

HINDI MAHAVIDYALAYA

(AUTONOMOUS & NAAC RE-ACCREDITED)

(Affiliated to Osmania University)

Nallakunta, Hyderabad-44



BOARD OF STUDIES

DEPARTMENT OF STATISTICS

(M.Sc. APPLIED STATISTICS)

2nd YEAR

2020-2021

HINDI MAHAVIDYALAYA

(AUTONOMOUS & NAAC RE-ACCREDITED)

(Affiliated to Osmania University)

Nallakunta, Hyderabad-44



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DEPARTMENT OF STATISTICS

M.Sc. APPLIED STATISTICS

(BOS – MEETING ON 24-12-2020 at 03 PM)

SYLLABUS, MODEL PAPER

PANEL OF EXAMINERS etc...

For the Academic Year

2020-2021

HINDI MAHAVIDYALAYA

(AUTONOMOUS & NAAC RE-ACCREDITED)

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Nallakunta, Hyderabad-44

DEPARTMENT OF STATISTICS

M.Sc. APPLIED STATISTICS

SCHEME OF INSTRUCTION

AND

EXAMINATION

(THEORY AND PRACTICALS)

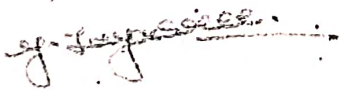
HINDI MAHAVIDYALAYA
(AUTONOMOUS & NAAC RE-ACCREDITED)
DEPARTMENT OF STATISTICS
(M.SC. APPLIED STATISTICS)

COMPOSITION: DEPARTMENT OF STATISTICS


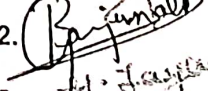

1. Head of the department concerned (Chairman)
Dr.M.Raghunadh Acharya-Department of Statistics
2. One expert to be nominated by the vice-chancellor from a panel if six recommended by the College Principal.

Dr. G. Jayashree-HOD, Department of Statistics,
Osmania University, Hyderabad.
3. Two experts in the subject to be nominated by the Academic Council.
 1. Dr.N.Ch.Bhatracharyulu-Department of Statistics, Osmania University.
 2. Dr. B.G.Manjunadh-Asst.Professor,School of Mathematics & Statistics, University of Hyderabad.
4. One industry expert in the subject from outside the college to be nominated by the Academic Council.
 - a. A.HariKrishna working for National textiles

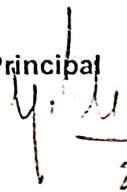
Chairperson
E. Swainalatha

University Nominee

HEAD
Department of Statistics,
University College of Science
Osmania University, Hyderabad-7.

Members

1. 
2. 
3. 

Principal


24/12/20

HINDI MAHAVIDYALAYA

(AUTONOMOUS & NAAC RE-ACCREDITED)

BOARD OF STUDIES DEPARTMENT OF STATISTICS (M.SC. APPLIED STATISTICS)

AGENDA OF THE MEETING

- 1.1. Welcome address by the chair.
- 1.2. Details of choice base credit system.
- 1.3. Discussion on Common Core Syllabus of Semester III & IV.
- 1.4. Marks allotted for Internal and End Semester exams.
- 1.5. Discussion on Semester Exam Model Paper & Internal Exam Model Paper of Semester III & IV.
- 1.6. Discussion on Practical Exam Model Paper of Semester III & IV.
- 1.7. Panel of Examiners
- 1.8. Any other matter
- 1.9. Vote of Thanks

Chairperson

E. Swahalatha

University Nominee

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Members

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2. *[Signature]*
3. *[Signature]*

Principal

[Signature]
24/12/20

HEAD
Department of Statistics,
University College of Science
Osmania University, Hyderabad-7.

HINDI MAHAVIDYALAYA

(AUTONOMOUS & NAAC RE-ACCREDITED)

BOARD OF STUDIES DEPARTMENT OF APPLIED STATISTICS

ACADEMIC YEAR – 2020-2021

MINUTES OF BOARD OF STUDIES MEETING

BOS meeting of the Department of APPLIED STATISTICS was held on 24th December 2020 at 3:00 PM.

The following members were present

Swarnalatha.	-	Chairperson
Dr.M.Raghunadha Acharya	-	HOD
Dr. G. Jayasree.	-	University Nominee
Dr.N.CH.Bhatracharyulu	-	Member
Dr. B.G.Manjunadh	-	Member
A.HariKrishna	-	Member

1.1 Welcome address by the chair

The chair welcomed the University Nominee, Ex-officio member BOS, O.U Department of APPLIED STATISTICS and Members of B.O.S.

1.2 Details of choice based credit system.

Members were informed that TSCHE has referred that from the academic year 2016-17 autonomous institutions have to follow CBCS i.e. From the Academic Year 2016-17 Osmania University has instructed all the Degree colleges including Autonomous Degree colleges to follow CBCS under which after passing the exam student will get the Grade in the Final Result. 4 Credits are given for theory paper and 4 credits is given for practical in each semester and 1 Credit for seminar in each subject.

Chairperson

E. Swarnalatha

University Nominee

[Signature]
24/12/2020

HEAD

Department of Statistics,
University College of Science
Osmania University, Hyderabad-7.

Members

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Principal

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24/12/20

Discussion and Distribution of Common Core Syllabus.

- i. Members were informed by the chair that Department of APPLIED STATISTICS, Hindi Mahavidyalaya is following common core syllabus prescribed by Osmania University for.
- ii. We are adopting Osmania University same syllabus of each semester as it is without any changes.

Syllabus copy for 2nd Year both the semesters is enclosed.
Syllabus was approved by the Members of BOS.

