APPENDIX – 19(ii) (R&S)

UNIVERSITY OF MADRAS

B.Sc. DEGREE COURSE IN STATISTICS

CHOICE BASED CREDIT SYSTEM
(w.e.f.2019-2020)

DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE (AUTONOMOUS)

Shift - II

REGULATIONS
(As per Common Regulations framed by University of Madras)

SCHEME OF EXAMINATIONS

B.Sc. Statistics - I SEMESTER

Course Components/Title of the paper	Credits	MARKS		
		CIA	EXT	TOTAL
Part –I - Language Paper –I	3	25	75	100
Part –II - English Paper –I	3	25	75	100
Part-III Core Paper-I: Descriptive Statistics	4	25	75	100
Core paper – III – Practical – I	Practical examination will be at the end of the semester II.			
Allied Paper- I – Mathematics for Statistics – I	5	25	75	100
Part-IV: * Basic Tamil/Adv. Tamil Non Major Elective -I:Fundamentals of Accounting	2	25	75	100
Soft Skills –I	3	50	50	100
Total	20			

B.Sc. Statistics - II SEMESTER

Course Components/Title of the paper	Credits	MARKS		
		CIA	EXT	TOTAL
Part –I – Language Paper -II	3	25	75	100
Part –II - English Paper –II	3	25	75	100
Part-III Core Paper -II: Probability and Random Variables	5	25	75	100
Core Paper – III: Core Practical –I	4	40	60	100

Allied paper- II – Mathematics for Statistics - II	5	25	75	100
Part-IV * Basic Tamil/Adv. Tamil/ Non Major Elective -II: Fundamentals of Insurance	2	25	75	100
Soft Skills - II	3	50	50	100
Total	25			

B.Sc. Statistics - III SEMESTER

Course Components/Title of the paper	Credits	**MARKS**		
		CIA	**EXT**	**TOTAL**
Part –I – Language Paper -III	3	25	75	100
Part –II – English Paper -III	3	25	75	100
Part-III Core paper-IV: Distribution Theory	4	25	75	100
Core VI – Practical II	Practical examination will be at the end of semester IV			
Allied paper- III- 'C' Language Programming	4	25	75	100
Allied Practical – 'C' Language Programming	Practical examination will be at the end of the semester IV			
Soft Skills –III	3	50	50	60
Total	17			

B.Sc. Statistics - SEMESTER – IV

Course Components/Title of the paper	**Credits**	**MARKS**		
		CIA	**EXT**	**TOTAL**
Part –I - Language Paper –IV	3	25	75	100
Part –II - English Paper –IV	3	25	75	100
Part-III Core Paper-V**:** Statistical Inference – I	5	25	75	100
Core Paper VI : Core Practical II	4	40	60	100
Allied paper- IV – Numerical Methods	4	25	75	100
Allied Practical –Numerical Methods and Practical in 'C'	2	40	60	100
Environmental Studies	2	25	75	100
Soft Skills-IV	3	50	50	100
Total	26			

B.Sc. Statistics - V SEMESTER

Course Components/Title of the paper	Credits	**MARKS**		
		CIA	**EXT**	**TOTAL**
Part-III Core Paper-VII: Operations Research	4	25	75	100

Core Paper -VIII: Statistical Inference – II	5	25	75	100
Core Paper-IX: Sampling Theory	4	25	75	100
Core X – Statistical Quality Control	4	25	75	100
Core Elective Paper -I: Demography **(or)** Statistical Applications with R- Language.	5	25	75	100
Core XIV - Practical – III	Practical examination will be at the end of the semester VI			
Value Education	2	25	75	100

B.Sc. Statistics - VI SEMESTER

Course Components/Title of the paper	Credits	**MARKS**		
		CIA	**EXT**	**TOTAL**
Part-III Core Paper-XI: Design of Experiments	4	25	75	100
Core Paper -XII: Actuarial Statistics	4	25	75	100
Core Paper XIII –Time Series, Index Numbers and Official Statistics	5	25	75	100
Core Paper XIV – Core Practical III	4	40	60	100
Core Elective Paper II : Stochastic Processes **(or)** Differential Equations , Fourier Series and Fourier Transformation	5	25	75	100
Core Elective Paper III: Mathematical Economics **(or)** International Trade	5	25	75	100
Part-V Extension Activity	1			

A.C.S ’19

UNIVERSITY OF MADRAS

B.Sc. DEGREE COURSE IN STATISTICS

CHOICE BASED CREDIT SYSTEM
(w.e.f.2019-2020)

DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE (AUTONOMOUS)

Shift - II

SYLLABUS

Code& Title : Descriptive Statistics Semester : I
Course Type : Core Credits : 4
Course Description Course

Course Content :

UNIT - 1:

Nature and scope of statistical methods and their limitations –concepts of research design- primary and secondary sources of data - nominal, ordinal, ratio and interval scale - complete enumeration, observational studies and sample surveys.

UNIT - 2:

Presentation by tables and diagrams- Construction of tables with one, two and three factors of classifications - Diagrammatic representations, frequency distributions for continuous and discrete data, graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods) and Ogives.

UNIT - 3:

Measures of location, dispersion, moments and measures of skewness and kurtosis for both grouped and ungrouped data.

UNIT - 4:

Correlation- Scatter diagram, Karlpearson‟s co-efficient and its properties, Spearman's rank correlation coefficient, principle of least squares and fitting of first, second degree and exponential curves,

UNIT -5:

Regression Equations- properties of regression equations, regression lines and concept of error in regression - partial and multiple correlation- concepts. Association of attributes and simple problems.

Suggested Readings

Books for Study:

1) Richard I. Levin , David S. Rubin (2008), Statistics for Management Pearson.
2) Goon, AM., Gupta M.K and . Dasgupta B (1991): Fundamentals of Statistics, Vol.1,World Press, Calcutta.
3) M.R. Spiegel (1961): Theory and problems of statistics, Schaum's outline series

4) Bhat B.R, Srivenkataramana T, and Madhava K.S,(1996) Statistics: A Beginner's textVol. I, New Age International (P) Ltd.

