

GOVERNMENT COLLEGE, SANQUELIM-GOA

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAS)

BROCHURE ACADEMIC YEAR 2024-25

1. INTRODUCTION

The Post Graduate Diploma in Applied Statistics is an initiative of the Government of Goa. The **Post Graduate Diploma in Applied Statistics (PGDAS) Programme** introduced under the Post Graduate Department and Research Centre in Economics of Government College, Sanquelim-Goa is a duly approved by the **Directorate of Higher Education, Government of Goa and affiliated to the Goa University**. The programme is framed considering the needs of the working professionals serving in Government and Non-Government Organisations as well as the ones who wish to improve their skills to take up research / field related jobs. The programme will provide the required knowledge and hands-on training in selected areas of statistics and equip the learners with the skills of using appropriate software like SPSS, 'R' for statistical applications in various fields. The PGDAS programme is based on the OA-35 Ordinance of Goa University governing the Post Graduate Degree and Post Graduate Diploma Programmes of study conducted by the on-campus Schools of Goa University and its Affiliated Colleges based on the Choice Based Credit System of Instruction based on NEP 2020 (Effective from the Academic Year 2023- 2024).

1.1 The Objectives of the Programme

1. To provide opportunities for continuing education and skill formation for human resource development required in different sectors of employment.
2. To acquaint the learners with the application of statistical tools in the analysis of data.
3. To provide the knowledge and hands-on training in selected areas of statistics
4. To equip learners with the skills of using appropriate software for statistical applications in various fields.
5. To help the learners in career progression.

1.2 Programme Outcomes

On successful completion of the Programme, the candidate will be able to:

- Apply various types of sampling methods to data collection.
- Create and interpret frequency tables.
- Display data graphically and interpret graphs.
- Recognize, describe, and calculate the measures suitable to the data sets.
- Use basic statistical tools to apply for a given research problem.
- Process and manage voluminous data using Statistical software.
- Make predictions and decisions based on data analysis.

2. PROGRAMME STRUCTURE AND DETAILS

2.1 GU Ordinance (Amended on 08th September, 2023) The standalone Post Graduate Diploma Programmes shall comprise of a total of 40 Credits i.e. 32 Credits of Core Courses (16 Credits) each in Semesters I and II) and 8 Credits of Discipline Specific Elective (DSE) (4 Credits each in Semesters I and II), as specified in OA-35.2.2 (a).

2.2 PROGRAMME STRUCTURE

Effective from Academic Year: 2023-24

SR. NO.	COURSE CODE	COURSE TITLE	CREDITS	LEVEL
SEMESTER I				
1.	DAS-500	Basic Mathematics	4	500
2.	DAS-501	Descriptive Statistics	4	500
3.	DAS-502	Probability Theory	4	500
4.	DAS-503	Practical I: Basic Statistics	4	500
5.	DAS-521 to DAS-524	Elective course (Any One)*	4	500
		TOTAL CREDITS	20	
SEMESTER II				
6.	DAS-504	Statistical Inference	4	500
7.	DAS-505	Statistical Techniques	4	500
8.	DAS-506	Practical II: Statistical Computations in R	4	500
9.	DAS-507	Practical III: Using Latest Statistical Software (SPSS)	4	500
10.	DAS-521to DAS-524	Elective course (Any One)*	4	500
		TOTAL CREDITS	20	

ELECTIVE COURSES (SEMESTER - I & II) *

1.	DAS-521	Demography	4	500
2.	DAS-522	Time Series Analysis	4	500
3.	DAS-523	Econometrics	4	500
4.	DAS-524	Statistics for Ecology	4	500

3. DURATION OF THE PROGRAMME

Two semesters conducted during weekends (Saturdays and Sundays).

4. ELIGIBILITY FOR ADMISSION

The candidate must have passed the Bachelor's Degree examination of Goa University or an equivalent examination of any other recognised University. The seats will be filled based on first come first served cum merit basis and based on Govt. of Goa reservation policy.