1.4. Marks allotted for Internal and End Semester exams (I & II).

1. Internal assessment is of 15 marks. In each semester two internal assessments of 15 Marks will be conducted and an average of both the internal assessments will be added in the marks of theory exam and one assignment is of 5 Marks, total of 20 Marks.
2. Theory Question paper is of 80 marks.
3. Total allotted marks are 100.

The distribution of marks was approved by the Members of BOS.

1.5 Discussion on Pattern and Model Paper of Semester exam and Model Paper of Internal Exam

1. Each Semester Two Internal exams will be conducted for 15 marks. The internal assessment will have three sections.

Section – A 10 Multiple choice questions each carries $\frac{1}{2}$ marks
($10 \times \frac{1}{2} = 5M$),

Section – B 10 Fill in the blanks each carries $\frac{1}{2}$ marks
($10 \times \frac{1}{2} = 5M$) and

Section – C 5 short notes each 1mark ($5 \times 1 = 5$)

Average of marks of these two internal exams will be taken.

2. Semester exam will be conducted as per the Almanac which will be provided by the exam branch. Internal exam duration will be 30Mnts and Semester exam duration will be of 3 hrs.

3. Model Question paper for Semester III and Semester IV was discussed. Theory paper for each Semester will have 2 sections.

(i) Section A contains 8 short Questions (2 questions from each unit) . Each Question carries 4 Marks ($8 \times 4 = 32$ Marks)

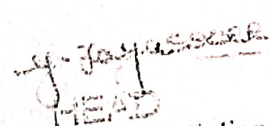
(ii) Section B contains 4 Essay type Questions with internal choice. Each Question carries 12 Marks ($4 \times 12 = 48$ Marks)

- Pattern of Model Theory Question Papers for Semester III & IV are approved.

Chairperson


E. Swarnatha

University Nominee

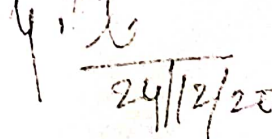
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Osmania University, Hyderabad-7.

Members



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3.

Discussion on Practical Exam Model paper.

It is decided that the practical examinations held for M.Sc. II year (Semester III & IV) will have the pattern of 100 marks and the credit will be 4. The duration of the exam will be 3hrs.

- The practical model paper of Semester III and IV(Paper V & VI) was approved by the members of BOS.

1.7 Panel of Examiners

The panel of examiners was approved by the members.
• List is enclosed

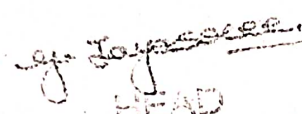
1.8 Any other matter.

1. The syllabus for the batch (2020-2021) is also approved by the members.
2. It is resolved to follow from 2020-2021 batch that the practical examination held for MSc. 2nd Year will have pattern of 100 marks scheme and 4 credits with 3 hrs duration.

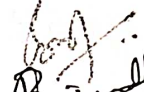
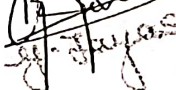
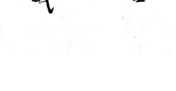
1.9 Vote of Thanks

Meeting concluded with the Vote of Thanks by Swarnalatha.

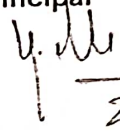
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E. Swarnalatha

University Nominee

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University College of Science
Osmania University, Hyderabad-7.

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HINDI MAHAVIDYALAYA

(AUTONOMOUS & NAAC RE-ACCREDITED)

(Affiliated to Osmania University)

Nallakunta, Hyderabad-44

DEPARTMENT OF STATISTICS

M.Sc. APPLIED STATISTICS

Second Year

**With effect from batch of students admitted
from the Academic Year**

2020-2021

under CBCS semester system

HINDI MAHAVIDYALAYA

(AUTONOMOUS & NAAC RE-ACCREDITED), (Affiliated to Osmania University)

Nallakunta, Hyderabad-44

M.SC. APPLIED STATISTICS

Choice Based Credit System (CBCS)

Semester – III

PAPER	SUB. CODE	PAPER TITLE	INSTRUCTION HRS/ WEEK	DURATION OF EXAM (IN HRS)	SEMESTER END EXAMINATION MARKS	CONTINUOUS EVALUATION IA AND ASSIGN.	TOTAL MARKS	CREDITS
THEORY								
I	MS301	Operations Research-I (OR-I)	4	3	80	20	100	4
II	MS302	Forecasting Models (FM)	4	3	80	20	100	4
III	MS303	Elective – I Econometric Models (EM)	4	3	80	20	100	4
IV	MS304	Elective – II Reliability Theory (RT) ✓	4	3	80	20	100	4
PRACTICALS								
V	MS305	Operations Research-I and Forecasting Models Elective – I & II (OR-I + FM Elective – I & II)	9	3	100	***	100	4
VI	MS306	Practical – II (R+ TORA)	9	3	100	***	100	4
VII	SEMINAR		2		20	5	25	1
Total			36	***	540	85	625	25
Semester Total						625		

Chairperson

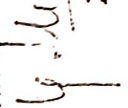
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Semester – IV

