

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI – 12.

B.Sc., Statistics

under Choice Based Credit System
(with effect from the academic year 2020-2021)

Eligibility for Admission:

Candidates who have passed the higher secondary examination conducted by Government of Tamil Nadu with Statistics / Mathematics / Business Mathematics / Computer Science / Physics / Chemistry / Commerce as one of the courses or other equivalent examinations are eligible for admission to the first year of the B.Sc., (Statistics) degree program.

Duration of the Program:

The duration of the program is three academic years comprising of six semesters with two semesters in each academic year. Examinations will be conducted at the end of each semester for the respective courses.

Medium of Instructions and Examinations:

The medium of instructions and examinations for the courses of Part I and Part II shall be in the languages concerned. For the courses of Part III and Part IV, the medium of instructions and examinations shall be in English.

Examination

The regulations for examination, passing minimum in each course and classification of successful candidates and award of ranks are at par with the regulations for other undergraduate science programs of the University.

SCHEME OF EXAMINATION

Table: CS-03: Common Program Structure for other UG Degree Programme in Sciences – B.Sc., in Statistics

Sem.	Pt. I/II/ III/ IV/ V	Sub No.	Course Status	Course Title	Contract Hrs./we ek	L Hrs. / week	T Hrs. / week	P Hrs. / week	C Credit s
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
I	I	1	Language	Tamil / Other Languages	6	6	0	0	4
	II	2	Language	Communicative English	6	6	0	0	4
	III	3	Core-I	Descriptive Statistics	5	5	0	0	4
	III	4	Major Practical - I	Statistics Practical - I	3	0	0	3	2
	III	5	Add on Major (Mandatory)	Professional English for Physical Sciences-I	4	4	0	0	4
	III	6	Allied - I	Mathematics	4	3	0	0	3
	IV	7	Common	Environmental Studies	2	2	0	0	2
Subtotal					30				23
II	I	8	Language	Tamil / Other Languages	6	6	0	0	4
	II	9	Language	English	6	6	0	0	4
	III	10	Core	Sampling Techniques	4	4	0	0	4
	III	11	Major Practical - II	Statistics Practical - II	2	0	0	2	2
	III	12	Core	Professional English for Physical Sciences -II	4	4	0	0	4

	III	13	Allied - II	Programming with C	4	3	0	1	3
	III	14	Allied Practical - II	Computer Practical	2	0	0	2	2
	III	15	Common	Value Based Education : r%f xOf;fq;fSk; gz;ghl;L tpOkpaq;fSk; /Social Harmony	2	2	0	0	2
	Subtotal				30				25
III	I	16	Language	Tamil / Other Languages – III	6	6	0	0	4
	II	17	Language	English – III	6	6	0	0	4
	III	18	Core	Statistical Distributions	4	4	0	0	4
	III	19	Core	Probability Theory	4	4	0	0	4
	III	20	Major Practical - III	Statistics Practical - III	2	0	0	2	2
	III	21	Allied-III	Mathematics - II	3	3	0	0	3
	III	22	Skilled Based Core	Mathematical Computations using R	3	2	0	1	3
	III	23	Non-Major Elective	Elements of Statistics - I	2	2	0	0	2
	IV	24	Common	Yoga	2	1	0	1	2
	Subtotal				32				28
IV	I	25	Language	Tamil / Other Languages - IV	6	6	0	0	4
	II	26	Language	English – IV	6	6	0	0	4
	III	27	Core	Demographic Methods	4	4	0	0	4
	III	28	Core	Time Series and Official Statistics	4	4	0	0	4
	III	29	Major Practical - IV	Statistics Practical - IV	2	0	0	2	2
	III	30	Allied- IV	Matrix Theory	3	3	0	0	3
	III	31	Skill Based Core	Numerical Methods	3	3	0	0	3
	IV	32	Non-Major Elective	Elements of Statistics - II	2	2	0	0	2
	IV	33	Common	Computers for Digital Era	2	2	0	0	2
	V	34	Extension Activity	NCC, NSS, YRC, YWF	0	0	0	0	1
	Subtotal				32				29
V	III	35	Core	Statistical Inference – I	4	4	0	0	4
	III	36	Core	Statistical Quality Control	4	4	0	0	4
	III	37	Elective	Major Elective – I (Econometrics / Stochastic Processes)	4	4	0	0	4
	III	38	Elective	Major Elective – II (Actuarial Statistics / Biostatistics)	4	4	0	0	4
	III	39	Major Practical – V	Statistics Practical - V	4	0	0	4	2
	III	40	Major Practical - VI	Statistics Practical - VI	4	0	0	4	2
	IV	41	Skill Based- Common	Personality Development / Effective Communication / Youth Leadership	2	2	0	0	2
	Subtotal				26				22
VI	III	42	Core	Statistical Inference – II	5	4	1	0	4
	III	43	Core	Design of Experiments	5	4	1	0	4
	III	44	Core	Operations Research	4	4	0	0	4
	III	45	Elective	Elective - III (Discrete Mathematics / Mathematical Computations Using <i>Python</i>)	4	4	0	0	4
	III	46	Major Practical - VII	Statistics Practical – VII	4	0	0	4	2
	III	47	Major Practical - VIII	Statistics Practical – VIII	4	0	0	4	2
	III	48	Major Practical - IX	Statistics Practical – IX	4	0	0	4	2
	Subtotal				30				22