Books for Reference:

1) G.U.Yule and M.G. Kendall (1956): An introduction to the theory of Statistics, Charles Griffin.
2) Snedecor .G.W. and Cochran W.G. (1967): Statistical methods, Iowa State University Press.
3) Anderson, T.W. and Sclove SL. (1978): An introduction to statistical analysis of data, Houghton Miffin co.
4) Croxton FE, and Cowden D.J. (1973) Applied General Statistics, Printice Hall of India.

Course – Basic Details

Course Code& Title	: ProbabilityandRandomvariables	Semester	: II
Course Type	: Core	Credits	: 5

Course Description Course

Course Content : UNIT - 1:

Random experiment, sample point, sample space, event, algebra of events, operations on events. Classical and relative frequency approach to probability - axiomatic approach to probability, Simple problems.

UNIT –2 :

Addition theorem of probability, conditional probability, independence of events multiplication theorem –Baye‟s theorem and its applications.

UNIT –3:

Definition of discrete and continuous random variables - probability mass function, distribution functions and probability density functions and their properties. Expectation of random variables and its properties.

UNIT-4:

Moment generating function, characteristic function, cumulant generating function – their properties, moments, measures of locations, dispersion, Skewness and Kurtosis for discrete and continuous variants-simple problems

UNIT-5:

Bivariate distributions - discrete and continuous type, cumulative distribution function(c,d.f.), and probability mass function (p.m.f) and probability density function (p.d.f.)Marginal and Conditional expectation.

Suggested Readings:

Books for Study:

1. A.M.Mood, F.A. Graybill and D.C. Boes (1974): Introduction to the theory of Statistics, International student ed. McGraw Hill.
2. Hogg, R.V. and Craig, A.T. (2002): Introduction to Mathematical Statistics, 4thed. Academic Press.

3. A.M.Goon, M.K.Gupta and B. Dasgupta (1980): An outline of Statistical theory, Vol. I, 6th revised, World Press.

Books for Reference:

1. P.G.Hoel (1971): Introduction to Mathematical Statistics, Asia publishing house.
2. Murry R. Spiegal (1982): Theory and problems of Probability and Statistics, Schaum's outline series, McGraw Hill.
3. Seymour Lipshutz (1982): Theory and problems of probability, Schaum's outline series, McGraw Hill.
4. K.L.Chung (1983): Elementary probability theory with stochastic processes, Springer International student edition.
5. William.Feller (1968): An introduction to probability theory and its applications, Vol. I, 3rd ed., John Wiley & Sons.

Course – Basic Details

Course Code & Title : Distribution Theory Semester : III

Course Type: Core / ~~Elective / Allied/Self Study / Soft skills / Project –~~ Credits : 4

Course Content : UNIT -1:

Discrete distributions: Binomial, Trinomial and Multinomial distributions and their properties - Poisson, Negative Binomial and Geometric distributions –interrelationships and their properties.

UNIT -2:

Continuous distributions: Normal, Uniform, Exponential, Gamma and Beta distributions and their properties.

UNIT -3:

Bivariate Normal Distribution and its properties-marginal and conditional distributions–simple problems.

UNIT -4:

Central Limit Theorem- Lindeberg- Levy, Demovier‟s (statement only) - convergence in probability, convergence in distribution, convergence in mean square- simple problems.

UNIT-5:

Order statistics-distribution of first, n^{th} and i^{th} order statistics, joint distribution of r^{th} and s^{th} order statistics-distribution of median and range- Simple problems.

Suggested Readings

Books for Study :

1. Parimal Mukhopadhyay,(1996), Mathematical Statistics, New Central Book Agency
2. Goon, AM., Gupta M.K and .Dasgupta B (1991): Fundamentals of Statistics, Vol.1, World Press, Calcutta

Books for Reference :

1. Hogg, R. V and Craig, A. T (2002), Introduction to Mathematical Statistics, Pearson Education Asia, India.
2. A.M.Mood, F.A. Graybill and D.C. Boes (1974): Introduction to the theory of Statistics, International student ed. McGraw Hill.

Course – Basic Details

Course Code & Title : Statistical Inference- I

Semester : IV

Course Type : Core Credits : 5

Course Description Course

Course Content :

UNIT - 1:

Sampling distributions - concept - distributions of mean and variance from Normal population. Sampling distributions : Chi-square, Student‟s t and F distributions - Derivation of their density functions and their properties

UNIT - 2:

Point Estimation - Problem of Point estimation - Properties of estimators- Consistency and Efficiency of an estimator. Sufficiency of a statistic - Neyman- Fisher factorization theorem (discrete case) - Simple problems.

UNIT - 3:

Unbiasedness - Properties, MVUE, BLUE, Rao - Blackwell theorem-Sufficiency and completeness, Lehman- Scheffe theorem, Cramer- Rao inequality - simple problems.

UNIT - 4:

Testing of Hypothesis - Neyman - Pearson theory - Statistical Hypothesis - Simple and composite hypothesis, Null and Alternative Hypothesis - Two types of errors – critical region- power of a test - Most powerful test – Neyman-Pearson lemma

–p-value and its interpretation, simple problems.

UNIT - 5:

Test of Significance - Interval Estimation - Confidence Interval for proportions, mean(s), variance, and variance ratio based on chi square, student's t, F and Normal distributions.

Suggested Readings

Books for Study:

1. Mood, AM. Graybill , F.A. and Boes, D.C. (1974) : Introduction to the theory of Statistics, McGraw Hill.
2. Hogg R.V. and Craig, A.T. (2002): Introduction to mathematical statistics, 3rdedition, Academic Press, USA.
3. Goon, A.M. Gupta, M.K., and Das Gupta, B. (1980): An outline of statistical theory, Vol.I, 6th revised ed. World Press limited, Calcutta.

Books For Reference:

1. Hoel, P.G. (1971) : Introduction to mathematical Statistics, Asia publishing house.
2. Rohatgi, V.K. (1984) An introduction to probability theory and mathematical statistics, Wiley Eastern.
3. Degroot, M.H. (1975): Probability and Statistics, Addison - Wesley
4. Spiegal, M.R. (1982): Theory and problems of probability and statistics, Schaum's outline series, McGraw Hill
5. Snedecor, G.W. and Cochran, W.G. (1967): Statistical methods 6th edition, Oxford IBH

Course – Basic Details

Course Code & Title : Operations Research Semester : V

Course Type : Core / ~~*Elective / Self Study / Soft skills / Project*~~

Credits : 4

Course Description Course

Course Content :

UNIT - 1:

Introduction to Operations Research - Nature, Scope, Functions, Linear programming problem - Formulation of LPP - Solving the LPP by graphical method.