Semester – IV								
PAPER	SUB. CODE	PAPER TITLE	INSTRUCTION HRS/ WEEK	DURATION OF EXAM (IN HRS)	SEMESTER END EXAMINATION MARKS	CONTINUOUS EVALUATION	TOTAL MARKS	CREDITS
THEORY								
I	MS401	Statistical Process and Quality Control (SPQC)	4	3	80	20	100	4
II	MS402	Applied Stochastic Processes (ASP)	4	3	80	20	100	4
III	MS403	Elective – I <i>Op. Research - I</i>	4	3	80	20	100	4
IV	MS404	Elective – II	4	3	80	20	100	4
PRACTICALS								
V	MS405	Practical – I Statistical Process and Quality Control, Applied Stochastic Processes Stochastic Processes, and Elective – I & II (SPQC, ASP, Elec. I & II)	9	3	100	***	100	4
VI	MS406	Practical – II SPSS / E-II Project**	9	3	100	***	100	4
VII	SEMINAR		2		20	5	25	1
Total			36	***	540	85	625	25
Semester Total							625	

Electives to be offered in Semester IV:

Elective – I:

1. Operations Research – II (OR – II)
2. Actuarial Science (ASC)

Elective – II:

1. Artificial Neural Networks and Fuzzy Logic (ANN & FL)
2. Demography (DGY)
3. Text Analytics (TA)

(*) Practical-I includes Elective-II practical's for those students who select ANN & FL / DGY as Elective-II in Semester-IV.

(**) Students who select TA as Elective-II have Project instead of Practical-II in Semester-IV.

(***) Foreign students will do project instead of Practical – II (SPSS) in Semester – IV.

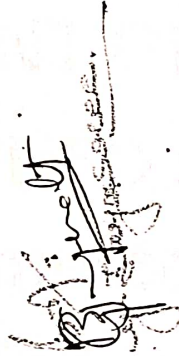
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HINDI MAHAVIDYALAYA
(AUTONOMOUS & NAAC RE-ACCREDITED)
(Affiliated to Osmania University)
Nallakunta, Hyderabad-44

DEPARTMENT OF STATISTICS
M.Sc. APPLIED STATISTICS
Semester III

SYLLABUS

**MAHAVIDYALAYA, NALLAKUNTA, HYDERABAD
(AUTONOMOUS)
BOS-DEPARTMENT OF STATISTICS**

M.SC. APPLIED STATISTICS

MS 301

SEMESTER – III

Credits:4

Paper – I : Operations Research–I (OR-I)

Unit–I

Definition and scope of OR: Phases in O.R.; Models and their solutions; decision making under uncertainty and risk. Duality and complementary slackness theorem, primal dual relation; dual simplex algorithm; Sensitivity Analysis: Introduction, definition of sensitivity analysis; discrete changes in requirement and cost vectors. Parametric Programming: Introduction, parameterization of cost and requirement vectors.

Unit–II

Queuing Theory: Introduction, essential features of Queuing system, Operating characteristics of Queuing system (transient and steady states). Queue length, General relationships among characteristics. Probability distribution in queuing systems, distribution of Arrival and interarrival. Distribution of death (departure) process, service time. Classification of Queuing models and solution of Queuing models; $M/M/1:\infty/FIFO$ and $M/M/1:N/FIFO$ Sequencing and scheduling Problems: 2 machine n-job and 3 machine n-job problems with identical machine sequence for all jobs; 2-job n-machine problem with different machine problem with different routings.

Unit–III

Inventory: Analytical structure of inventory problems; ABC analysis; EOQ problem with and without shortages with (a) production is instantaneous (b) Finite constant rate (c) shortages permitted random models where the demand follows uniform distribution. Multi-item inventory subject to constraints.

Networks: Basic concepts constraints in networks, construction of networks. Time calculation in Networks. PERT, CPM, Network problems.

Unit–IV

Integer Programming Problem: Gomory's cutting plane algorithm for pure and mixed IPP; Branch and bound Technique. Stochastic Programming problem; analysis of chance constrained linear programming under zero order, non randomised decision rule, deterministic equivalents of chance constraints with reference to Normal and Cauchy distributions.

Met.: Introduction to O. R.

ADDITIONAL REFERENCES

2. Philips, D.T., Ravindran, A. and Solbegg, J. (2000) : Operations Research

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E. samalatha

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4.16
24/12/20

**HINDI MAHAVIDYALAYA, NALLAKUNTA, HYDERABAD
(AUTONOMOUS)**

BOS-DEPARTMENT OF STATISTICS

M.SC. APPLIED STATISTICS

Code: MS 302

SEMESTER – III

Credits:4

PAPER – II : Forecasting Models (FM)

Unit- I:

Forecasting: The role of forecasting in decision-making, forecasting techniques.

Smoothing Techniques: Simple Moving Averages, exponential smoothing and Winter's linear and seasonal exponential smoothing. Stationary stochastic processes, Autocovariance and Autocorrelation functions and their estimation. Standard error of autocorrelation estimates. Bartlett's approximation (without proof). Periodogram, power spectrum and spectral density functions. Simple examples of autocorrelation and spectral density functions. Link between sample spectrum and auto-correlation function.

Unit-II

Linear Stationary Models: Two equivalent forms for the general linear process. Autocovariance generating function and spectrum. Stationarity and invertibility conditions for a linear process. Autoregressive and moving average processes. autocorrelation function (ACF), partial autocorrelation function (PACF). Spectrum for AR processes up to 2. Moving average process. stationarity and invertibility conditions. ACF and PACF for M.A.(q) spectrum for M.A. processes up to order 2, Duality between autoregressive and moving average processes. Mixed AR and MA (ARMA) process. Stationarity and invertibility properties, ACF and spectrum of mixed processes. The ARMA(1,1) process and its properties.

Unit-III

Linear Non-Stationary Models–Autoregressive integrated and moving average (ARIMA) processes. The three explicit forms for the ARIMA models viz., difference equation, random shock and inverted forms. Model Identification: Stages in the identification procedures, use of autocorrelation and partial auto-correlation functions in identification. Standard errors for estimated auto correlations and partial autocorrelations. Initial

parameters of MA, AR and ARMA processes and residual variance. Model estimation: Least squares, maximum likelihood estimation and interval estimation of parameters.

