

SARDAR PATEL UNIVERSITY



**DEPARTMENT OF STATISTICS
FACULTY OF SCIENCE
COURSE OF STUDY**

RULES FOR CERTIFICATE COURSE IN FINANCIAL STATISTICS

R.CCFinStat.1: A candidate who has passed the Bachelor’s degree examination in any faculty of this University under 10 + 2 + 3 or an examination recognized as equivalent thereto with at least 40 percent of marks will be considered eligible for admission. In addition, the candidate should have studied a four credit course in Statistics / Mathematics. The M.Sc (Semester IV) students of the Department are also eligible for the course if they are not offered Financial Statistics specialization.

R.CCFinStat.2: In this course the candidates will have to study the courses (i) PS04ESTA01:Econometrics **OR** PS03ESTA04:Time Series (The offering of the option is left to the discretion of the Head of the Department) (ii) PS04ESTA02: Actuarial Statistics. These two courses are already running in the department as optional courses in the fourth semester of M.Sc Programme of the department. Therefore, the certificate course will be run in schedule of semester iv.

R.CCFinStat 3:The course coordinator will be in charge internal test examination. Candidates will be examined in each theory paper for 100 marks. For deciding result the ratio between the internal assessment and external assessment will be 30:70. For the purpose of internal assessment, the Department concerned will conduct one test. The Department will also arrange Quiz, Seminar etc. for internal assessment in theory course work. The distribution of marks will be as under: -

1. Structure for each theory paper:

a)	Quiz	..	..	..	5 marks
b)	Seminar	..	..	..	5 marks
c)	Test	..	..	..	20 marks

				Total	30 marks

The following grading scheme will be adopted to issue the certificate.

Marks in percentage	Grade
70 and above	A
65-69	B+
60-65	B
55-59	C+
50-54	C
0-49	Attendance Certificate

R.CCFinStat.4: The following are the details of the courses.

PS04ESTA01:ECONOMETRICS

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|---------------|--|------|
| Unit 1 | Econometrics: Definition, Methodology, Examples, Nature and Source of Data, Classical Linear Regression Model (CLRM): Assumptions, estimation of parameters through Maximum Likelihood Method and Ordinary Least Square Method, Properties of Estimator, Model Selection Criterion; RSquare, Adjusted RSquare, Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) Mallow's C_p Criterion, Forecast Chi-Square, Significance Test and Confidence Interval, Testing of Subset of Regressors, Point Predictor, Cobb-Douglas Production function, Constraint Least Square, Dummy Variable: Nature, introduction, examples, Chow Test, Seasonal Adjustment | 12 L |
| Unit 2 | Heteroscedasticity: Reason of Heteroscedasticity; Detection: Informal Method, Formal Test; Park Test, Goldfield-Quant Test, White General Heteroscedasticity Test, The Breusch-Pagan Test; Remedial Measures, OLS Assumptions in presence of Heteroscedasticity; Method of Generalized Least Squares (GLS), Consequences of using OLS in presence of Heteroscedasticity;
Autocorrelation: Nature of the Problem, OLS Estimation in the presence of Autocorrelation, Consequences of Autocorrelation, Detection: Graphical Method, The Run Test, Durbin-Watson d Test, A General Test of Autocorrelation, The Breusch-Goldfrey (BG) Test; GLS when correlation coefficient is known as well as unknown; Auto Regressive Conditional Heteroscedasticity (ARCH) and Generalized Autoregressive Conditional Heteroscedasticity (GARH) Model; Analysis of Residuals: Outliers, Leverage, Influence; Chow Prediction Failure Test | 12L |
| Unit 3 | Multicollinearity Problem, Its implications and tools for handling the problem; Detection of Multicollinearity; Remedial Measures; Ridge Regression; Use of Principle Component Analysis;
Linear Regression with Stochastic Regressors, Types of Specification Errors, Errors of Measurement, Instrumental (Proxy) Variable | 12L |

Unit 4 Simultaneous Equation Models: Nature, Examples, Identification Problems: Rules of Identification: The Order Condition of Identifiability, The Rank Condition of Identifiability. 12L

Estimation in Simultaneous Equation Models, Recursive System, Indirect Least Square (ILS) Method, Two Stage Least Square Method (2SLS)

Books Recommended

- 1 Doran, H.E.(1989). Applied Regression Analysis in Econometrics, Marcel Dekker Inc.
- 2 Freud, R.J., Wilson,W.J. and Sa,P.(2006). Regression Analysis: Statistical Modeling of a Response Variable, Ed. II Elsevier Inc.
- 3 Gujarathi, D.N. and Sangeetha (2007). Basic Econometrics, Ed. IV , Tata MacGraw Hill
- 4 Greene, W.G. (2003) Econometric Analysis. Ed. V, Pearson Education
- 5 Intriligator,M.D., Bodkin, R.G., Hsiao, C.(1996). Econometric Models, Techniques and Applications, Pearson Publisher
- 6 Johnston, J. (1984) : Econometric methods, Third edition, McGraw Hill.
- 7 Ruppert, D.(2004). Statistics and Finance: An Introduction , Springer (India) Pvt. Ltd.
- 8 Theil, H. (1982) : Introduction to the theory and practice of Econometrics, John Wiley.
- 9 Walters, A (1970) : An introduction to Econometrics, McMillan & Co
- 10 Wasington, S.P., Karlftis, M.G. and Mannering, F.L. (2011). Statistical and Econometric Methods for Transportation Data Analysis, Ed. II, CRC Press, Chapman & Hall Books

PS03ESTA04: TIME SERIES ANALYSIS

Time-series as discrete parameter stochastic process. Auto covariance and autocorrelation functions and their properties.

