|| सा विद्या या विमुक्तये ||

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

Phone: (02462) 229542
Fax : (02462) 229574

Website: www.srtmun.ac.in

E-mail: bos.srtmun@gmail.com

संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, मा. विद्याशाखेने **दिनांक ३१ मे २०२१ रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व दिनांक १२ जून २०२१ रोजी संपन्न झालेल्या ५१ व्या मा. विद्या परिषद बैठकीतील विषय क्र. २६/५१–२०२१**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्यात येत आहेत.

1. B.Sc.-III Year-Biophysics
2. B.Sc.-III Year-Bioinformatics
3. B.Sc.-III Year-Biotechnology
4. B.Sc.-III Year-Biotechnology (Vocational)
5. B.Sc.-III Year-Botany
6. B.Sc.-III Year-Horticulture
7. B.Sc.-III Year-Agro Chemical Fertilizers
8. B.Sc.-III Year-Analytical Chemistry
9. B.Sc.-III Year-Biochemistry
10. B.Sc.-III Year-Chemistry
11. B.Sc.-III Year-Dyes & Drugs Chemistry
12. B.Sc.-III Year-Industrial Chemistry
13. B.C.A. (Bachelor of Computer Application)-III Year
14. B.I.T. (Bachelor of Information Technology)-III Year
15. B.Sc.-III Year-Computer Science
16. B.Sc.-III Year-Network Technology
17. B.Sc.-III Year-Computer Application (Optional)
18. B.Sc.-III Year-Computer Science (Optional)
19. B.Sc.-III Year-Information Technology (Optional)
20. B.Sc.-III Year-Software Engineering
21. B.Sc.-III Year-Dairy Science
22. B.Sc.-III Year-Electronics
23. B.Sc.-III Year-Environmental Science
24. B.Sc.-III Year-Fishery Science
25. B.Sc.-III Year-Geology
26. B. A./B.Sc.-III Year-Mathematics
27. B.Sc.-III Year-Microbiology
28. B.Sc.-III year Agricultural Microbiology
29. B.Sc.-III Year-Physics
30. B. A./B.Sc.-III Year Statistics
31. B.Sc.-III Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०२१–२२/७५

दिनांक : १२.०७.२०२१.

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
७) अधीक्षक, परिक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

NANDED

SYLLABUS

OF

STATISTICS

B.A/B.Sc. Third Year

Semester – V & VI

Under Choice Based Credit System (CBCS) Pattern

(With Effective from 2021 - 22)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
NANDED

Detailed Structure of B.A/B.Sc. (III) Third Year Statistics Syllabus
(SCIENCE AND TECHNOLOGY FACULTY)
Under CBCS Pattern
(With Effective from 2021 - 22)

Semester	Section & Paper Code	Period / Week	Paper No. & Title of paper	End Semester Examination (ESE)	Continuous Assessment (CA)	Total Marks	Credits
V	DSES – I Section – A	03	**Paper- XII** Sampling Methods **(Compulsory)**	40	10	50	02
	DSES – I (B_1) Section – B **OR** DSES-I (B_2) Section -B	03	**Paper – XIII (B_1)** Operations Research –I (Elective) **OR** **Paper – XIII (B_2)** Statistical Quality Control (Elective)	40 40	10 10	50 50	02 02
	SECS - III	02	SECS – III (Any one Skill from Optional)	25	25	50	02
VI	DSES – II Section – A	03	**Paper – XIV** Design of Experiments **(Compulsory)**	40	10	50	02
	DSES – II (B_1) Section – B **OR** DSES-II (B_2) Section -B	03	**Paper – XV (B_1)** Operations Research Techniques-II (Elective) **OR** **Paper – XV (B_2)** Demography (Elective)	40 40	10 10	50 50	02 02
	SECS – IV	02	SECS – IV (Any one Skill from Optional)	25	25	50	02
Lab Course Work (Annual Practical)	DSESP – IV	03	**Paper – XVI** Practical's based on theory papers - XII & XIV	40	10	50	02
Lab Course Work (Annual Practical)	DSESP – V (A) **OR** DSESP- V (B)	03	**Paper – XVII (A)** Practical's based on theory papers - XIII (A) & XV(A) **OR** **Paper – XVII (B)** Practical's based on theory papers - XIII (B) & XV(B)	40 40	10 10	50 50	02 02
Total for B.Sc. III Year : Sem. V + Sem. VI + Lab Course Work (Annual)							**16**