5. TOTAL PROGRAMME FEE: Rs. 20000/- (inclusive of all fees)

6. LINK TO APPLY FOR THE PROGRAMME: <https://forms.gle/iQsDwDGA1TxCgfWa9>

7. CONTACT PERSON

For additional details interested candidates may contact Prof. Seema P. Rath, Programme Coordinator, PGDAS (email: seema.rath@gcsanquelim.ac.in Mobile: 9373696506).

8. SYLLABI

SEMESTER I

CORE COURSES

COURSE CODE: DAS-500 TITLE OF THE COURSE: BASIC MATHEMATICS

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 60

Course Objective	To introduce elementary mathematical concepts and tools which are useful in understanding the numerical and derivations in the remaining courses of the programme.	
	Content	Contact Hours
	<p>Module 1: Set theory Types of sets, Operation on sets, Distributive properties and Demorgans laws, Venn diagrams, Number of elements in a set, Applications of sets.</p> <p>Module 2: Matrices and Determinants Types of matrices, Elementary operations on matrices, Determinant of a matrix, Cramer's rule, Solution of linear equations using matrices and determinants, Consistency of linear equations. (No theorems and proofs).</p> <p>Module 3: Ratio and proportion, Percentage, Simple interest, Compound interest.</p> <p>Module 4: Functions and Limits Cartesian coordinate system, ordered pairs, Cartesian product, Relations, Functions, Types of functions, Limit of a function, Concept of continuity.</p> <p>Module 5: Differentiation Definition of derivative of a function, Standard forms for differentiation, Derivatives of functions (algebraic, exponential and logarithmic only). Rules for differentiation, Applications of differentiation in commerce and economics.</p> <p>Module 6: Integration Meaning of integration, Standard forms, Methods of finding integrals of algebraic, exponential and logarithmic expressions, Definite integration, Application of integration in science, commerce and economics, Area under a curve (No theorems and proofs).</p>	<p>10</p> <p>10</p> <p>10</p> <p>9</p> <p>11</p> <p>10</p>
Pedagogy	<ul style="list-style-type: none"> • Traditional Chalk board Classes. • Online / Power-point presentations & Videos • Assignments and presentations. 	
References/ Readings	<ul style="list-style-type: none"> • Shanti Narayan (2009) A Textbook of Matrices, S. Chand & Co, New Delhi • Mittal P. K, Mathematics for Degree Students (2010), S. Chand & Co. Mumbai • Chitale S.G & Joshi N, A New Approach to mathematical Techniques, Sheth Publishers, Mumbai. • Shanti Narayan, Differential Calculus, S. Chand & Co. New Delhi. 	
Course Outcomes	<p>On successful completion of the Course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Critically evaluate the relationships between sets using Venn diagrams 2. Interpret and explain the meaning of a proportion in real-world contexts 3. Solve problems involving loans and investments using interest calculations 4. Explain the concept of a determinant and its significance in matrix operations and apply matrix operations to solve systems of linear equations. 5. Explain the concept of determinants and matrices and use the matrix operations to solve systems of linear equations. 6. Understand the concept of differentiation and integration and use it to solve problems on area under the curve. 	