Model diagnostic checking—Checking the stochastic model. Diagnostic checks applied to residuals.

Forecasting—minimum: Mean square error forecasts and their properties, derivation of the minimum mean square error forecasts, calculating and updating forecasts, probability limits of the forecasts at any lead time.

REFERENCES

- 1) Weel Wright, S.C. and Makridakis, S. (1973) : Forecasting methods for Management, John Wiley & sons. New York.
- 2) Box, G.E.P. and Jenkins, G.M. (1970) : Time series Analysis (Forecasting and control), Holden day publication.

ADDITIONAL REFERENCES

1. Anderson, T.W. (1971) : The statistical analysis of Time series, John Wiley, New York.
2. Brockwell, P.J. and Davis, R.A. : Time Series : Theory and methods (Second Edition),

Chairperson

E-Swarnalatha .

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24/12/20

Code: MS 3

M.Sc.(Applied Statistics) Semester III
STAS3 - IV : Elective II (A) - Data Modeling using Machine Learning Techniques (DMMLT)

Unit - I

Introduction to data types, Measurement of scales, Understanding data with descriptive statistics and understanding the data with Visualization and data pre-processing (data cleaning, Outlier identification/outliers treatment, Identifying missing values/ missing value treatment, transformation)

Unit - II

Introduction to statistical hypothesis concepts, Understanding relationship between variables using Parametric / Non Parametric tests (Correlations, Chi square , t-tests for proportions, t test for means and F tests. Non parametric tests like sign, Wilcoxon sign, rank test, Kruskal-Wallis test, Friedman test) ,data transformations (Standardize, Normalize, converting data from one scale to other scales) and Feature Selection Methods

Unit - III

Introduction to Modeling concepts, review of the modeling process, Concepts of unsupervised and Supervised Modeling, detail approaches of unsupervised models (Hierarchical cluster analysis, K means cluster Analysis, data reduction techniques) and details approaches of supervised models (Linear regression, Multiple regression, Logistic, Multinomial logistic, DT(Decision Tress), NN (Neural Networks), SVM (Support vector Machine) and concepts of ensemble methods and detail approaches of Random forest, XG boosting

Unit - IV

Concepts of Model evolution, over fitting, under fitting, cross validation concepts, (train/test, K fold and Leave out one approaches), Model Performance concepts for classification techniques (classification matrix, Precision and Recall, F1 score, Sensitivity, Specificity, ROC curve) and Model performance concepts for regression (MSE, RMSE, R2, MAPE), Concepts of Model improvement (Tuning parameters using manual search, Manual grid search, random search) and saving models for future use.

Reference Books:-

- 1) Foster Provost & Tom Fawcett, Data science for Business, O'REILLY Publications
- 2) Henrik Brink, Joseph W. Richards, Mark Feltherolf, Real World Machine Learning, Manning Publications
- 3) Charu C Agrawal, Data Mining, Springer Publications
- 4) Trevor Hastie & Robert Tibshirani, An introduction to statistical learning with R, Springer Publications
- 5) Brett Lantz, Machine Learning with R, Packt Publications

Practicals:- Hands on training will be given on the techniques covered in theory with real life data.

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BOS-DEPARTMENT OF STATISTICS

M.SC. APPLIED STATISTICS

Code: MS 303

SEMESTER – III

Credits:4

PAPER – III: Elective I (B) – Econometric Models (EM)

Unit- I

Meaning and scope of econometrics. Concepts of dummy variables and proxy variable. Problems and methods of estimation in single equation regression Models
Multicollinearity: Consequences of multicollinearity, tests to detect its presence and solutions to the problem of multicollinearity. Generalised Least Squares: Estimates of regression parameters – Properties of these estimates.

Unit II

Heteroscedasticity: Consequences of heteroscedastic disturbances – test to detect its presence and solutions to the problem of heteroscedasticity. Auto Correlation: Consequences of autocorrelated disturbances. Durbin –Watson test – Estimation of autocorrelation coefficient (for a first order autoregressive scheme).

Unit-III

Distributed lag models: study of simple finite lag distribution models – Estimation of the coefficients of Koyack geometric lag model. Instrumental Variable: Definition – derivation of instrument variable estimates and their properties.

Unit IV

Errors in variables: Problem of errors in variables simple solutions using instrumental variables technique. Simulation equation models and methods of estimation: distinction between structure and Model-Exogenous and Endogenous variables – Reduced form of a model. Problem of identification – Rank and order conditions and their application. Methods of estimation: Indirect least squares. Two stages least squares, three stages least squares. A study of merits and demerits of these methods.

on - Econometrics Methods (2 nd Edition) :

1. Chapter 7: Section 7-1,7-3, Chapter 9 : Section 9-3, 9-4, Chapter 12

non 12-2,12-3. Chapter 13. Section 13-2,13-6

G. S. Maddala - Econometrics

Chapter 1,chapter 9: Section 9-2,9-6. Chapter 10 : Section 10-1,10-2, Chapter

16: Section 16-1,16-2

3) A. Koutsoyiannis - Theory of econometrics

Chapter 9: Section 9-3.1,9-3.3,9-3.4,9-3.5, Chapter 10: Section 10-1,10-2, 10-

3, 10-4, 10-5, 10-6.2,10-7,10-8.3,10-8.4, Chapter 11 : Section 11-4.2, Chapter

12 : 12-1,12-1.3,12-1.4, Chapter 16 : Section 16-1.1,16-1.2,16-3.1,16-3.2

Chairperson

University Nominee

Members

Principal

E. Sureshmalathi

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24/12/20

**HINDI MAHAVIDYALAYA, NALLAKUNTA, HYDERABAD
(AUTONOMOUS)**

BOS-DEPARTMENT OF STATISTICS

M.SC. APPLIED STATISTICS

Code: MS 304

SEMESTER – III

Credits:4

PAPER – IV: Paper IV(B) Elective II (B) - Reliability Theory (RT)

Unit I

Coherent Systems: Reliability concepts – Systems of components. Series and parallel systems – Coherent structures and their representation in terms of paths and cuts. Modular decomposition.