DSES - Discipline Specific Elective Statistics
DSESP - Discipline Specific Elective Statistics Practical
SECS - Skill Enhancement Course Statistics
ESE - End Semester Examination
CA - Continuous Assessment

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure
B.A/ B.Sc. (III) Third Year (Semester - V)
STATISTICS

The crucial objective is to impart knowledge in natural and social sciences so that the students may learn the fundamental concepts in these fields, and develop familiarity with some of the basic and important problems in these fields which call for statistical analysis along with the corresponding techniques used. Further, objective is to enrich the general scientific knowledge which may be of use later in professional work.

DSES - I (Section A)

SAMPLING METHODS

Paper - XII (Compulsory)

Credits : 02 (Marks 50) **Periods: 45**

- **Salient features:** This paper explores the various sampling techniques.
- **Utility:** Survey sampling methods are useful for collecting information related to problems in many disciplines.
- **Learning objectives:** To learn this paper is to develop scientific view to conduct the survey in proper way to collect the data about specific perspective.
- **Prerequisites:** This paper requires basic of data types, organization of data, tabulation of data etc.

Unit I: Sample Survey: Concepts of population and sample, sampling unit, sampling frame, Parameters and statistics, Sampling Distribution, Principal steps in Sample Survey, Principles of Sample Survey, Sampling and Non-sampling errors, Advantages of sampling over complete census, Limitations of sampling.

Unit II: Types of Sampling, Random and Non random sampling, Methods of achieving randomness, sample size, Determination of sample size, Purposive Sampling, Probability Sampling, Snow ball Sampling, Quota Sampling, Mixed Sampling, Cluster Sampling.

Unit III: Simple Random Sampling with and Without Replacement: Probability of selecting any specified unit in the sample, selection of simple random sample, Estimation of population mean and its standard error, Simple Random sampling of attributes, Merits and demerits of simple random sampling.

Unit IV: Concept of Stratification: Stratified Random sampling: sampling from heterogeneous population, Allocation of sample size, Proportional Allocation, Neyman Allocation. Estimation of population mean and its variance under each allocation and their comparison, Proportional allocation Vs simple random sampling, Gain in precision due to stratification, Systematic sampling, Sampling Interval, Variance of Estimated means, relation between Systematic sampling and Simple Random sampling, Merits and Demerits of Systematic sampling, Condition for systematic sampling to be better than SRS.

Scope of Syllabi:

i) Fundamentals of Applied Statistics - S. C. Gupta and V. K. Kapoor (Sultan Chand and Sons), 4th Edition.

Reference Books:

1) Murty M. N. (1967): Sampling Theory and Methods, (Statistical Publishing Society Calcutta.)
2) Sukatme B.V. (1984): Sampling Theory and Applications, (Indian Society of Agricultural Statistics)
3) Desraj (2000) : Sample Survey Theory, (Narosa Publishing House)
4) Singh D and Chaudhri F. S: Theory and Analysis of Sample Survey Design.
5) Bajaj V.H. and Jadhav O.S.: Introducing to Sampling Theory. (First Edition Statperson Corporation
6) S. Sampath : (2001): Sampling Theory and Methods, (Narosa Publishing House, New Delhi)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure

B.A/B.Sc. (III) Third Year (Semester - V)

STATISTICS

DSES - I (Section B)

OPERATIONS RESEARCH - I

Paper - XIII (B_1) (Elective)

Credits: 02(Marks 50) **Periods: 45**

- **Salient features:** This paper develops to convert the real problems in mathematical form and to obtain optimal solution of it.
- **Utility:** In real life, it is applicable to everywhere in personal, profession life, business and production industries etc. fields.
- **Learning objectives:** This paper helps to develop the optimization techniques which will be useful in the student's personal and professional life.
- **Prerequisites:** Basic linear algebra, matrix operations, definition of set should be familiar.