COURSE CODE: DAS-501 TITLE OF THE COURSE: DESCRIPTIVE STATISTICS

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 60

Course Objective	To help students understand the fundamentals of data, the process of asking logical questions, collecting data relevant to those question and basic frameworks of analysing and interpreting data, that will be relevant for students to answer to real problems from their daily life.	
	Content	Contact Hours
	Module-1: Introduction to data and statistics Introduction to Statistics, Data and Research – Asking Logical Questions – Inductive and Deductive Questions – Process of Answering Logical Questions – Hypothesis Building – Classification of Data.	15
	Module-2: Collection of Data Sampling Designs (Probability vs Non-Probability Design) – Sampling Errors – Design of Experiments and Importance of Controls – Techniques of Data Summarisation	15
	Module-3: Data Distribution and Basic Data Analysis Types of Data Distribution – Measures of Central Tendency – Measures of Dispersion – Moments in Data (Skewedness and Kurtosis) – Parametric vs Non-Parametric Analysis of Data – Interpretation of Sample Data for a Population (Standard Error and Confidence Intervals)	15
	Module-4: Data Representation and Summarisation Summarization of Univariate and Bivariate Data – Text – Table (structure of a balanced table) – Graphs (scatter, line, multi-line, bar, multi-column, pie) – Statistical Maps	7
	Module-5: Theory of Attributes Classification of Attributes – Independence of Attributes – Association of Attributes	8
Pedagogy	<ul style="list-style-type: none"> • Traditional Chalk board Classes. • Online / Power-point presentations & Videos • Lab exercises • Assignments and presentations. 	
References/ Readings	<ul style="list-style-type: none"> • Goon A.M., Gupta M.K. and Dasgupta B. (2002), Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata. • Miller, Irwin and Miller, Marylees (2006): John E. Freund’s Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia. • Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd. • D. Freedman, R. Pisani and R. Purves, Statistics, Norton & Company. 	
Course Outcomes	<p>On successful completion of the Course students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the basics of statistics, data, and research. 2. Ask critical logical questions with the basis of statistics. 3. Understand the methods of data collection and summarisation. 4. Solve problems on moments in data and apply them to distinguish normal vs. non-normal data sets. 5. Explain theory of attributes. 	

COURSE CODE: DAS- 502 TITLE OF THE COURSE: PROBABILITY THEORY

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 60

Course Objective	To introduce the concepts, approaches and laws of probability and to familiarise with the useful aspects of random experiments and computation of probabilities; probability and distribution functions for univariate and bivariate random variables for discrete and continuous cases; mathematical expectation, standard continuous distributions.	
	Content	Contact Hours
	Module 1: Basic Concepts in Probability Introduction to Probability; Different Approaches to Probability Theory; Laws of Probability; Inverse Probability -Bayes Theorem.	14
	Module 2: Random Variables and Expectation Random Variables; Bivariate Discrete Random Variables; Bivariate Continuous Random Variables; Probability Distribution; Mathematical Expectation.	12
	Module 3: Discrete Probability Distributions Binomial Distribution; Poisson Distribution; Discrete Uniform and Hyper-geometric Distributions; Geometric and Negative Binomial Distributions.	16
	Module 4: Continuous Probability Distributions Normal Distribution; Properties of Normal Distribution; Computation of area under Normal Curve; Standard Normal Variate; Continuous Uniform and Exponential Distributions.	14
	Module 5: Relation between Discrete and Continuous Probability Distribution Relation between Binomial and Normal Distribution; Relation between Normal and Poisson Distribution.	04
Pedagogy	<ul style="list-style-type: none"> • Traditional Chalk board Classes. • Online / Power-point presentations & Videos • Lab exercises • Assignments and presentations. 	
References / Readings	<ul style="list-style-type: none"> • Goon A.M., Gupta M.K. and Dasgupta B. (2002), Fundamentals of Statistics, Vol. I, 8th Edn. The World Press, Kolkata. • Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi. • Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia. • Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi. 	
Course Outcomes	<p>On successful completion of the Course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Understand probability, distinguish between different approaches to probability, apply laws of probability and Bayes theorem. 2. Discuss Random Variables, differentiate between Continuous and Discrete random variable, utilize mathematical expectations. 3. Distinguish between different Probability distributions. 4. Solve problems using appropriate probability distribution 5. Describe Area property of Normal Distribution. 6. Utilize Area property to find probability. 	