UNIT - 2:

Solving the LPP by simplex method, Big-M method, Duality in LPP, Dual simplex method and problems.

UNIT - 3:

Transportation problem- obtaining initial feasible and optimal solutions. Optimality test, degeneracy, Unbalanced transportation problem, Assignment problem, and unbalanced assignment problem - Traveling salesman problem.

UNIT - 4:

Game Theory - Two person zero sum games, The maximin - minimax principle – Games without saddle points - Mixed strategies - Graphical solution of 2xn and mx2 games Dominance property. Sequencing - 'n' jobs through 2 machines - 'n' jobs through 3 machines - 'n' jobs through „m' machines, Two jobs and 'm' machines.

UNIT - 5:

Network analysis by CPM / PERT basic concepts - constraints in Network – construction of the network - Time calculations - Concepts of slack and float in Network Analysis -finding optimum project duration and minimum project cost, finding expected project time and variance.

Suggested Readings

Books For Study:

1. Handy A. Taha (1996): Operations Research, 6 ed. Prentice Hall of India.
2. Sharma J.K. (2001): Operations Research. Theory and applications, Macmillan India Ltd.
3. Kanti Swaroop,Gupta.P.K.and Manmohan : Operations Research, Sultan Chand and Sons, New Delhi.

Books for Reference:

1. Goel& Mittal (1982): Operations Research, PragatiPrakashan, Meerut.
2. Gupta R.K.(1985): Operations Research, Krishna Prakashan, Mandir, Meerut.
   Schaum's outline series : Operations Research.
3. Sharma J.K. (2002): Operations Research, Problems and Solutions, Macmillan India Ltd.

Course – Basic Details

Course Code & Title	: Statistical Inference- II	Semester	: V
Course Type	: Core / ~~*Elective / Self Study / Soft skills / Project*~~		
Credits	: 5		

Course Description

Course Content

UNIT – 1

Methods of estimation: Method of Moments and Method of Maximum Likelihood Estimators with their properties -simple problems.

UNIT - 2:

Method of minimum chi-square, Method of modified minimum chi-square, method of least squares- simple problems.

UNIT - 3:

Uniformly most powerful tests, Likelihood ratio criterion - Definition and test for means and variance (one sample only).

UNIT - 4:

Sequential Probability Ratio Test: Definition – OC functions, ASN and simple problems.

UNIT - 5:

Non-parametric tests - Run, Sign ,Wilcoxon Signed rank test ,Kolmogorov's Smirnov one sample test, Mann Whitney tests (one sample and two sample), Median, Kruskal Wallis test - Applications and simple problems.

Suggested Readings

Books for Study

1. Hogg R.V.and Craig, A.T. (2002): Introduction to mathematical statistics, 3rd edition, Academic Press, USA.
2. Goon, A.M. Gupta, M.K., and Das Gupta, B. (1980): An outline of statistical theory, Vol.I, 6th revised ed. World Press limited, Calcutta.
3. Rohatgi, V.K. (1984) An introduction to probability theory and mathematical statistics, Wiley Eastern.

Books for Reference:

1. Mood, A.M. Graybill, F.A. and Boes, D.C. (1974): Introduction to the theory of Statistics, McGraw Hill.
2. Hod, P.G. (1971): Introduction to mathematical statistics, Asia publishing house.
3. Marek Fisz (1961): Probability theory and Mathematical statistics, John Wiley.
4. Spiegal,M.R. (1982): Theory and problems of probability and statistics, Schaum's outline series, McGraw Hill
5. Snedecor, G.W. and Cochran, W.G. (1967): Statistical methods 6th edition.

Course – Basic Details

Course Code & Title : Sampling Theory Semester :V

Course Type : Core / ~~*Elective / Self Study / Soft skills / Project*~~

Credits : 4

Course Content :

UNIT - 1:

Design - Organization and execution of sample surveys - principle steps in sample survey- Pilot survey - principles of sample survey - sampling and non-sampling errors - advantages of sampling over census - limitations of sampling.

UNIT - 2:

Sampling from finite population - simple random sampling with and without replacement - unbiased estimate of the mean, variance of the estimate of the mean finite population correction estimation of standard error from a sample - determination of sample size.

UNIT - 3:

Stratified random sampling - properties of the estimates - unbiased estimates of the mean and variance of the estimates of the mean-optimum and proportional allocations – relative precision of a stratified sampling and simple random sampling - estimation of gain in precision in stratified sampling.

UNIT - 4:

Systematic sampling - estimate of mean and variance of the estimated mean – comparison of simple and stratified with systematic random sampling.

UNIT - 5:

Ratio estimators: Ratio estimates, variance of the ratio estimates - Bias of the ratio estimates. Regression estimators: Linear regression estimate regression estimates with preassigned b-regression estimates when b is computed from the sample.

Suggested Readings

Books for Study:

1. William, G. Cochran (1984): Sampling techniques, Wiley Eastern. Murthy, M.N. (1967): Sampling theory and methods,
2. Statistical Publishing Society, Calcutta.
3. Sampath S. (2005): Sampling theory and methods (2nd Edition). Alpha science International Ltd.

Books For Reference:

1. Des Raj and Khanis (1976): Sampling theory, Narosha Publications,
2. Daroga Singh and Chaudhary, F.S. (1986): Theory and Analysis of Sample Survey Designs.Wiley Eastern.
3. Sukhatme P.V. and SukhatmeB.V. (1984): Sample survey methods and its applications, Indian Society of Agricultural Statistics, New Delhi.

Course – Basic Details

Course Code & Title : Statistical Quality Control Semester :V

Course Type : Core / ~~*Elective / Self Study / Soft skills / Project*~~

Credits : 4

Course Content :

UNIT -1:

Need for Statistical Quality Control techniques in Industry - Causes of Quality variation control charts - Use of the Shewhart - control chart - Specification and tolerance limits – 3sigma limits - warning limits - application of theory of runs in quality control.