Note 1:

- Statistics Practical – I : Based on the course “Descriptive Statistics”
- Statistics Practical – II : Based on the course “Sampling Techniques”
- Computer Practical : Based on the course “Programming with C”
- Statistics Practical – III : Based on the course “Statistical Distributions” and “Probability Theory”
- Statistics Practical – IV : Based on the course “Demographic Methods” and “Time Series and Official Statistics”
- Statistics Practical – V : Based on the course “Statistical Inference – I” and Elective – II (Actuarial Statistics / Biostatistics)
- Statistics Practical – VI : Based on the course “Statistical Quality Control”
- Statistics Practical – VII : Based on the course “Statistical Inference – II”
- Statistics Practical – VIII : Based on the course “Design of Experiments”
- Statistics Practical – IX : Based on the course “Operations Research”

Note 2:

- Elective – I: Econometrics
Stochastic Processes
- Elective – II: Actuarial Statistics
Biostatistics
- Elective - III: Discrete Mathematics
Mathematical Computations Using Python.

SEMESTER – V

5.1 STATISTICAL INFERENCE - I (Core V)

Unit - I

Statistical Inference: meaning and purpose, parameter and statistic. Sampling distribution and standard error. Estimator and estimate. Point Estimation: consistency, unbiasedness, efficiency and sufficient statistic - Neyman's factorization theorem (without proof) - simple problems.

Unit - II

Unbiased Estimation: Minimum variance unbiased estimator - Cramer-Rao Inequality and Rao-Blackwell theorem - applications and simple problems.

Unit - III

Methods of estimation: Method of moments and Method of maximum likelihood. Properties of estimators obtained by these methods. Method of least squares for regression models. asymptotic properties of maximum likelihood estimators (without proof).

Unit - IV

Interval estimation: Interval estimator, confidence coefficient, confidence limits, pivotal quantity. Interval estimation for proportions, mean(s), variance(s) based on *Chi* - square, Student's *t*, *F* and normal distributions – simple problems.

Unit - V

Bayes estimation: concepts of prior, posterior and conjugate prior. Loss function: 0-1 loss function and quadratic error loss function. Bayes estimator. Simple problems involving quadratic error loss function.

BOOKS FOR STUDY:

1. Goon, A. M., M.K. Gupta, and B. Dasgupta (2002) Fundamentals of Statistics, Vol. I, (Third Edition), World press Ltd, Kolkata.
2. Alexander, M. Mood, Franklin A. Graybill and Duane C. Boes (2017). Introduction to the Theory of Statistics (Third Edition), Mc Graw Hill Education, New Delhi.