COURSE CODE: DAS-503 TITLE OF THE COURSE: PRACTICAL I- BASIC STATISTICS

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 120

Course Objective	To acquaint with the use of MS Excel for graphical representation of data and use of various statistical techniques for processing of data.	Contact Hours
	Content	
	Introduction to MS Excel; Formulas and functions in MS Excel, Commands – Find, Replace, Spellcheck e, Data coding, Classification and Tabulation of Data; Diagrammatic Presentation of Data. Graphical Presentation of Data; Graphical Presentation of Time Series Data; Vertical lookup, Measures of Central Tendency; Measures of Dispersion Moments, Skewness and Kurtosis; Correlation Analysis; One Sample Tests; Two Sample Tests; Chi-square test, Analysis of Variance; Design of Experiments. Finding probabilities: Binomial & Poisson, Pivot tables, ANOVA – Analysis of Variance, Linear Regression.	4hr. x 30
Pedagogy	<ul style="list-style-type: none"> • Lab demonstration and exercises using MS Excel • Online / Power-point presentations & Videos • Assignments and presentations 	
References / Readings	<ul style="list-style-type: none"> • David M. Levine, David F. Stephan, Kathryn A. Szabat, (2017) Statistics for Managers Using Ms Excel, Pearson 	
Course Outcomes	<p>On successful completion of the Course, the student will be able to use MS Excel to</p> <ol style="list-style-type: none"> 1. Display data graphically 2. Find the measures of Central Tendency to data sets 3. Testing samples 4. Find probabilities 5. Apply analysis of variance and linear regression to the data sets. 	

SEMESTER II

CORE COURSES

COURSE CODE: DAS-504 TITLE OF THE COURSE: STATISTICAL INFERENCE

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 60

Course Objective	Learning basic concepts and methodologies of sampling distributions with their applications, estimation theory, parametric and non-parametric testing of hypothesis and to draw inferences about the population on the basis of samples by using appropriate statistical techniques.	
	Content	Contact Hours
	Module 1: Sampling Distributions Introduction to Sampling Distribution; Sampling Distributions of the Mean; Central Limit Theorem; Sampling Distribution of the Difference of mean; Sampling Distributions of the Proportion; T Distribution; Sampling Distribution of S^2 .	12
	Module 2: Estimation Introduction to Estimation; Point Estimation; Interval Estimation for One Population; Interval Estimation for Two Populations.	10
	Module 3: Testing of Hypothesis Concepts of Testing of Hypothesis; Test of Significance(concept); Procedure of Testing of Hypothesis; Types of Errors in Testing of Hypothesis.	06
	Module 4: Parametric Tests Large Sample (Significance Test for a Single Mean, Significance Test for Difference of Mean); Small Sample Tests (Student's Distribution- Student's t-test for single sample mean, Student's t test for Difference of means of two Independent Samples); F-Test; One way ANOVA	18
	Module 5: Non-parametric Tests One-Sample Test-Chi Square test; Two-Sample Tests-Wilcoxon signed rank test, Mann-Whitney test; k-Sample Tests-Kruskal Walli's test.	14
Pedagogy	<ul style="list-style-type: none"> • Traditional Chalk board Classes. • Online / Power-point presentations & Videos • Lab exercises • Assignments and presentations. 	
References / Readings	<ul style="list-style-type: none"> • Bhat B.R, Srivenkatramana T and Rao Madhava K.S. (1997) Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd. • Dudewicz, E. J., and Mishra, S. N. (1988): Modern Mathematical Statistics. John Wiley & Sons. • Goon A.M., Gupta M.K.: Das Gupta B. (2005), Fundamentals of Statistics, Vol. I, World Press, Calcutta. • Gupta, S. C., Fundamentals of Statistics, Himalaya Publishing House. • Hogg, R.V., Tanis, E.A., Probability and Statistical Inference, 9th edition. • Miller, I. and Miller, M. (2002), E. Freund's Mathematical Statistics (6th addition, low price edition), Prentice Hall of India. • Rohatgi V. K. and Saleh, A.K. Md. E. (2009), An Introduction to Probability and Statistics. 2nd Edn. (Reprint) John Wiley and Sons. 	