UNIT - 2:

Control chart for variables - $\bar{X}$ chart, R chart, σ chart - purpose of the charts - Basis of subgrouping - plotting *X* and R results - determining the trial control limits - Interpretation of control charts *X* and R.

UNIT - 3:

Control chart for attributes - purpose of the chart - p chart - np chart - construction of p and np chart - choice between chart for P and chart for np - construction of c-chart.

UNIT - 4:

Acceptance of sampling plans for attributes - Producer's risk and consumer's risk -- single, double sampling plans –associated performance measures.

UNIT - 5:

Variable sampling plans - Sigma known and sigma unknown determination of „n" and „k" for one sided specification - OC curve- concepts and simple problems.

Suggested Readings

Books for Study:

1. Gupta, R.C.(1974): Statistical Quality Control.
2. Montgomery, D.C. (1983): Introduction to Statistical Quality Control, John Waley & Sons.

Books For Reference:

1. Grant, E,L. and Laven Worth, R.S.: Statistical Quality Control, McGraw Hill.
2. Edward G. Schilling and Dean V. Neubauer (2009) Acceptance sampling in Quality Control, 2nd edition,(Statistics: A series of Textbooks and Monographs) hard cover – March 2, 2009. Chapman and hall/ CRC.
3. Parimal Mukhopadhyay,(1999),Applied Statistics , New Central Book Agency Pvt Ltd,Kolkata.

Course – Basic Details

Course Code & Title : Design of Experiments Semester V

Course Type : Core / ~~*Elective / Self Study / Soft skills / Project*~~

Credits : 4

Course Content :

UNIT - 1:

Fundamental Principles of Experiments - Replication, Randomization and Local Control Techniques - Size of experimental unit-Methods of determination of experimental units -Basic linear model and its assumptions- simple problems.

UNIT - 2:

Analysis of Variance - one-way, two-way classification (without interaction) Multiple range tests: Newman Keul's test- Duncan's multiple range test- Tukey's test.

UNIT - 3:

Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD) and its analysis.

UNIT - 4:

Missing plot technique- estimating missing observation- RBD and LSD - Analysis of covariance in CRD with single covariate, difference between ANOVA and ANCOVA.

UNIT - 5:

Factorial experiments and their need,2^2, $2^3$and 2^k factorial experiments and their analysis - Principles of confounding-Partial and Complete confounding in 2^2, 2^3.

Suggested Readings

Books for Study:

1. Dass M.N and Giri N.C (1986) Design and Analysis of Experiments, Wiley Eastern, New Delhi.
2. Montgomery, D (1972) Design and Analysis of Experiments, John Wiley and Sons

Books For Reference:

1. Kempthorne, (1956) Design and Analysis of Experiments, John Wiley. New York
2. Giri N.C (1986) Analysis of Variance, South Asian publishers .
3. Parimal Mukhopadhyay, (1999),Applied Statistics , New Central Book Agency Pvt Ltd, Kolkata.

Course – Basic Details

Course Code & Title : Actuarial Statistics Semester : VI

Course Type : Core / ~~*Elective / Self Study / Soft skills / Project*~~

Credits : 4

Course Description Course

Course Content : UNIT – 1:

Elements of compound interest-nominal and Effective rates of interest, annuities certain, present values accumulated amounts, deferred annuities – the functions included in compound interest - tables and their uses.

UNIT – 2:

Redemption of loans – sinking funds – the average yield on the life fund of an assurance office.

UNIT – 3:

Premiums – general principles – natural premiums – level premiums – office premiums – loading for expenses – with profit and without profit premiums – adequacy of premiums relative consistency.

UNIT – 4:

Life office valuations – general principles – policy values – retrospective and prospective methods of valuation of liabilities.

UNIT – 5:

Surplus - Sources of Surplus, Principle methods of surplus (Numerical problems can be asked in the theory question paper).

Suggested Readings

Books for Study:

1. Federation of Insurance Institutes Study Courses – Mathematical Basis of Life Assurances F1, 2
2. Donald. D. W . (1970) – Compound Interest and Annuities, Heinemann, London

Books for Reference:

1. Elandt – Johnson. R.C, Johnson. N.L (1980), Survival Models and Data Analysis, John Wiley.

Course – Basic Details

Course Code & Title:Time Series, Index Numbers and Official Statistics Semester:VI

Course Type : Core / ~~*Elective / Self Study / Soft skills / Project*~~

Credits : 5

Course Description Course

Course Content : UNIT - 1:

Time series - Concept - Components of time Series - Additive and multiplicative models- Measurement of trend – free hand method- semi average method-Moving average method - Least square method.

UNIT - 2:

Measurement of seasonal variations - Simple average method - Ratio to trend method -Ratio to moving average method - Link relative method – Variate Difference method.

UNIT - 3:

Index Numbers - uses, classification of index numbers - Problems in the construction of index numbers - Methods of constructing index numbers - Unweighted index numbers -weighted index numbers.

UNIT - 4:

Quantity index numbers - Fixed and chain base index numbers - Optimum test for index numbers - Time reversal test - factor reversal test - cost of living index numbers.

UNIT - 5:

Official Statistics: Statistical System in India CSO and NSSO and their functions – Present structure of the Indian statistical system - Functions of a statistical system – Agricultural statistics - Industrial statistics - Trade statistics - Labour statistics - Transport Communication statistics and Health statistics.

Suggested Readings

Books for Study:

1. Saluja,M.R (1972): Indian official statistical systems: Statistical publishing society, Calcutta and The Indian Econometric Society, Hyderabad.
2. Goon, A.M. Gupta, M.K., and Das Gupta, B. (1980): An outline of statistical theory, Vol.I, 6th revised ed. World Press limited, Calcutta.

Books For Reference:

1. Croxton, F.E and Cowdon, D.J. (1973): Applied general statistics, Prentice Hall
2. Parimal Mukhopadhyay, (1999),Applied Statistics , New Central Book Agency Pvt Ltd, Kolkata.
3. T.M.J.A. Cooray, Applied Time series Analysis and Forecasting, Narosha Publishing House.