BOOKS FOR REFERENCE:

1. Bhuyan K.C. (2010), Probability Distribution Theory and Statistical Inference, New Central Book Agency (P) Ltd., New Delhi.
2. Gupta, S. C., and V. K. Kapoor (2020) Fundamentals of Mathematical Statistics, (Twelfth Edition). Sultan Chand & Sons, New Delhi.
3. Robert, V. Hogg, Joseph W. McKean and Allen T. Craig (2013) Introduction to Mathematical Statistics (Seventh Edition), Pearson Education, New York.
4. Rohatgi, V. K. and A. K. Md. E. Saleh (2009). An Introduction to Probability Theory and Mathematical Statistics (Second Edition). John Wiley & Sons, New York.

5.2 STATISTICAL QUALITY CONTROL (Core)

Unit - I

Control charts for variables: Quality control and need for statistical quality control techniques in industries - causes of variation - process control and product control. Process control: specifications and tolerance limits- 3σ limits, construction of Shewhart control charts - variable control charts - \bar{X} , R and σ charts- simple problems.

Unit - II

Control charts for attributes: control chart for fraction defectives (p chart), control chart for number of defectives (d chart) and control chart for number of defects per unit (c chart)-simple problems.

Unit - III

Acceptance Sampling: Product control - Sampling inspection, acceptance sampling by attributes-concepts of producer's risk and consumer's risk-acceptable quality level (AQL), lot tolerance percent defective (LTPD), average outgoing quality level (AOQL), ATI and ASN. Rectifying inspection plans.

Unit - IV

Acceptance sampling by attributes: Single sampling plan - OC, AOQ, ATI and ASN curves - Dodge and Romig sampling plans -Double sampling plan and its advantages over single sampling plan, Operating procedure.

Unit - V

Acceptance sampling for variables-sampling plan based on normal distribution-known and unknown standard deviation cases. Determination of n and k for one- sided specification limits (without derivation) - OC curve.

BOOKS FOR STUDY:

1. Montgomery, D.C. (1991) Statistical Quality Control (2nd Edition) John Wiley and Sons, New York.
2. Eugene L. Grant, and Richard S. Leavenworth (1988) Statistical Quality Control (Sixth Edition), McGrawhill Book co, New York.
3. Gupta, S. C. and V.K. Kapoor (1999) Fundamentals of Applied Statistics (Third Edition), Sultan Chand & sons, New Delhi.

BOOKS FOR REFERENCES:

1. Goon, A. M., M.K. Gupta and B. Dasgupta (1987) Fundamentals of Statistics, Vol. II. World Press, Kolkata.
2. Mahajan (1997) Statistical Quality Control, Dhanpat Rai & sons, New Delhi.
6. Juran, J.M.(1988) Quality Control Handbook, McGraw Hill, New York.

5.3 (A) ECONOMETRICS (Major Elective-I)

Unit - I

Model with one explanatory variable: Definition, scope and objectives of Econometrics. Linear model with one independent variable - Least squares estimators of regression coefficients, properties of least squares estimators - analysis of variance to regression model.

Unit - II

Model with more variables: Linear model with more than one explanatory variables – assumptions – estimation of model parameter - Least squares estimators and their properties. Hypothesis testing – test the overall significance of the regression – Testing the individual regression coefficients.

Unit - III

Adequacy of Model: Model adequacy checking – residual analysis – residuals – standardized residuals – residual plot – normal probability plot – plot of residuals against estimated response. A formal test for lack of fit of the model.

Unit - IV

Autocorrelation: Meaning of serial independence – sources of autocorrelation – first order autoregressive scheme – consequences of autocorrelation – Durbin – Watson test – analysing the model in the presence of autocorrelation.

Unit - V

Multicollinearity : meaning and sources – consequences of multicollinearity. Test for detecting multicollinearity – Examining the correlation matrix – Variance Inflation factor – Eigen values of $X'X$.

BOOKS FOR STUDY:

1. Montgomery, D.C, Peck, E.C and Vining, G.G (2003) Introduction to Linear Regression Analysis (Third Edition). Wiley India, New Delhi.
2. Koutsoyiannis, A. (2006) Theory of Econometrics. (Second Edition) Palgrave, New York.