Course Outcomes	<p>On successful completion of the Course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Understand Sampling distribution and apply it further in future for data sampling. 2. Describe types of estimation and evaluate parameter as per given data or situation. 3. Explain hypothesis, types of error, and how and when to implement appropriate test. 4. Construct hypothesis based on situation 5. Differentiate between Parametric and non-parametric tests. 6. Analyse data by applying appropriate test of hypothesis.
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COURSE CODE: DAS-505 TITLE OF THE COURSE: STATISTICAL TECHNIQUES

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 60

Course Objective	To enable students to understand the fundamentals of descriptive statistical techniques, the process of applying these techniques, and identifying where to apply these techniques.	
	Content	Contact Hours
	<p>Module 1: Correlation Scatter Diagrams – Fitting of Curves – Karl Pearson’s Correlation Coefficient – Spearman’s Rank Correlation – Intra-Class Correlation – Introduction to Discriminant, Cluster analysis and Principal Component Analysis.</p>	15
	<p>Module 2: Regression and Partial Correlation Linear Regression – Plane of Regression – Partial Correlation and t-Test – Multiple Correlation</p>	15
	<p>Module 3: Analysis of Variance Introduction to Analysis of Variance; One-way Analysis of Variance; Two-way Analysis of Variance.</p>	14
	<p>Module 4: Random Numbers Generation Random Number Generation for Discrete Variables; Random Number Generation for Continuous Variables</p>	8
	<p>Module 5: Simulation Techniques Simulation Techniques – Process simulations; Monte Carlo/Risk analysis simulation; Discrete event simulation; Concept simulation; Strategic simulation – Applications of Simulation and Integration with Artificial Intelligence.</p>	8
Pedagogy	<ul style="list-style-type: none"> • Traditional Chalk board Classes. • Online / Power-point presentations & Videos • Lab exercises • Assignments and presentations. 	
References/ Readings	<ul style="list-style-type: none"> • Robert C.P. and Casella G. (1999), Monte Carlo Statistical Methods, Springer-Verlag, New York. • Good P.I. (1999), Resampling Methods: A Practical Guide to Data Analysis, Birkhauser, Boston. • Davison and Hinkley (1997), Bootstrap Methods and their Application, Camb. Univ. Press, Cambridge. 	

	<ul style="list-style-type: none"> • P McCullagh and J.A. Nelder (1989), Generalized Linear Models, 2nd Ed, Chapman and Hall. • Wu, C. F. J. And Hamada, M. (2009), Experiments, Analysis, and Parameter Design Optimization (Second edition), John Wiley.
Course Outcomes	<p>On successful completion of the Course students will be able to:</p> <ol style="list-style-type: none"> 1. Understand and apply concepts of correlation. 2. Solve problems on regression and partial correlations while learning to apply the concepts in real life datasets. 3. Explain analysis of variance and solve problems with real life datasets. 4. Interpret the process of random number generation. 5. Understand and explain the processes involved in simulation techniques.