Exploratory time Series Analysis, Tests for trend and seasonality.

Exponential and Moving average smoothing. Hot and winters smoothing. Forecasting based on smoothing, adaptive smoothing. **9L**

Detailed study of the stationary processes: (1) moving average (MA), (2) Auto regressive (AR), (3) ARMA and (4) AR integrated MA (ARIMA) models. Box-Jenkins models. Discussion (without proof) of estimation of mean, auto covariance and autocorrelation functions under large sample theory. Choice of AR and MA periods. Estimation of ARIMA models parameters. Forecasting. Residual analysis and diagnostic checking. Use of computer packages like SPSS. **24L**

Spectral analysis of weakly stationary process. Periodogram and correlogram analyses. Computations based on Fourier transform. Spectral decomposition of weakly AR process and representation as a one-sided MA process-necessary and sufficient conditions. **12L**

Books Recommended:

1. Box, G. E. P. and Jenkins, G. M. (1976). Time Series Analysis – Forecasting and Control, Holden-day, San Franciscor.
2. Anderson, T. W. (1971). The Statistical Analysis of Time Series, Wiley, N.Y.
3. Montgomery, D. C. and Johnson, L. A. (1977). Forecasting and Time Series Analysis, McGraw Hill.
4. Kendall, Sir Maurice and Ord, J. K. (1990). Time Series (Third Edition), Edward Arnold.
5. Brockwell, P.J. and Davis, R. A. Time Series: Theory and Methods (second Edition). Springer – Verlag.

Additional Books for Reference:

6. Fuller, W. A. (1976). Introduction to Statistical Time Series, John Wiley, N. Y.
7. Granger, C. W. J. and Newbold (1984). Forecasting Econometric Time Series, Third Edition, Academic Press.
8. Priestley, M. B. (1981). Spectral Analysis & Time Series, Griffin, London.
9. 4. Bloomfield, P. (1976). Fourier Analysis of Time Series – An Introduction, Wiley.
10. Granger, C. W. J. and Hatanka, M. (1964). Spectral Analysis of Economic Time Series, Princeton University Press, N. J.
11. Koopmans, L. H. (1974). The Spectral Analysis of Time Series, Academic Press.
12. Nelson, C. R. (1973). Applied Time Series for Managerial Forecasting, Holden-Day.
13. Findley, D. F. (Ed.) (1981). Applied Time Series Analysis II, Academic Press.

PS04ESTA02: ACTUARIAL STATISTICS

Section I – Probability Models and Life Tables.

- Unit 1** Utility theory, insurance and utility theory, models for individual claims and their sums, survival function, curtate future lifetime, force of mortality 10 L
Life table and its relation with survival function, examples, assumptions for fractional ages, some analytical laws of mortality, select and ultimate tables.
Multiple life functions, joint life and last survivor status, insurance and annuity benefits through multiple life functions evaluation for special mortality laws.
- Unit 2** Multiple decrement models, deterministic and random survivorship groups, associated single decrement tables, central rates of multiple decrement, net single premiums and their numerical evaluations. 10 L
Distribution of aggregate claims, compound Poisson distribution and its applications. Distribution of aggregate claims, compound Poisson distribution and its applications.

Section II – Insurance and Annuities

- Unit 3 Principles of compound interest:** Nominal and effective rates of interest and discount, force of interest and discount, compound interest, accumulation factor, continuous compounding. 13L
- Life insurance:** Insurance payable at the moment's of death and at the end of the year of death-level benefit insurance, endowment insurance, differed insurance and varying benefit insurance, recursions, commutation functions.
- Life annuities:** Single payment, continuous life annuities, discrete life annuities, life annuities with monthly payments, commutation functions, varying annuities, recursions, complete annuities-immediate and apportion able annuities-due.
- Unit 4 Net Premiums:** Continuous and discrete premiums, true monthly payment premiums, apportionable premiums, commutation functions, accumulation type benefits. 12 L
- Payment premiums, apportionable premiums, commutation functions accumulation type benefits.
- Net premium reserves:** Continuous and discrete net premium reserve, reserves on a semi continuous basis, reserves based on true monthly premiums, reserves on an apportion able or discounted continuous basis, reserves at fractional durations, allocations of loss to policy years, recursive formulas and differential equations for reserves, commutation functions.
- Some practical considerations:** Premiums that include expenses-general expenses types of expenses, per policy expenses.
- Claim amount distributions, approximating the individual model, stop-loss insurance

Books Recommended:

1. Shailaja R Deshmukh(2009) Actuarial Statistics:An Introduction using R. University Press Pvt.Ltd Hyderabad(Text Book)
2. N. L. Bowers, H. U. Gerber, J. C. Hickman, D. A. Jones and C. J. Nesbitt, (1986), Actuarial Mathematics', Society of Actuaries, Itasca, Illinois, U. S. A. Second Edition (1997)
Section I – Chapters: 1, 2, 3, 8, 9, and 11
Section II – Chapters: 4, 5, 6, 7, 13, and 14

Books for Additional References:

3. Spurgeon E. T. (1972), Life Contingencies, Cambridge University Press
4. Neill, A. (1977). Life Contingencies, Heinemann

R.FinStat.5: Total number of seats for the course is 50.The fee structure of the course is as under.

Collection Head	Amount in Rupees
Information Brochure and application form fee	300.00
Tuition Fee	5000.00
Examination Fee	250.00
Certificate Fee	100.00
Total	5650.00