BOOKS FOR REFERENCE:

1. Singh, S. P., Parashar, K. and Singh, H. P. (1980) Econometrics. Sultan Chand & Co., New Delhi.
2. Klein, L. R. (1975) A Text Book of Econometrics (Second Edition). Prentice Hall of India, New Delhi.
3. Johnston, J. and DiNardo, J. (1997). Econometric Methods, McGraw-Hill.
4. Gujarati, D.N. and Sangeetha (2007). Basic Econometrics (Third Edition). McGraw Hill Publisher, New York.
5. Wooldridge, J. (2012). Introduction Econometrics: A Modern Approach. Cengage Learning.

5.3(B) STOCHASTIC PROCESSES (Major Elective -I)

Unit - I

Elements of Stochastic Processes: Basic terminologies. Classification of stochastic processes according to state space and domain-Elementary ideas on the Poisson process and Wiener process-Martingales-Markov processes- Stationary processes.

Unit - II

Markov Chain: definition-transition probability- discrete time Markov chain and transition probability matrix. spatially homogeneous Markov Chain-one -dimensional random walk.

Unit - III

Classification of states of Markov Chain. Reducible and irreducible Markov Chains-periodicity. Recurrent and transient states with examples. Concepts, results and problems concerning limiting probabilities (without Proof)- Simple problems.

Unit - IV

Classical examples of continuous time Markov Chain- infinitesimal generator - Poisson processes. General pure birth process and Yule's process. Birth and death processes - their differential and difference equations and solutions.

Unit - V

Queueing models and Classifications – Queueing system - Definition of transient and Steady-states - Kendall's notations and classification of queueing models - Distributions in queueing systems.

BOOK FOR STUDY:

1. Medhi, J. (1994) Stochastic Processes (Second Edition). Wiley Eastern Limited, New Delhi.
2. Samuel Karlin and Taylor (1975) A First Course in Stochastic Processes. Academic Press, New York.

BOOKS FOR REFERENCE:

1. Bhat, U. N. (1972) Elements of Applied Stochastic Processes. John Wiley & Sons, New York.
2. Basu, A.K. (2005) Introduction to Stochastic Process, Narosa Publishing House Pvt. Ltd., New Delhi.
3. Ross, S.M (1983): Stochastic Processes, John Wiley and Sons, New York.

5.4 (A) Actuarial Statistics (Major Elective – II)

UNIT-I

Introductory Statistics and Insurance Applications - Discrete, continuous and mixed probability distributions. Insurance applications, sum of random variables. Utility theory: Utility functions, expected utility criterion, types of utility function, insurance and utility theory.

UNIT-II

Principles of Premium Calculation - Properties of premium principles, examples of premium principles. Individual risk models: models for individual claims, the sum of independent claims, approximations and their applications.

UNIT-III

Survival Distribution and Life Tables- Uncertainty of age at death, survival function, time until-death for a person, curate future lifetime, force of mortality, life tables with examples, deterministic survivorship group, life table characteristics, assumptions for fractional age, some analytical laws of mortality.

UNIT-IV

Life Insurance- Models for insurance payable at the moment of death, insurance payable at the end of the year of death and their relationships.

UNIT-V

Life annuities: continuous life annuities, discrete life annuities, life annuities with periodic payments. Premiums: continuous and discrete premiums.

Book for study

1. Dickson, C. M. D. (2010): Insurance Risk and Ruin (International Series on Actuarial Science), Cambridge University Press.

Book for References

1. Bowers, N. L., Gerber, H. U., Hickman, J. C., Jones, D. A. And Nesbitt, C. J. (1997): Actuarial Mathematics, Society of Actuaries, Itasca, Illinois, U.S.A.
2. Dickson, C. M. D., Hardy, S.C. and Waters, H.R. (2013). Actuarial Mathematics for Life Contingent Risks, (2nded.), Cambridge University Press.
3. Gerber, H.U. (1990). Life Insurance Mathematics, Springer.

5.4 (B) BIO-STATISTICS

UNIT I

Study Designs and Statistical Measures Introduction to Study Designs- Different Types of Observational, Studies –Experimental Studies. Epidemiology – Odds-Odds Ratio- Confidence Interval for Odds Ratio- Control Event Rate – Experimental Event Rate- Relative Risk.