Course – Basic Details

Course Code& Title	: Practical I
Semester	: II
Course Type	: Core / ~~*Elective / Self Study / Soft skills / Project*~~
Credits	: 4

Course Description Course

Record 40 Marks, Practical Examination 60 Marks

Duration of the Examination :Three Hours.
Six questions are to be set without omitting any unit. Candidates are to answer any four questions.
All questions carry equal marks.

Course Content :

1. Construction of Uni-variate, Bi-variate frequency distributions, and graphical representations.
3. Ogives, Lorenz curves.
4. Measures of location, dispersion
5. Measures of skewness and kurtosis for both grouped and ungrouped data.
6. Measures of skewness and kurtosis using moments.
7. Principle of least squares and fitting of first, second degree and exponential curves.
8. Computation of correlation co-efficient.
9. Rank correlation coefficient.

10. Fitting of Single linear Regression Equations.
11. Partial and Multiple correlations.
12. Association of Attributes.

Pedagogy

Assignments~~/ Seminars~~ / ~~Self-study/ Internship / Field visits / Study tour / Library work / Laboratory / Dissertation~~

Policies

Attendance : As per University of Madras Norms

Evaluation Scheme : (Continuous Assessment / Written test ~~/ Minimum marks to pass / Maximum marks / Grading)~~

Course Schedules : ~~Lecture /Tutorial~~ / Practical / ~~Library hrs / Lab hrs~~

Course – Basic Details

Course Code & Title : Practical II Semester
: IV

Course Type : Core / ~~*Elective / Self Study / Soft skills / Project*~~

Credits : 4

Credit equivalence : NA

Pre-requisites : NA

Course Description

(Based on core paper IV and V)

Record 40 Marks, Practical Examination 60 Marks

Duration of the Examination :Three Hours.

Six questions are to be set without omitting any unit. Candidates are to answer any four questions.

All questions carry equal marks.

Course Content :

1. Fitting of Binomial Distribution.
2. Fitting of Poision Distribution.
3. Fitting of Normal Distribution.
4. Test of Hypothesis:
   Power of the test , level of significance.
5. Test of significance
   i. Mean and variance.
   ii. Difference of means.
   iii. Equality of two variances from normal distribution
   iv. Correlation coefficients.
   v. Specified proportions.
   vi. Difference of proportions.
6. Confidence interval for mean and proportion.
7. Test based on Chi-square distribution and F-distribution.

Course – Basic Details

Course Code & Title	:	Practical III Semester
	:	VI
Course Type	:	Core / ~~*Elective / Self Study / Soft skills / Project*~~
Credits	:	4
Credit equivalence	:	NA
Pre-requisites	:	NA

Course Description Course

(Based on core paper IV and V)

Record 40 Marks, Practical Examination 60 Marks

Duration of the Examination : Three Hours.

Six questions are to be set without omitting any unit. Candidates are to answer any four questions.

All questions carry equal marks.

Course Content :

1. Non-parametric methods :
    a. Sign test
    b. Wilcoxon Signed rank test
    c. Mann Whitney U-test
    d. Median test
    e. Test of randomness of sample.
2. Simple Random Sampling.
3. Stratified Random Sampling- Proportional Allocation and Optimum Allocation.
4. Systematic Sampling.
5. Estimation of parameters by the methods of Moments.
6. Estimation of parameters by the methods of MLE.
7. X-bar Chart ,R Chart, σ chart.
8. p, np and c chart.
9. Analysis of Variance - one-way and two-way.
10. Design of Experiment –CRD, RBD, LSD.
11. Factorial experiments – 2^2, 2^3 experiments with total and partial confounding.
12. Moving average method (3 year and 5 year)
13. Ratio to trend, Ratio to moving average, Link relative method.
14. Fixed and chain base index numbers.
15. Time reversal test, Factor reversal test.
16. Cost of living index numbers.

Course – Basic Details

Course Code & Title	:	Demography Semester
	:	V
Course Type	:	C~~ore~~ / Elective / ~~*Self Study / Soft skills / Project*~~
Credits	:	5
Credit equivalence	:	NA
Pre-requisites	:	NA

Course Description Course

Elective Paper I

Course Content : UNIT - 1:

Sources of Demographic data – Civil Registration- Population Census – Population Registers – Errors in Demographic data – Methods of Improvement.

UNIT – 2:

Mortality measurements –Merits and Demerits - general and specific rates – standardized rates – age pyramid of sex composition – Ratios, propositions and percentage rates – Population pyramids, sex ratio, crude rate, specific rates, standard rates – direct and indirect.

UNIT -3:

Fertility, Measures of fertility, General fertility rate, Specific fertility rate, Net reproduction rate, Gross reproduction rate, Crude Rate of natural increase. Definition – stable population and stationery population.

UNIT - 4:

Life table - Structure - Construction – Relationship between function of the life table – abridged life table (Concept only)

UNIT – 5:

Population estimation and projection, component method of population projection Forces of mortality - Gompertz and Makcham law logistic curve fitting and its use.

Suggested Readings

Books for Study :

1. Srivastava, O.S (1983): A text book Demography, Vikas Publishing

Books for Reference:.

1. Bogue, Donald, . J: Principles of Demography, (1976), John Wiley, New York.

Course – Basic Details

Course Code & Title:	Statistical Applications with R-Programming Semester :V
Course Type	: Core / Elective / *~~Self Study / Soft skills / Project~~*
Credits	: 5
Credit equivalence	: NA
Pre-requisites	: NA

Course Description Course

Elective Paper I

Course Content : Unit 1:

Introduction to R: R as a calculator, statistical software and a programming language, R preliminaries, getting help, data inputting methods(direct and importing from other spread sheet

applications like Excel), data accessing, and indexing, Graphics in R, built in functions, saving, storing and retrieving work.

Unit 2:

Descriptive statistics: diagrammatic representation of univariate and bivariate data (box plots, stem and leaf diagrams, bar plots, pie diagram, scatter plots), measures of central tendency (mean, median and mode), partition values.

Unit 3:

Measures of dispersion (range, standard deviation, mean deviation and inter quartile range), summaries of a numerical data, skewness and kurtosis.

Unit 4:

Correlation- Karlpearson‟s co-efficient, Spearman's rank correlation coefficient, Regression Equations - partial and multiple correlation - simple problems.