Unit-II

Reliability of coherent systems – Reliability of Independent components, association of random variables, bounds on systems reliability and improved boundson system reliability under modular decomposition.

Unit-III

Life Distribution: Survival function – Notion of aging IFR, DFR, DFRA, NBU and NBUE classes. Exponential distributions and its no-ageing property, ageing properties of other common life distribution, closures under formation of coherent structures, convolutions and mixtures of these cases.

Unit-IV

Maintenance and replacement policies, relevant renewal theory, availability theory, maintenance through spares and repair. Reliability estimation: Estimation of two and three parameter Gamma, Weibull and log normal distributions.

REFERENCES

1. Barlow, R.E. and Proschen, F. (1975): Statistical Theory of Reliability and life testing. Halt. Reinhart and Winston Inc.
Chapter I – Section 1 to 4
II – Section 1 to 4
III – Section 1.2.4 and 5
IV – Section 1 to 4
VI – Section 1 to 3
VII – Section 1 to 3, Section 4.1,4.2

ADDITIONAL REFERENCES

1. Barlow and Proschen (1965): Mathematical Theory of Reliability, John Wiley
2. Balaguru Swamy – Reliability Engineering
3. L.J. Bain: Statistical analysis of Reliability and like testing Marcel Decker.
4. Sinha. S.K.. and Kale, S.K.. (1980): Life testing and Reliability estimation, Wiley Eastern

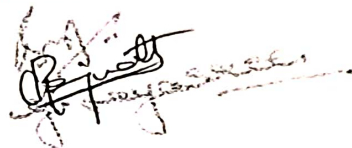
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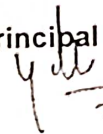
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BOS-DEPARTMENT OF STATISTICS
M.SC. APPLIED STATISTICS

Code: MS 305

SEMESTER –III
Credits:4

PAPER – V :- Practical (OR-I, FM, Elective-I, Elective-II)

Operations Research–I

1. Solving an LPP by Dual Simplex Method
2. Solving an LPP by Revised Simplex
3. Sensitivity Analysis for cost and requirement vectors.
4. Parametric Programming for cost and requirement vectors.
5. Sequencing problem with 2 jobs n machine problem by graphical method.
6. Evaluation of project time through CPM and PERT
7. Time cost Analysis for CPM and PERT
8. Integer Programming Problem- Gomery's cutting plane method.

Forecasting Models

1. Moving Averages and exponential smoothing.
2. Generation of Time series by means of simple time series models.
3. Sample and theoretical correlograms.
4. Periodogram analysis.
5. Writing the models in B notation and stationarity and invertability of the models.
6. Classification of ARIMA models and computation of weights.
7. Identification AR, MA and ARMA models.
8. Estimation of parameters in AR, MA and ARMA models.
9. Computation of forecasts, updating and probability limits for forecasts.

Elective – I Econometric Models

1. Use of dummy variables (dummy variable trap) and seasonal adjustment
2. GLS estimation and predictors
3. Tests for heteroscedasticity.
4. Tests for Autocorrelations
5. Instruments variable estimation
6. Estimation with lagged dependent variable
7. Identification problems – Checking rank and order condition
8. Two SLS estimation

Part - II Reliability Theory

- Finding Minimal path sets and Minimal cut sets and their representations.
1. Computation of System reliability – parallel, Series and k out of n system.
 2. Computations of reliability of Structures when components are independent.
 3. Computation of estimated reliability and hazard rates.
 4. Computation of bounds on systems reliability.
 5. Graphing the reliability function of the systems when the life times of components are exponentially distributed.

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BOS-DEPARTMENT OF STATISTICS

M.SC. APPLIED STATISTICS

Code: MS 306

SEMESTER – III

Credits:4

PAPER – VI : Practical (R, TORA)

1. R Programming, EDA.
2. GGPlot & Class Assessment on R, Supervised Learning - Linear Regression Project - Prediction of Health Insurance Costs.
3. Class Assessment on Linear Regression using R & Placement Intervention.
4. Supervised Learning - Logistic Regression Project - Diabetes Prediction.
5. Supervised Learning - Decision Trees Project - Mushroom Type Prediction.
6. Supervised Learning - Random Forests Project - Telecom Customer Churn, Class Assessment on Logistic Regression.
7. Decision Tree, Random Forest, KNN, SVM, Supervised Learning - K-Nearest Neighbors (k-NN) Project - Income Prediction.
8. Supervised Learning - K-Nearest Neighbors (k-NN) Project - Income Prediction.
9. Supervised Learning - Support Vector Machines Project - Predicting Term Deposit Subscription by a client.
10. Unsupervised Learning (Project 25) K-Means Clustering Project - Football Player Segmentation.
11. Project 26 (R using both Supervised and Unsupervised Learning) Telecom Customer Churn.
12. Exam - Data Science with R.
13. Mock Interview - Data Science with R.