UNIT II

Collection of data – primary data, designing questionnaire and schedule – Secondary data – Methods of collection of data – classification of data – Tabulation and presentation of data

UNIT III

Measures of Central Tendency – Mean, Median, Mode, Geometric Mean – Merits and Demerits. Measures of dispersion – Range, Standard deviation, Mean deviation, Quartile deviation, Merits and demerits, coefficient of variations

UNIT IV

Correlation – Types and methods of correlation, Rank – Correlation, Regression, Simple regression equation, fitting, Prediction

UNIT V

Sampling Methods – population. Sample – Simple Random sample – concept of sampling distributions – standard error – Test of significance – Hypothesis – Simple hypothesis – Tests based on large samples and small samples – Chi-square test.

UNIT VI

Contemporary issues: Experts' lectures – online seminars and webinars. [2 hours]

Note 1: Students will be trained to develop appropriate computer programmes in *R* and *Python* related to computations taught in this course.

[**Total:**62 hours]

Note 2: Examination shall be conducted on contents of UNIT I through UNIT V only.

BOOKS FOR STUDY:

1. P.S.S. Sundar Rao, J. Richard (2012). An introduction to Biostatistics and Research methodology. Fifth Edition, Prentice Hall of India Learning Private Ltd, New Delhi.
2. Gurumani N (2005). An introduction to Biostatistics. 2nd Revised Edition, MJP Publishers, Chennai.

BOOKS FOR REFERENCE:

1. Daniel WW, (1987). Biostatistics, John Wiley and Sons, New York.
2. Dr. Pranab Kumar Banarjee. An Introduction to Biostatistics (A text book of Biometry). Revised and 4th enlarged Edition 2011, S. Chand and Company Ltd, Ram Nagar, New Delhi.
5. A. Indrayan, L. Sathyanarayana(2006). Biostatistics for Medical, Nursing and Pharmacy students. Prentice Hall of India Private Ltd, New Delhi.

5.5 Statistics Practical – V (Major)

5.6 Statistics Practical – VI (Major)

5.7 Personality Development / Effective Communication / Youth Leadership (Skill Based Common)

SEMESTER – VI

6.1 STATISTICAL INFERENCE - II (Core)

Unit - I

Statistical hypotheses- simple and composite hypotheses - null and alternative hypotheses-critical region- two kinds of errors. Randomized and non-randomized tests -most powerful test- Neyman-Pearson lemma. Simple problems.

Unit - II

Likelihood ratio test- construction of tests for mean, equality of two means (independent samples), variance and equality of variances of normal populations.

Unit - III

Tests of significance: sampling distribution, standard error. Large sample tests concerning mean(s), variance(s), proportion(s) and correlation coefficient – simple problems.

Unit - IV

Tests of significance: Exact tests based on t , F and chi -square distributions concerning mean(s), variance(s), correlation coefficient(s) - Partial and multiple correlation coefficients. Chi – square test - contingency table-test for goodness of fit, test for independence of attributes, test for association – simple problems.

Unit - V

Non-parametric tests – advantages and disadvantages of nonparametric tests- test for randomness, Kolmogorov -Smirnov test, sign test, median test, Mann-Whitney U test, and Wilcoxon's signed - rank test – simple problems and applications.

BOOKS FOR STUDY:

1. Goon, A. M., M.K. Gupta, and B. Dasgupta (2002) Fundamentals of Statistics, Vol. I, (Third Edition), World press Ltd, Kolkata.
2. Alexander, M. Mood, Franklin A. Graybill and Duane C. Boes (2017). Introduction to the Theory of Statistics (Third Edition), Mc Graw Hill Education, New Delhi.

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1. Bhuyan K.C. (2010), Probability Distribution Theory and Statistical Inference, New Central Book Agency (P) Ltd., New Delhi.
2. Gupta, S. C., and V. K. Kapoor (2020) Fundamentals of Mathematical Statistics, (Twelfth Edition). Sultan Chand & Sons, New Delhi.
3. Robert, V. Hogg, Joseph W. McKean and Allen T. Craig (2013) Introduction to Mathematical Statistics (Seventh Edition), Pearson Education, New York.
4. Rohatgi, V. K. and A. K. Md. E. Saleh (2009). An Introduction to Probability Theory and Mathematical Statistics (Second Edition). John Wiley & Sons, New York.

