex, geographical region and time etc.

Books for Reference:

1. Choudhary, A and Mukherjee, R (1989): Randomized Response techniques, Marcel Decker.
2. Cochran, W. G. (1977): Sampling techniques, Third Edition, Wiley.
3. Des Raj and Chandok (1998): Sampling Theory, Narosa.
4. Murthy, M. N. (1977): Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
5. Singh,D. and Choudhary, F. S. (1986): Theory and Analysis of Sample Survey Designs, New Age International.
6. Sukhatme et al. (1984): Sampling Theory of Surveys with Applications, Iowa State University Press.
7. C.S.O. (1980): National Accounts Statistics- Sources and Health.

SEMESTER IV

22STHCT4.1	Time Series Analysis	
Credits: L:4	Teaching: 4Hrs/week	Max. Marks: 100
	Total Teaching Hours : 52	C1: 15; C2: 15; C3: 70

Course Outcomes:

C01: A person successfully completing the Course will be exposed to specialized techniques to analyse data on time series and the practical component aids in understanding fitting of suitable time series models to time series data.

C02: Knowledge about the forecasting system.

Unit 1

10 Hrs

Time series as discrete parameter stochastic process, auto-covariance and auto-correlation functions and, their properties.

Unit 2

16 Hrs

Detailed study of the stationary processes: (i) moving average (MA), (ii) auto-regressive (AR), (iii) ARMA, and, (iv) AR integrated MA (ARIMA) models. Box-Jenkins models. Discussion (without proof) of estimation of mean, auto-covariance and auto-correlation functions under large sample theory.

Unit 3

10 Hrs

Choice of AR and MA orders. Estimation of ARIMA model parameters. Forecasting. Residual analysis and diagnostic checking.

Unit 4

16 Hrs

Spectral analysis of weakly stationary process, periodogram and correlogram analysis, computation based on Fourier transforms, Spectral decomposition of weakly AR process and representation as a one-sided MA process -necessary and sufficient conditions.

Implication of spectral decomposition in prediction problems. State space representation of time series. Kalman filter techniques.

Books for Reference:

1. Anderson. T.W. (1971). The Statistical Analysis of Time Series. Wiley.
2. Bloomfield, P. (2000). Fourier Analysis of Time Series: An Introduction. Second Edition, Wiley.
3. Box, G.E.P., Jenkins, G. W. and Reinsel, G.C. (1994). Time Series Analysis:Forecasting and Control Prentice Hall.
4. Box, G.E.P. and Jenkins, G.M (1976). Time Series Analysis -Forecasting and Control Holden-day, San Francisco.
5. Chatfield, C. Analysis of Time Series -Theory and Practice, Chapman and Hall.
6. Chow, C.G. (1985). Econometrics.. Mc Graw Hill.
7. Findley, D.F..ed., (1981). Applied Time Series Analysis II. Academic. Press.
8. Fuller, W.A. (1976). Introduction to Statistical Time series. Wiley.

21STOEP2.1	Statistical Methods and Applications	
Credits: L:4	Teaching: 4Hrs/week Total Teaching Hours : 56	Max. Marks: 100 C1: 15; C2: 15; C3: 70

Learning Objectives: This course gives an overview of statistical methods and applications. Statistical Methods are part of this course and a comprehensive introduction to statistics for applications is also included in the course.

Course Outcomes: A person successfully completing the Course will acquire a very good knowledge of standard statistical method and a comprehensive knowledge of Statistics used in study of applications and the Course also has Practical problem solving and data analysis techniques.

Pedagogy :The course is taught using traditional chalk-and-talk method using problem solving through examples and exercises. Practical training in solving problems in the subjects is given as part of the Course. Students are encouraged to use text and video resources available on the web.

Assessment :The assessment is done through periodic written tests involving problem solving, oral quizzes, assignments and student seminars.

Unit 1: **14 Hours**
Descriptive Statistics: Data presentation by charts and tables, measures of central tendency, Measures of dispersion, Skewness and kurtosis.

Unit 2: **14 Hours**
Correlation and regression Analysis, Scatter plot, Karl-Pearson's coefficient of correlation, Spearman's rank correlation, Simple regression Analysis.

Unit 3: **14 Hours**
Basic s of testing of hypothesis, Test for proportions (one sample and two sample problems), Test for mean, test for variance (one sample and two sample problems), Chi-Square test of independence.

Unit 4: **14 Hours**
Linear programming problems (LPP), Solution by graphical method, Transportation, Assignment and sequencing (Feasible solutions only).

Books for Reference:

1. Medhi J (1994), Stochastic Processes, 2nd edn., Wiley Eastern Ltd., New Delhi.
2. Bhattacharya, G.K. and Johnson, R.A. Statistical concepts and methods. Wiley Eastern. Calcutta, Bombay and Delhi.