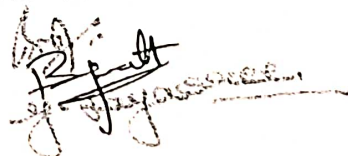
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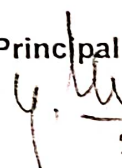


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DEPARTMENT OF STATISTICS

M.Sc. APPLIED STATISTICS

Semester IV

SYLLABUS

INDI MAHAVIDYALAYA, NALLAKUNTA, HYDERABAD
(AUTONOMOUS)
BOS-DEPARTMENT OF STATISTICS
M.SC. APPLIED STATISTICS

SEMESTER – IV

Credits:4

PAPER – I : Statistical Process and Quality Control (SPQC)

Code: MS 401

Unit-I

Basic concept of process monitoring – Basic principles, Choice of control limits, sample size and sampling frequency. rational subgroups, analysis of patterns on control charts, magnificent seven, manufacturing applications of Statistical process control, Process capability and Process optimisation.

General theory and review of control charts for variable data and attributes : O.C. and A.R.L. functions of control charts. modified control charts for variables and Acceptance control charts for attributes, control by gauging.

Unit II

Moving Average and exponentially weighted moving average charts, Cu-sum charts using V-Masks and decision intervals. Economic design of X bar chart. Concept of control chart for non-normal distributions, concept of Nonparametric control charts.

Unit-III

Acceptance sampling plans for attribute inspection, single, double and sequential sampling plans and their properties: Rectifying sampling plans for attributes, AOQ, AOQL, designing of R.S.P. for specified AOQL and LTPD. Plans for inspection by variables for one-sided and two-sided specifications; Dodge's Continuous sampling Plan-I and its properties modifications over CSP-I.

Unit-IV

Process Capability Analysis: Capability indices C_p , C_{pk} and C_{pm} , estimation, confidence intervals and tests of hypotheses relating to capability indices for normally distributed characteristics.

Multivariate quality control, use of control ellipsoid and of utility functions. Concept of TQM, Six sigma.

REFERENCES

- 1) Montgomery, D.C.(1985) : Introduction to Statistical Quality Control, Wiley
- 2) Wetherill, G.B. (1977): Sampling Inspection and Quality Control, Halsted Press.
- 3) Cowden, D. J. (1960) : Statistical Methods in Quality Control, Asia Publishing House.

ONAL REFERENCES

1. Ott, E.R. (1975) : Process Quality Control, McGraw Hill

2. Phadke, M.S. (1989): Quality Engineering through Robust Design, Prentice Hall.

3. Wetherill, G.B., and Brown, D.W: Statistical Process Control: Theory and Practice, Chapman and Hall.

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BOS-DEPARTMENT OF STATISTICS

M.SC. APPLIED STATISTICS

Code: MS 402

SEMESTER – IV

Credits:4

PAPER – II : - Applied Stochastic Processes (ASP)

Unit I

Markov Chains: Classification of states, canonical representation of transition probability matrix. Probabilities of absorption and mean times for absorption of the Markov Chain from transient states into recurrent classes. Limiting behaviour of Markov chain: Stationary distribution

Unit-II

Continuous-time Markov Processes: Kolmogorov-Feller differential equations, Poisson process and birth and death processes.

Renewal Processes: Renewal process when time is discrete and renewal process with time is continuous, with examples. Renewal function, renewal density, limiting behaviour. Statement of elementary and basic renewal theorems.

Branching Processes: Examples of natural phenomena that can be modelled as a branching process. Probability of extinction: Statement of fundamental theorem of branching processes.

Note: Emphasis is only on statements of theorems and results and their applications.

Unit-III

Stochastic Processes in Biological Sciences: Markov models in population genetics; Recovery, relapse and death due to disease; cell survival after irradiation; compartmental analysis.

Stochastic Processes in communication and information systems: Markov models in storage requirements for unpacked messages; buffer behaviour for batch arrivals; loop transmission systems; a probabilistic model for hierarchical message transfer.

Stochastic Processes in traffic-flow theory; some traffic flow problems; pedestrian traffic on a side-walk; free-way traffic; parking lot traffic; intersection traffic; left-turning traffic; pedestrian delay; headway distribution

Unit-IV

Stochastic Processes in social and behavioural sciences; Markov chain models in the study of social mobility; industrial mobility of labour; educational advancement; labour force planning and management; diffusion of information.

Stochastic Processes in Business Management: Markov models in marketing and accounting; consumer behaviour: selecting a portfolio of credit-risks; term structure; human resource management; income determination under uncertainty.

ENCE

Bhat. U.N.. (1984): Elements of Applied Stochastic Processes, John Wiley

ADDITIONAL REFERENCE

1. Ross. S. (1996): Stochastic Processes. Second Edition, John Wiley.
2. J. Medhi: Stochastic Processes.

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(AUTONOMOUS)
BOS-DEPARTMENT OF STATISTICS

M.SC. APPLIED STATISTICS

MS 403

SEMESTER – IV

Credits:4

PAPER – III : Elective I (A) - Operations Research – II (OR – II)

Unit I

Non-linear Programming problem – Formulation Generalised Lagrange multiplier technique, Kuhn-Tucker necessary and sufficient conditions for optimality of an NLPP, Wolfe's and Beale's Algorithms for solving QPP. Separate Programming Problem; Piecewise linearization method.

Unit-II

Dynamic Programming, Principle of optimality, solution of LPP by Dynamic Programming technique, Knapsack problem by Dynamic Programming Technique. General goal Programming model and formulation of its objective function. Solutions to linear goal programming and linear integer goal programming.