Unit 5:

Statistical Inference: classical tests: One- and two-sample tests, z test, t-test, F- test, chi-square test of independence and goodness of fit, interval estimation for mean, difference of mean and variance.

Suggested Readings

Books for Study:

1. Michale J. Crawley (2009), THE R BOOK, John Wiley & Sons, England
2. Sudha G. Purohit (2008), Statistics Using R, Narosa Publishing House, India
3. John Verzani, simple R-Using R for Introductory Statistics,

(http:// www.math.csi.cuny.edu/Statistics/R/SimpleR/Simple)

Books for References:

1. W. N. Venables, D. M. Smith and the R Core Team (2012), An Introduction to R Notes on R: A Programming Environment for Data Analysis and Graphics, Version 2.15.2

(http://www.r-project.org)

Note: Either one from must be selected from two elective paper for Semester V.

Course – Basic Details

Course Code & Title	:	Stochastic Processes Semester
	:	VI
Course Type	:	C~~ore~~ / Elective / ~~*Self Study / Soft skills / Project*~~
Credits	:	5

Course Description Course

Core Elective Paper II

Course Content : UNIT - 1:

Basic Concepts : Definition and examples of stochastic process, classification of general stochastic processes into discrete and continuous time, discrete and continuous state spaces, types of stochastic processes, elementary problems.

UNIT - 2:

Markov chains: Definition and examples of Markov chain, Transition Probability Matrix, classification of states, recurrence concepts, simple problems only. (No Derivations)

UNIT - 3:

Basic limit theorem of Markov chain (statement only), stationary probability distribution, and its applications.

UNIT - 4:

Continuous Time Markov chain: Pure birth process and Poisson process, Birth and Death process, problems.

UNIT - 5:

Branching process: Definition and examples of discrete time branching process, probability generating function, mean and variance, probability of extinction - simple problems.

Suggested Readings

Books For Study:

1. Medhi, J. (1996): Stochastic processes, New Age International (p) Ltd.
2. Taylor, H.M. and Karlin, S. (1999): Stochastic Modelling, Academic press.

Books for Reference:

1. Hoel, P.M.G., Port, S.C. and Stone, C.J. (1991): Introduction to Stochastic processes, Universal Book Stall.
2. Parzen, E. (1962): Stochastic processes, Holden-Day. Ross, S.M. (1983): Stochastic processes, John Wiley.

Course – Basic Details

Course Code & Title	:	Differential Equations , Fourier Series and Fourier Transforms
Semester	:	VI
Course Type	:	C~~ore~~ / Elective / ~~*Self Study / Soft skills / Project*~~
Credits	:	5
Credit equivalence	:	NA
Pre-requisites	:	NA

Course Description Course Objective(s) :

- To know about concept of Differential Equations.
- To understand the Fourier series and transformations.

Core Elective Paper II

Course Content : Unit – 1

First order and First degree equations of Bernouli – Differential equations of first order and higher degree. Clairaut‟s equation.

Unit – 2

Second order differential equations with constant coefficients – Linear operator Dn solution for homogenous equations. Methods of obtaining particular integral for e^{ax}, x^m, e^{ax} sinmx, e^{ax} cosmx.

Unit – 3

Linear homogenous equation – Lagrange‟s Linear equation – Cauchy – Euler equation and their problems (no derivation)

Unit – 4

Fourier Series – Fourier coefficients expansion of function using Fourier series of period 2 . Fourier Series for odd and even functions. Half range Fourier series.

Unit –5

Fourier Transformation – Infinite Fourier transform.(no derivation) Sine and Cosine Form, simple properties and their problems.

Suggested Readings

Books for Study:

1. P.Kandasamy K.Thilagavathy K. Gunavathy. Engineering Mathematics Vol 3: S.Chand & Co.
2. Dr.S.Sudha Differential Equations and Integral Transforms : Emerald Publishers.

Books for Reference:

1. M.K.Venkataraman Engineering Mathematics Vol 3: National Publishing Co.
2. Dr. A. Singaravelu. Transforms and Partial differential equations, Meenakshi agency.

Note: Either one from must be selected from two elective paper for Semester VI.

Course – Basic Details

Course Code & Title : Mathematical Economics Semester
: VI
Course Type : C~~ore~~ / Elective / ~~*Self Study / Soft skills / Project*~~
Credits : 5
Course Description Course

Core Elective Paper III Course
Content :

Unit 1: Scope and methods of Mathematical Economics – Laws of demand , Demand schedule(Individual and Market) - Demand function - Factors influencing the demand - Exception to the law of demand – Elasticity of demand with respect to price and income
- Factors affecting the elasticity of demand - Partial elasticity of demand with respect to price - Simple problems in elasticity of demand.

Unit 2: Supply - Factors affecting the supply of a commodity - Relation between demand and supply – Utility - Concept of utility - Concept of human wants - Maximization of utility -Marginal and total utility - Law of diminishing marginal utility - Indifference curves and map - Properties of indifference curve - Price line.

Unit 3: Cost Analysis – Different types of cost - Total, average and marginal cost functions -Relation between average and marginal costs - Problems related to total, average and marginal costs – Revenue - Total, average and marginal revenue functions and their relationship - Simple problems related to maximization of total revenue

Unit 4: Market Structure – Definition of Market - Perfect competition - Pure competition - Monopolistic competition and duopolistic competition (Only concept) – Profit maximization – Profit function - Cournot solution to monopoly problem for maximization problem - Joint monopoly and discriminating monopoly - Problems related

to profit maximization under monopoly. Duopoly - Conjectural variation and reaction curves - Simple maximization problem under duopoly.

Unit 5: Theoretical Production functions – Mathematical definition of production function -Constant product curves (Isoquant) - Average and marginal productivity – Homogenous production functions – Properties of linearly homogeneous production function – Cobb-Douglas production function – C. E. S. production function.