COURSE CODE: DAS-506

**TITLE OF THE COURSE: PRACTICAL II -
STATISTICAL COMPUTATIONS IN R**

CREDITS: 4

TOTAL CONTACT HOURS: 120

Course Description	<p>As an introductory practical course it will expose students to the basics of R – programming language, which is used widely for data mining, bioinformatics, and statistics. Available under the available under the GNU General Public License, R is a free to use tool which has wide applications in everyday life of a statistician. Much of this course will focus on understanding coding in R and utilising coding skills for basic statistical analysis and modelling.</p>	
Course Objective	<p>To introduce and acquaint the students with the use of R Language and interface for processing and managing voluminous data sets.</p>	
	Content	Contact Hours
	<p>Introduction to R environment and R studio – Installation and start-up – R studio Interface – Importing Data sets (.csv & .xls extensions) – Simple Algorithm Building – Summarisation of Imported Data – Calculation of Mean and Median using Long-form Data – Packages (TidyVerse/GGPlot, Vegan, GridExtra) – Working with Library Data (Iris, Dune, Mtcars) – Correlations – Regressions – Curve Fitting – ANOVA – Linear Models – Mixed Effect Models – Interaction Terms – Interpretation of Summary Tables – Multi-Plots in GGPlot (Scatter, Line, Bar) and Gridding – Random Number Generation.</p>	4 Hr. * 30
Pedagogy	<ul style="list-style-type: none"> • Lab demonstration and exercises using R Studio • Online / Power-point presentations & Videos • Assignments and presentations. 	
References/ Readings	<ul style="list-style-type: none"> • James (JD) Long and Paul Teetor (2019), R Cookbook, 2nd Edition. https://rc2e.com/ 	
Course Outcomes	<p>On successful completion of the Course, the candidate will be able:</p> <ol style="list-style-type: none"> 1. Understand the basics of a programming environment. 2. Explain the process of algorithm building. 3. Critically evaluate big datasets 4. Understand the workflow of scripts and compiler in R studio environment. 5. Solve complex linear and mixed effect models using real world data sets. 	

COURSE CODE: DAS-507

**TITLE OF THE COURSE: PRACTICAL III –
USING LATEST STATISTICAL SOFTWARE (SPSS)**

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 120

Objective	To introduce and acquaint the learner with the use of latest statistical software for processing and managing voluminous data.	
	Content	Contact Hours
	<p>Introduction SPSS with hands-on training on computers. Classification of data. Labelling and coding of data in SPSS. Identifying errors and cleaning of large datasets. Syntax and output file.</p> <p>Control Charts for Mean; Control Charts for Mean using Range; Control Charts for Mean using Standard Deviation; Control Charts for Range; Control Charts for Standard Deviation; Simple Linear Regression; Multiple Linear Regression; Regression with Dummy Variable; Variable Selection Methods; Estimation of Trend by Curve Fitting; Smoothing or Filtering the Time Series; Seasonal Component Analysis.</p> <p>Distribution of Quadratic forms; Simple Linear Regression; Multiple Regression; Tests for Hypothesis; Analysis of Variance of a one way classified data; Analysis of Variance of a two way classified data with one observation per cell; Analysis of Covariance of a one way classified data; Analysis of Covariance of a two way classified data.</p>	4Hr. * 30
Pedagogy	<ul style="list-style-type: none"> • Lab demonstration and exercises using MS Excel • Online / Power-point presentations & Videos • Assignments and presentations. 	
References / Readings	<ul style="list-style-type: none"> • Field, A. (2013). Discovering statistics using IBM SPSS statistics. Sage. • Stockemer, D., Stockemer, G., & Glaeser, J. (2019). Quantitative methods for the social sciences (Vol. 50, p. 185). Cham, Switzerland: Springer International Publishing. • Elliott, A. C., & Woodward, W. A. (2014). IBM SPSS by example: A practical guide to statistical data analysis. Sage Publications. 	
Course Outcomes	<p>On successful completion of the Course, the will be able to demonstrate practical skills to:</p> <ol style="list-style-type: none"> 1. Process and manage voluminous data by using the latest statistical software like SPSS. 2. Prepare Control Charts for various measures 3. Use the tools to find Simple Linear Regression; Multiple Linear Regression 4. Apply the Tests for Hypothesis. 	