Unit III

Game Theory : 2 person zero sum game, pure strategies with saddle point, mixed strategies with saddle point, principles of dominance and games without saddle point.

Introduction to simulation, generation of random numbers for Uniform, Normal, Exponential, Cauchy and Poisson Distributions. Estimating the reliability of the random numbers, Simulation to Queuing and Inventory problem.

Unit-IV

s-S policy for inventory and its derivation in the case of exponential demand; Models with variable supply and models for perishable Items.

Replacement Problems; Introduction, block and age replacement policies, replacement of items with long life. Machine interference problems.

REFERENCES

1. Taha. H.A.(1982): Operations Research : An Introduction; McMillan
2. Kantiswarup:Gupta P.K. and Singh,M.N.(1985) : Operations Research; Sultan Chand.
3. Sharma.S.D.: Operations Research.
4. U. N. Bhat: Introduction to Applied Stochastic Process.

ADDITIONAL REFERENCES

1. Hillier F.S. and Lieberman, G.J. (1962) : Introduction to Operations Research; Holdon Day
2. Philips, D.T., Ravindran, A. and Solberg, J. (2000) : Operations Research principles and practice.

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Department of Statistics,
University College of Science
Osmania University, Hyderabad-7.

**HINDI MAHAVIDYALAYA, NALLAKUNTA, HYDERABAD
(AUTONOMOUS)
BOS-DEPARTMENT OF STATISTICS**

M.SC. APPLIED STATISTICS

Code: MS 404

SEMESTER – IV

Credits:4

PAPER – IV : Elective II(A) – Artificial Neural Networks and Fuzzy Logic (ANN & FL)

Unit - I

Biological Neuron, Biological and Artificial Neuron Models. Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN. Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN, Learning Strategy (Supervised, Unsupervised, Reinforcement) and Learning Rules.

Unit - II

Gathering and partitioning of data for ANN and its pre and post processing. Single Layer Feed Forward Neural Networks: Perceptron Models, Hebbian Learning and Gradient Descent Learning. Limitations and applications of the Perceptron Model. Multilayer Feed Forward Neural Networks: Generalized Delta Rule, Back propagation (BP) Training Algorithm. Learning rate, Momentum and Conjugate Gradient Learning, Difficulties and Improvements. Bias and Variance. Under- Fitting and Over-Fitting.

Unit - III

Radial Basis Function Networks: Introduction, Algorithms and Applications. . Approximation properties of RBF. Self Organizing Maps: Fundamentals, Algorithms and Applications.

Unit - IV

Applications of ANN in classification, clustering, regression, time series forecasting, variable selection and dimensionality reduction.

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M.SC. APPLIED STATISTICS

Code: MS 405

SEMESTER – IV

Credits:4

PAPER – V : Practical (SPQC, ASP, Elective-I, Elective-II)

Statistical Process and Quality Control

1. Construction of \bar{X} , R and s - charts and OC curves for \bar{X} and R charts
2. Construction of p - chart (with constant and variable sample size) – OC curve for constant sample size
3. Construction of C-chart and U-chart and OC curve for C-Chart
4. Construction of Simple and Exponentially weighted moving average control chart and simple moving range control chart.
5. Construction of CUSUM chart using tabular approach.
6. Construction of CUSUM charts V – Mark and ARL curves
7. Designing Single Sampling Plans for specified p_1, p_2, a and b
8. OC. ASN Curves for double sampling plans – designing for specified p_1, p_2, a and b
9. Construction of AOQ and AFI curves for CSP-I
10. Computation of process capability indices

Applied Stochastic Processes

1. Classification of states of a Markov chain, determination of periods of states and mean recurrence times of recurrent states.
2. Computation of higher order transition probability matrix in a two-state Markov chain using spectral decomposition
3. Probabilities of absorption and mean time for absorption from each transient state into recurrent class.
4. Determination of stationary distribution(s) and evaluation of the same.

Elective – I (A) Operations Research-II

1. Wolfe and Beale's methods for QPP
2. Separable Programming problem
3. Dynamic Programming Problem
4. Goal Programming Problem
5. Game Theory
6. Simulation

1.0 Artificial Neural Networks and Fuzzy Logic

- 2. Forward propagation
- 3. Backward propagation
- 4. Classification
- 5. Clustering
- 6. Regression
- 7. Time Series

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REFERENCES

- Bishop. C. (1995). *Neural Networks for Pattern Recognition*. Oxford: University Press. Extremely well-written but requires careful reading, putting neural networks firmly into a statistical context.
- 2) Haykin. S. (1994). *Neural Networks: A Comprehensive Foundation*. New York: Macmillan Publishing. A comprehensive book and contains a great deal of background theory.
- 3) Ripley. B.D. (1996). *Pattern Recognition and Neural Networks*. Cambridge University Press. A very good advanced discussion of neural networks, firmly putting them in the wider context of statistical modeling.
- 4) Neural Networks Chapter in www.statsoft.com

ADDITIONAL REFERENCES

- 1) Carling. A. (1992). *Introducing Neural Networks*. Wilmslow, UK: Sigma Press.
- 2) Fausett. L. (1994). *Fundamentals of Neural Networks*. New York: Prentice Hall.
- 3) Patterson. D. (1996). *Artificial Neural Networks*. Singapore: Prentice Hall.
- 4) Kishan Mehrotra, Chilukuri K. Mohan and Sanjay Ranka (1996). *Elements of Artificial Neural Networks*: The MIT Press.

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HINDI MAHAVIDYALAYA, NALLAKUNTA, HYDERABAD
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BOS-DEPARTMENT OF STATISTICS

M.SC. APPLIED STATISTICS

Code: MS 406

SEMESTER – IV

Credits:4

PAPER – VI: Practical with SPSS Package

Practical with SPSS Package for the following topics.