Suggested Readings

Books for Study :

1. Mehta and Madhnani (2001): Mathematics for Economists, Sultan Chand,
2. R.G.D.Allen(1976) Mathematical Analysis for Economists,Macmillian

Books for Reference:

1) Varma and Agarwal (1998): Managerial Economics, Sultan Chand and Company, New Delhi.
2) R.G.D. Allen Mathematics for Economics.
3) Varshney and Maheswari Managerial Economics
4) K.P. M.Sundaram Busniess Economics
5) Dr. S. Shankarn Managerial Economics**.**

Course – Basic Details

Course Code & Title : International Trade Semester: VI

Course Type : C~~ore~~ / Elective / ~~*Self Study / Soft skills / Project*~~

Credits : 5

Course Description

Core Elective Paper III Course

Content : UNIT 1 :

International Trade- Importance of International Trade – Theories of Foreign Trade – Theories od Adam Smith, Ricardo , Haberler, Heckscher.

UNIT 2 :

Balance of Trade – Balance of Concept – Causes of Disequilibrium – Method of Correct Disequilibrium – Fixed and Floating exchange rates – Euro – Dollar market.

UNIT 3 :

Export Management – Export procedure and document – Export finance – Export promotions- Export pricing.

UNIT 4 :

International economics organization and its functions – International Monetary Fund(IMF),- International Bank for Reconstruction and Development (IBRD)[World Bank] – International Development Association (IDA)-International Finance Corporation (IFC) – Asian Development Bank(ADB) – United Nationals Conference on trade and Development (UNCTAD) – United Nations Industrial development organization (UNIDO).

UNIT 5 :

(WTO) World trade organistaion and Trade liberalistation – Liberalistion of Trade in manufacturing and in Agricultural trade – (TRIPS) Trade related intellectual property Rights – Trade related Investment Measures (TRIMS) – Indian patent Law.

Suggested Readings

Books for Study:

1) Francis Cherunilam, International Trade and Export Management, Himalaya Publishing House 2003.
2) Dr. S. Sankaran, International Economics, Margham Publications.

Books for References:

1) B. Santhanam, International Trade and Foreign Exchange, Margham Publications.
2) Paul K. Krugman and Mourice, International Economics.
3) Robert J. Karbough, International Economics.

Note: Either one from must be selected from two elective paper for Semester VI.

Course – Basic Details

Course Code& Title	: Mathematicsfor Statistics– I Semester :I
Course Type	: C~~ore / Elective~~ /Allied / ~~*Self Study / Soft skills / Project*~~
Credits	: 5
Credit equivalence	: NA
Pre-requisites	: NA

Course Description Course

Course Content : UNIT – 1:

Matrix theory-definition and type of matrices, scalar, Elementary, Symmetric, Skew Symmetric, Hermitian, Skew - Hermitian, independent and unitary matrices- algebric operations on matrices and their properties-elementary transformations of matrices -determinant of matrix, definition of a row rank – column rank and rank of a matrix -determination of rank of a matrix.

UNIT – 2:

Inverse of a square matrix – computation of the inverse of the square matrix - solution of linear equations – Homogenous and non-homogenous systems of equations

–solutions space – consistency and general solutions Cramer‟s Rule and matrix methods of solving system equations and numerical examples, characteristic equations
– root and vectors of a square matrix – left and right eigen vectors – Cayley – Hamilton theorem - quadratic forms, definite, semi definite and indefinite quadratic forms.

UNIT – 3:

Logarithmic differentiation – Differentiation of one function with respect to another function – differentiation from parametric equations – Differentiation of implicit functions- Increasing and decreasing functions.

UNIT – 4:

Successive differentiation – Leibnitz theorem – Partial Differentiation – Maxima and Minima of functions of two variables.

UNIT – 5:

Integration – Properties of definite integrals – Reduction formula – Bernoulli‟s formula.

Suggested Readings

Books for Study:

1) Narayanan and T. K. Manickavachagam Pillai (1996): Calculus (Vol I & II) S.V. Publications.
2) Shanti Narayanan: Differential and Integral Calculus, Chand & Co.

Books for Reference:

1) S.Narayanan and others , Calculus,S.Viswanathan publications.

Course – Basic Details

Course Code& Title	: Mathematicsfor Statistics–II
Semester	: II
Course Type	: C~~ore / Elective~~ /Allied / ~~*Self Study / Soft skills / Project*~~
Credits	: 5

Course Description Course

Course Content : UNIT – 1:

Sets, Operations on sets – real valued functions – countability – real numbers bounds, supremum and infimum – sequence of real numbers – limit inferior and limit superior and limits of real sequences – limit theorems.

UNIT – 2:

Convergence and divergence of series with non-negative terms – alternating series – conditional and absolute convergence – rearrangement of series – test for absolute convergence – summation by parts.

UNIT – 3:

Continuity and derivative – the derivative of a real function – mean value theorems Taylor‟s theorem - concept of uniform continuity – Riemann integrals, sufficient condition for Riemann intergrability, Darboux theorem, fundamental theorem of integral calculus – first mean value theorem.

UNIT – 4:

Improper Riemann integral – Gamma and Beta integrals – multiple integrals – their evaluations using transformations of variables – simple example of multiple, integrals relevant to statistical methods.

UNIT – 5:

Laplace transformation (LT) – definitions, LT of the function t, e^{at}, cos at, sin at, e^{at} cos bt, e^{at} sin bt, transform f ' (t), f "(t)- Inverse LT relating to the above standard functions.

~~V~~ Suggested Readings

Books for Study:

1. D.Somasundram and B.Choudhary (2002): A first course in Mathematical Analysis, Narosa Publishing house.
2. Gold berg, R.R (1970): Method of Real Analysis, Oxford and IBH.

Books for Reference:

1. Narayanan and T. K. Manickavachagam Pillai – Ancillary Mathematics Book II
2. Bartle , R. G &Shebert, D. R. (1982): Introduction to Real Analysis, Wiley Eastern & Sons.
3. Bartle, R.G.Real 1976. Analysis, John Wiley and sons Inc.,
4. Malik, S.C. and Savita Arora (1991). Mathematical Analysis, Wiley Eastern Limited. New Delhi,
5. Sanjay Arora and Bansi (1991). Introduction to Real analysis, Satya Prakashan, New Delhi.
6. W. Rudin (1976): Principles of Mathematical Analysis, 3/e, McGraw Hill company.

Course – Basic Details

Course Code & Title : C- Language Programming Semester : III

Course Type : C~~ore / Elective~~ /Allied / ~~*Self Study / Soft skills / Project*~~

Credits : 5

Course Description

Course Content : UNIT -1:

Introduction to "C", variables, data types - declarations, type conversions, increment and decrement, Bitwise, Logical and Assignment operators.