ELECTIVE COURSES

COURSE CODE: DAS-521

TITLE OF THE COURSE: DEMOGRAPHY

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 60

Course Objective	To provide knowledge of different concepts of demography, sources of data, evaluation and adjustment of data.	
	Content	Contact Hours
	Module 1: Scope and importance of demography	5
	Module 2: Data sources and their limitations Population census, Vital registration, Population register, Demographic and Health surveys, other sources.	8
	Module 3: Evaluation and adjustment of census and survey data on age-sex distribution. Growth of Human Population: Rate of natural increase; Arithmetic, Geometric and Exponential growths.	10
	Module 4: Fertility Terms and Concepts, Determinants of natural fertility; Davis intermediate variables framework of fertility, Coale and Trussell Fertility Model.	8
	Module 5: Mortality Basic Concepts and Measures of Mortality, Causes of death. Life Tables: Definition, simple construction and applications	10
	Module 6: Migration Concepts, pattern, determinants and consequences of migration and issues related to migration, Ravenstein's Laws of Migration, Todaro's Model of Rural-Urban Migration., spatial distribution and urbanisation.	9
	Module 7: Population and Development Concepts and Measures of Development, Population and Resources, Population and Environment.	10
Pedagogy	<ul style="list-style-type: none"> • Traditional Chalk board Classes. • Online / Power-point presentations & Videos • Assignments and presentations 	
References / Readings	<ul style="list-style-type: none"> • H.S. Shryock and J. S. Siegel (1976) The Methods and Materials of Demography (Studies in Population). • K. Srinivasan (1998) Basic Demographic Techniques and Applications, Sage. • R. Ramkumar (2018), Technical Demography, New Age International, Second edition. 	
Course Outcomes	<p>On successful completion of the Course, the student will be able to</p> <ol style="list-style-type: none"> 1. Gain knowledge of different concepts of demography. 2. Analyse demographic measurements. 3. Evaluate and adjust data 4. Identify sources of data. 	

COURSE CODE: DAS-522

TITLE OF THE COURSE: TIME SERIES ANALYSIS

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 60

Course Objective	<ul style="list-style-type: none"> To introduce learner to time series methods and the applications of these methods to different types of data. 	
	Content	Contact Hours
	<p>Module 1: The Structure of Economic Data Time Series Data; Cross-Sectional Data; Pooled Cross Sections; Panel and Longitudinal Data.</p> <p>Module 2: Exploratory Analysis of Time Series Graphical display; classical decomposition model – trend, seasonal and cyclical components.</p> <p>Module 3: Stationary Stochastic Time Series Weak and strong stationarity; Auto Regressive (AR), Moving Average (MA) and Auto Regressive Moving Average, (ARMA) models; Box-Jenkin’s correlogram analysis – Auto Correlation Function (ACF) and Partial Correlation Function (PACF); diagnostic tests.</p> <p>Module 4: Non-Stationary Time Series Auto-Regressive Integrated Moving Average (ARIMA) model; deterministic and stochastic trends; unit root tests – DF and ADF tests.</p> <p>Module 5: Forecasting Forecasting based on ARIMA/ARMA model; Introductory Vector Autoregression (VAR) Analysis.</p> <p>Module 6: Causality in time series Granger causality. Hypothesis testing on rational expectations. Hypothesis testing on market efficiency.</p>	<p>04</p> <p>10</p> <p>12</p> <p>12</p> <p>10</p> <p>12</p>
Pedagogy	<ul style="list-style-type: none"> Traditional Chalk board Classes. Online / Power-point presentations & Videos Lab exercises Assignments and presentations. 	
References / Readings	<ul style="list-style-type: none"> Brockwell, P. and R.A. Davis (2002): Introduction to Time Series and Forecasting, 2nd edition, Springer- Verlag. Chatfield, C. (1996): Analysis of Time Series, 5th edition, Chapman & Hall. Mills, T.C. (1990): Time Series Techniques for Economists, Cambridge University Press. Mills, T.C. (1999): The Econometric Modelling of Financial Time Series, 2nd edition, Cambridge University Press. 	
Course Outcomes	<p>Upon successful completion, students will have the knowledge and skills to:</p> <ol style="list-style-type: none"> 1. Apply the concept of stationarity to the analysis of time series data 2. Run and interpret time-series models and regression models for time series; 3. Use the Box-Jenkins approach to model and forecast time-series data empirically; 4. Use appropriate models to analyse time series data; 5. Utilise fundamental research skills in applied time series analysis; 6. Use software packages for analysing time series data. 	