6.2 DESIGN OF EXPERIMENTS (Core)

Unit - I

Fundamental principles of scientific experiments – randomization, replication and local control. Size of experimental units. Analysis of variance- one-way and two-way classifications.

Unit - II

Post ANOVA Tests: Fisher Critical Difference Test, Multiple range test; Newman-Keul's test-Duncan's multiple range test-Tukey's test. Concept of Analysis of Covariance.

Unit - III

Analysis of Variance and Basic Designs: Cochran's Theorem (statement only). Completely randomized design(CRD)- Randomized Complete Block Design(RCBD) - Latin square design(LSD) and their analysis - Missing plot techniques in RCBD.

Unit - IV

Factorial experiments: 2^2 , 2^3 and 2^n factorial experiments. Definitions and their analyses.

Unit - V

Principles of confounding –partial and complete confounding – Introduction to Incomplete Block Design – Concept, definitions and examples of Balanced Incomplete Block Design (BIBD) – parametric relationship of BIBD.

BOOKS FOR STUDY:

1. Das, M.N. and Giri, N.C. (1988) Design and Analysis of Experiments (2nd Edition). New Age International, New Delhi.
2. Gupta, S. C. and V. K. Kapoor (1999) Fundamentals of Applied Statistics (Third Edition), Sultan Chand & Sons, New Delhi.
3. Agarwal, B.L., (2010). Theory and Analysis of Experimental Designs., CBS Publishers & Distributors Pvt. Ltd., New Delhi.

BOOKS FOR REFERENCE:

1. Douglas, C. Montgomery (2012) Design and Analysis of Experiments. John Wiley & Sons, New York.
2. Dean, A and Voss (2006) Design and Analysis of Experiments. Springer India Private Limited, New Delhi.
3. Rangasamy, R (2010) A Textbook of Agricultural Statistics, New Age International Pvt Ltd.

6.3 OPERATIONS RESEARCH (Core)

Unit - I

Concepts of Operations Research – Limitations - Linear Programming Problem(LPP) - mathematical formulation of normal form - graphical solution.

Unit – II

Simplex method – Big M method –Two-phase method – dual simplex.

Unit - III

Transportation problem-mathematical formulation- North-West corner rule and Vogel's rule-MODI method - Assignment problem - Hungarian method.

Unit - IV

Game theory: Maximin and Minimax criterion - saddle points- 2×2 Games without saddle point- Dominance rule based on graphical method for $(2 \times n)$ and $(m \times 2)$ games.

Unit - V

Network analysis by CPM/PERT: Basic Concept – Constraints in Network – Construction of the Network – Time calculations – Concept of slack and float in Network Analysis – Network crashing – Finding optimum project duration and minimum project cost.

BOOKS FOR STUDY:

1. Goel,B.S.and Mittal,S.K. (2000) Operations Research, PragatiPrakashan, Meerut.
2. Gupta, R.K.(1985) Operations Research, Krishna Prakashan, Mandir, Meerut.
3. Hillier, F.S and Lieberman, G. J. (1998) Operations Research, CBS Publishers and Distributors, New Delhi.
4. Kanti Swarup, Gupta, P.K. and Man Mohan (2008) Operations Research (3rd Edition). Sultan Chand & Co, New Delhi.

BOOKS FOR REFERENCE:

1. Kapoor, V.K. (2001), Operations Research, Sultan Chandan & Sons, New Delhi.
2. Sharma, J.K. (2001) Operations Research. Theory and applications, Macmillan, New Delhi.
3. Sharma J.K. (2002) Operations Research.Problems and solutions, Macmillan, New Delhi.
4. Taha, H.A. (2007) Operations Research – An Introduction (8th Edition) Prentice Hall of India, New Delhi.

6.4 (A) Discrete Mathematics (Elective-III)

Unit - I

Sets and Relations: Introduction - Sets – Ordered pairs – Operations on Sets - Introduction to Relations – Binary relation – Classification of Relations – Composition of Relations –Inverse of Relation.