1. Charts and Diagrams
2. Basic Statistics
3. Design of Experiments
4. Multivariate Analysis
5. Time Series Analysis
6. Parametric tests
7. Non-Parametric tests
8. Operations Research (TORA Package)
9. Statistical Quality Control
10. Regression Analysis

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HINDI MAHAVIDYALAYA
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DEPARTMENT OF STATISTICS
M.Sc. APPLIED STATISTICS
Semester III & Semester IV

PATTERN OF
INTERNAL ASSESSMENT QUESTION
PAPER AND
THEORY QUESTION PAPER

HINDI MAHAVIDYALAYA, NALLAKUNTA, HYDERABAD
(AUTONOMOUS)
BOS-DEPARTMENT OF STATISTICS
M.SC. APPLIED STATISTICS

Pattern of internal assessment test from the academic year 2019-2020 with the following specifications:

Two internal Assessment Tests of 15 Marks each (Average to taken)
One Assignment : 05 Marks
Total : 20 Marks

Internal Tests

I test to be conducted at the end of the 9th week of instruction (Covering 2/3 units of the syllabus).
II test to be conducted at the end of the 14th week of instruction (Covering the rest of the units).

Assignment

One Assignment (Topic to be assigned in the 6th week of instruction).
The assignment will consist of hand written (students own handwriting).

Definition /Explication of 20key concepts worth $\frac{1}{4}$ mark each. To be submitted for assessment in the 13th week of instruction.

Total marks for assignment $20 \times \frac{1}{4} = 05$ Marks

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BOS-DEPARTMENT OF STATISTICS
M.SC. APPLIED STATISTICS
INTERNAL ASSESSMENT MODEL (III-IV SEMESTER)

Max. Marks :15

Note answer all the questions

Multiple choice questions

$10 \times \frac{1}{2} = 05$ Marks

Q1. – Q10.

Fill in the Blanks

$10 \times \frac{1}{2} = 05$ Marks

Q1. – Q10.

Short Answers type Questions

$5 \times 1 = 05$ Marks

Q1. – Q10.

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(AUTONOMOUS)
BOS-DEPARTMENT OF STATISTICS
M.SC. APPLIED STATISTICS
MODEL PAPERS FOR SEMESTER EXAMINATION
(III-IV SEMESTER)

Time: 3 Hours

Max. Marks :80

SECTION-A

Marks : = 8 x 4 =32

1
2

Unit-I

3
4

Unit-II

5
6

Unit-III

7
8

Unit-IV

SECTION-B

Marks : = 4 x 12 =48

9. a) (OR) b)

Unit-I

10. a) (OR) b)

Unit-II

11. a) (OR) b)

Unit-III

12. a) (OR) b)

Unit-IV

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BOS-DEPARTMENT OF STATISTICS
M.SC. APPLIED STATISTICS
MODEL PAPERS FOR PRACTICAL EXAMINATION
(III SEMESTER / IV SEMESTER)

PAPER – V: OR-I, FM, RT, EM (SEMESTER – III)

PAPER –VI : R + TORA (SEMESTER – III)

PAPER –V: SPQC, ASP, OR-II, ANN&FL (SEMESTER – IV)

PAPER –VI : SPSS (SEMESTER – IV)

Credits-4

Time: 3 Hours

Max. Marks :100

SECTION-A

Note: Answer any three questions. Choosing at least one question from each section. All question carries equal marks.

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SECTION-B

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- 5.
- 6.

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DEPARTMENT OF STATISTICS

M.Sc. APPLIED STATISTICS

PANEL OF EXAMINERS

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DEPARTMENT OF STATISTICS
M.Sc. APPLIED STATISTICS
PANEL OF EXAMINERS

SEMESTER III

Subject With Code	Name of the Internal Examiner	Name of the External Examiner	Institution Name	Contact No
Operations Research-I (OR-I) MS 301	Dr.M.RaghunadhAcharya	Dr. N Ch. Bhattacharyulu	Osmania University, Hyderabad	9553417181
	(Dr).Ch.Anusha	Dr. G. Jayasree	Osmania University, Hyderabad	8501091000
	(Dr). Ranjitha Chul	Dr. G. Sirisha	Osmania University, Hyderabad	9440929490
Forecasting Models (FM) MS302	(Dr). Ranjitha Chul	Dr.N.Ch.Bhattacharyulu	Osmania University, Hyderabad	9553417181
	Dr.M.RaghunadhAcharya	Dr.B.G.Manjunath	HCU, Hyderabad	9663014098
	(Dr).Swarnalatha	Dr. Amen Saheb		9989926352
Econometric Models (EM) MS 303	Dr.M.RaghunadhAcharya	Dr. N Ch. Bhattacharyulu	Osmania University, Hyderabad	9553417181
		Dr.B.G.Manjunath	HCU, Hyderabad	9663014098
		Prof.Lakshmi Manga retd.	Osmania University, Hyderabad	9441853035
		Sri. Madhusudhan Rao	Aurora's Degree and P.G.College	9849425211/ 9100000791

Ability (RT) MS 304	(Dr).Swarnalatha	Dr. N Ch. Bhattacharyulu	Osmania University, Hyderabad	9553417181
	(Dr).Ch.Anusha	Dr. G. Jayasree	Osmania University, Hyderabad	8501091000
		Dr. G. Srisha	Osmania University, Hyderabad	9440929490

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University Nominee

H.E.D.
 Department of Statistics,
 University College of Science
 Osmania University, Hyderabad-7.

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