COURSE CODE: DAS-523

TITLE OF THE COURSE: INTRODUCTION TO ECONOMETRICS

NUMBER OF CREDITS: 4

TOTAL CONTACT HOURS: 60

Course Objective	To provide learners with the knowledge and skills of basic applied econometrics to enable them to understand and to conduct basic econometrics analyses.	
	Content	Contact Hours
	<p>Module 1 Economic Concepts and Database for Econometric Analysis: National Income Accounting – Base year – Methods of estimation – Types of reporting – BOP and NI – SGDP Census - types – other data sets from Census –Economic Census, Educational Census, Agricultural census, etc. NSSO – sample – large and small samples, NFHS, RBI International data – World bank, IMF, ILO, WTO, UNCTAD, UN</p> <p>The Structure of Economic Data: Cross-Sectional Data; Time Series Data; Pooled Cross Sections; Panel and Longitudinal Data.</p> <p>Module 2: Simple Linear Regression Model</p> <p>Two Variable Case Estimation of model by method of ordinary least squares; properties of estimators; goodness of fit; tests of hypotheses; scaling and units of measurement; confidence intervals; Efficiency of OLS: Gauss-Markov theorem; forecasting.</p> <p>Module 3: Multiple Linear Regression Model</p> <p>Estimation of parameters; properties of OLS estimators; goodness of fit - R^2 (R square) and adjusted R^2; partial regression coefficients; testing hypotheses – individual and joint; functional forms of regression models; Omitted Variable Bias, Multicollinearity: Nature of the problem and its consequences; econometric solutions.</p> <p>Module 4: Heteroscedasticity and Autocorrelation</p> <p>Problems of Heteroscedasticity and Autocorrelation; Identification & Solution, GLS method of estimation; tests for heteroscedasticity and autocorrelation.</p> <p>Module 5: Qualitative Response Models</p> <p>Qualitative (dummy) independent variables; Probit model, Alternative measures of Goodness of Fit (R^2) in Qualitative response models, Logit vs Probit model selection, Limited dependent variable model/ Tobit Model</p>	<p>15</p> <p>15</p> <p>10</p> <p>10</p> <p>10</p>
Pedagogy	<ul style="list-style-type: none"> • Traditional Chalk board Classes. • Online / Power-point presentations & Videos • Lab exercises • Assignments and presentations. 	

References/ Readings	<ul style="list-style-type: none"> • Gujarati, D. N. and Porter, D.C. (2009), Essentials of Econometrics, McGraw Hill, 4th edition, International Edition,. • Dougherty Christopher (2007), Introduction to Econometrics, Oxford University Press, 3rd edition, Indian edition. • Maddala, G.S. (2001), Introduction to Econometrics, John Wiley. • Wooldridge, J. M. (2008), Introductory Econometrics: A Modern Approach, Cengage Learning. 	
Course Outcomes	<p>Upon successful completion of the Course, the students will be able to</p> <ol style="list-style-type: none"> 1. Know Economic Concepts and Database for Econometric Analysis 2. Understand the Structure of Economic Data 3. Use appropriate economic model to Evaluate and analyse economic data 4. Interpret statistical evidence from economic data. 5. Build economic models from the data sets. 	

9. EVALUATION OF COURSES (OA-35.6)

(a) A One Credit Course shall carry 25 marks. All other Courses shall carry marks proportionate to the number of Credits. (b) The weightage for the ISA and SEA for both theory and practical Courses shall be 60% and 40% respectively. (c) There shall be four ISAs for each Course of two or more Credits, each of 20%, for a total of 60% of total marks of the Course. Out of four ISAs best three ISAs shall be considered.

Prof. (Dr.) Gervasio S. F. L. Mendes
Principal (Offg.)