UNIT-2:

Expression and conditional expressions, control structures ,IF-ELSE, SWITCH, WHILE,FOR and DO WHILE loop structures. Break continue, GO and Lable statements. Function, function returning, Non-integers, Function arguments-Static and register variables..

UNIT-3:

Arrays and Strings-Array Declaration, Multidimensional Arrays Strings/ Character Arrays, Array initialization-Pointers and addresses. Pointers and Arrays Pointer to function.

UNIT-4:

Standard input and output -formatted output-output-Access to the standard library.

UNIT-5:

File Access, File handling in C-File descriptions - Error handling - „Low level i/o- Read and Write". Open, Create, Close, Unlike.

Suggested Readings

Books For Study:

1. Balagurusamy,E.(1997):ANSI,„C"Programming,Tata-McGrawHillPublishersLtd.
2. B.W.Kernighan,D.M.Ritchie C programming Language 2nd Edition,

Books for Reference:

1. Yaswant Kanetkar (1997): Let Us „C",BPB Publications, New Delhi.
2. Bruce,H.Hunter: Introduction to „C". K.N. King, C Programming – A Modern Approach.

Course – Basic Details

Course Code & Title	:	Numerical Methods Semester
	:	IV
Course Type	:	C~~ore / Elective~~ /Allied / ~~*Self Study / Soft skills / Project*~~
Credits	:	5
Credit equivalence	:	NA
Pre-requisites	:	NA

Course Description Course

Course Content : UNIT – 1:

Finite differences-forward and backward differences, operators E and Δ, and their basic properties, Interpolation with equal intervals: Newton"s forward and backward differences-simple problems.

UNIT –2 :

Interpolation with unequal intervals:Divided differences and their properties, Newton"s divided differences formula and Lagrange"s formula for interpolation – simple problems.

UNIT- 3 :

Central difference interpolation formula-gauss forward and backward differences formulae - Stirling, Bessel"s Everett"s central difference formula.

UNIT – 4 :

Inverse interpolation -Lagrange"s method - iteration of successive approximation method - simple problems. Numerical differentiation - Numerical differentiation upto 2nd order only-simple problems.

UNIT –5:

Numerical intergration -Trapezoidal rule - simpsons 1/3rd and 3/8th rules-Weddle"s rule-Euler"s summation formula. Numerical method of solution of ordinary differential equations -Taylor"s series method - Euler method and Runga Kutta upto second order – simple problems.

Suggested Readings

Books for Study :

1. B.D. Gupta , Numerical Analysis, Konark Publishing.
2. Saxena, Calculus of finite differences and Numerical Analysis S. Chand & Co.

Books for Reference :

1. Gupta-Malik, Krishna Prakastan Mandir, Calculus of finite differences and Numerical analysis, Meerut.
2. M.K. Venkataraman, Numerical methods in Science and Engineering, National publishing house, Chennai.
3. M.M. Ramasamy and Palaniappan, Numerical mathematics

Course – Basic Details

Course Code & Title	: Numerical Methods & Programming in 'C' Semester : IV
Course Type	: C~~ore / Elective~~ /Allied / ~~*Self Study / Soft skills / Project*~~
Credits	: 5
Credit equivalence	: NA
Pre-requisites	: NA

Course Description

Course Content :

A. Summation of Series :
   1. Sin(x), 2. Cos(x), 3.Exp(x) (Comparison with built in functions)
B. String Manipulation :
   1. Counting the no. of vowels, consonants, words, white spaces in a line of text and array of lines
   2. Reverse a string & check for palindrome.
C. Matrix Manipulation : 1.Addition & Subtraction
   2.Transpose, and trace of a matrix

1. Solution of polynomial equation-Newton Rapson method
2. Solution of system of simultaneous equation-Gauss elimination method. 3.Lagrange interpolation.
4.Numerical integration by Trapezoidal, Simpson‟s and Weddle‟s rules.
5.Calculate the value of Π (up to five decimal places).
6.Check the accuracy of the built in functions Sin(x), Cos(x),(x in radians) ex, e-x. 7.Generation of Fibonacci Sequence.
8.Solution of simultaneous equations by Iterative methods and by using inverse.

NON MAJOR ELECTIVE PAPER I – FUNDAMENTALS OF ACCOUNTING
SEMESTER – I

Level of Knowledge: Basic Level

Unit – I

Need for Accounting – Definition of Accounting – its Objectives and Advantages – Internal & External Users - Branches of Accounting - Methods of Accounting - Types of Accounts - Accounting rules - Accounting Concepts and Conventions – Accounting Equation.

Unit – II

Book Keeping - Journal – Ledger - Subsidiary Books - Petty Cash Book - Single, Double, Triple column Cash Book - Trial Balance - Final Accounts - simple problems on recording of Journal entries, preparation and balancing of various Ledger Accounts -preparation of Trial Balance and Final Accounts (Sole Proprietorship Concern only) – Accounts of Non- Trading Concerns.

REFERENCE BOOKS:

1. T.S.Reddy & A.Murthy – Financial Accounting
2. Jain & Narang – Financial Accounting
3. P.C.Tulsian – FinancialAccounting
4. S.Parthasarathy & A.Jaffarulla – Financial Accounting

NON MAJOR ELECTIVE PAPER II – FUNADAMENTALS OF INSURANCE

Level of Knowledge: Basic Level Unit – I

Origin and history of Insurance – Meaning and definition of Insurance – Features of Insurance - Principles of Insurance – Objectives and advantages of Insurance- Types of Insurance – Insurance Organizations in India and their Profile - Insurance Regulatory and Development Authority – its Duties and Functions

Unit – II

Meaning and Definition of Life Insurance – its Features – its Fundamental Principles - Types of policies in Life Insurance – Meaning and Definition of Fire Insurance - its Features – its Fundamental Principles – Types of policies in Fire Insurance - Meaning and Definition of Marine Insurance - its Features – its Fundamental Principles - Types of Policies in Marine Insurance.

REFERENCE BOOKS:

1. A.Murthy – Elements of Insurance
2. M.N.Mish – Insurance – Principles and Practice

A.C.S ’19