Unit - II

Functions: Introduction to Functions – Addition and Multiplication of Functions - Classifications of Functions – Composition of Function – Inverse Function.

Unit - III

Mathematical Logic: Introduction – Statement (Propositions)- Laws of Formal Logic- Basic Set of Logical operators/operations - Propositions and Truth Tables – Tautologies and Contradictions – Logical Equivalence – Logical Implication.

Unit - IV

Matrix Algebra: Introduction – Operations on Matrices – Symmetric and Skew-symmetric Matrices – Conjugate of a Matrix – Determinant of a Matrix – Adjoint and Inverse of a Matrix – Singular and Non-singular Matrices - Inverse of Matrices.

Unit - V

Graph: Introduction – Graph and Basic Terminologies – Types of Graphs – Sub Graph – Representation of Graph – Tree.

BOOKS FOR STUDY:

1. Swapan Kumar Chakraborty and Bikash Kanti Sarkar (2014), Discrete Mathematics, oxford university press, UK.
2. Glory Ratna Mary and Y. S. Irine Viola, Mathematical foundations for computer science – part 1, Shekina publications.
3. Seymour Lipschutz and Marc Lars Lipson (2010), Discrete mathematics, third edition, Tata Mcgraw Hill education private limited, New Delhi.

BOOKS FOR REFERENCE:

1. P.Duraipandian and S.Udayabaskaran,(1997) Allied Mathematics, Vol. I & II. Muhil Publishers, Chennai
2. S.P.Rajagopalan and R.Sattanathan,(2005) Allied Mathematics .Vol. I & II. Vikas Publications, New Delhi.
3. P.Kandasamy, K.Thilagavathy (2003) Allied Mathematics Vol-I, II S.Chand & company Ltd., New Delhi-55.

6.4 (B) MATHEMATICAL COMPUTATIONS USING PYTHON (Elective III)

UNIT-I

Introduction - commands – Random numbers generation – Data Types – Objects – Basic data and Computations – Data input – Data frames – Graphics – Tables.

UNIT-II

Fundamentals of Python - Running Python Programs - Writing Python Code; Working with Data – Data Types and Variables - Using Numeric Variables - Using String Variables; Input and Output - Making Decisions - Lists and Loops; Numeric and Date Functions - Working with Strings – Functions - Python Classes - Class Instances

UNIT–III

Descriptive Statistics - Diagrammatic representation of data - measures of central Tendency - measures of dispersion - measures of skewness and kurtosis.

UNIT–IV

Probability and probability distributions - problems on finding basic probabilities - some special discrete distributions – Binomial distribution – Poisson Distribution – Continuous distributions – Normal distribution – Uniform distribution.

UNIT–V

Correlation - inference procedure for correlation coefficient - bivariate correlation - multiple correlations - Linear regression and its inference procedure.

BOOKS FOR STUDY:

1. Normal Maltoff (2009) The art of R programming, William Pollock Publishers, San Fransisco.
2. Purohit S. G., Gore S. D. and Deshmukh S. K. (2010) Statistics using R, Narosa Publishing House Pvt. Ltd., New Delhi.
3. Lee, K. D. (2015). Python Programming Fundamentals. United Kingdom: Springer London.
4. John Braun, W. and Duncan James Murdoch (2007) First Course in Statistical Programming with R, Cambridge University Press, Uk.

BOOKS FOR REFERENCE

1. Ugarte, M. D., A. F. Militino, A. T. Arnholt (2008) Probability and Statistics with R, CRC Press, Taylo & Francis Group, London.
2. Peter Dalgaard (2008) Introductory Statistics with R, Springer India Private Limited, New Delhi.
3. Michael J. Crawley (2007) The R Book, John Wiley and Sons, New York.
4. Lambert, K. (2014). Fundamentals of Python: Data Structures. United States: Cengage Learning PTR.
5. Python Programming Fundamentals: A Beginner's Handbook. Educreation Publishing.
6. Jones, P. (2016). Python: The Fundamentals of Python Programming. United States: CreateSpace Independent Publishing Platform.

1.5 Statistics Practical – VII (Major Practical)

6.6 Statistics Practical – VIII (Major Practical)

6.7 Statistics Practical – IX (Major Practical)