Unit I: Basics of Operations Research: Introduction, definition of Operations Research, Objectives of Operations Research, Phases of O. R., Scope and Limitations of O.R., Linear Programming Problem: Introduction, General Linear Programming problems, Mathematical Formulation of L.P.P., Basic solution, Non degenerate and Degenerate Basic solution, Important Theorems, Important Definitions, Convex set and Theorems on it, Numerical problems.

Unit II: Solution of L.P.P.: Solution of L.P.P. by Graphical Method, Slack, Surplus and Artificial variables, some definitions and Notations. Fundamental Theorems of L.P.P (statement only). Basic Feasible Solution from feasible solution, Simplex method of solving L.P.P, Degeneracy in L.P.P, Two Phase Method, Big - M method, Numerical problems.

Unit III: Transportation Problem: Introduction, Mathematical Formulation of T. P., Important definitions, Balanced and Unbalanced Transportation Problem, Solution of Transportation problem, Initial Feasible Solution, North-West Corner rule method, Lowest-cost entry method, Vogel's approximation method, Optimality test, computational procedure of Optimality test (Modified Distribution method), Resolving Degeneracy in Transportation problem, Numerical problems.

Unit IV: Assignment Problem: Introduction, Assignment problem, Mathematical Formulation of an Assignment problem, Difference between Transportation problem and Assignment problem, Unbalanced Assignment Problem, Method for solving a minimal assignment problem (Hungarian Method), Numerical problems.

Scope of Syllabi:

i) Dr .R. K. Gupta: Linear Programming (Krishna Publication Media (P) Ltd Meerut). 12th Edition

ii) Kanti Swarup, P. K. Gupta, Man Mohan: Operations Research: (Sultan Chand and Sons, New Delhi) 16th edition.

Reference Books:

1) Gass E.: Linear Programming Method and Application. (Narosa publishing House New Delhi).
2) Gupta R.K.: Operations Research (Krishana Prakashan Media (P) Ltd., Meerut).
3) Sharma .S.D.: Operations Research, (Kedarnath Ramnath and Co. Meerut)
4) H. A. Taha : Operations Research an Introduction; (Pearson), 9th Edition.
5) Sharma Manju: Linear Programming (Ramprasad and Sons Ag ra-3)
6) Bajaj V.H., Umap H.P., Jadhav O.S.: Operations Research,(First Edition Statperson Corporation)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure

B.A/ B.Sc. (III) Third Year (Semester - V)

STATISTICS

DSES - I (B) (Section B)

STATISTICAL QUALITY CONTROL

Paper No. – XIII (B_2) (Elective)

Credits: 02 (Marks 50) **Periods: 45**

- **Salient features:** This paper dealt with various techniques useful in production planning, process and quality improvement.
- **Utility:** This is applied paper mostly useful in industries.
- **Learning objectives:** Students should able to understand, implement and overcome problems through statistical techniques.
- **Prerequisites:** Awareness about the methods of data collection and tabulation, data transformation, Distribution theory.

Unit I: Statistical Quality Control: Definition of quality, Meaning and purpose SQC, Process control, Product control, Types of Variability: Assignable cause's variability, Chance causes variability, Applications of SQC, Shewhart Control charts, 3- sigma control limits, specification limits, Natural tolerance limit, Seven SPC tools.

Unit II: Control Charts for Variables: X - bar, R and S chart, Construction, Interpretation of X- bar and R - Chart.

Unit III: **Control Chart for Attributes:** Defects, Defectives, fraction defective, Control chart for fraction defective (p - chart), control chart for number of defectives (d chart), Control chart for number of defects C- chart, U chart, Application of C-chart, Limitations of C- chart and U chart.

Unit IV: Acceptance Sampling Plan: Acceptance Sampling for attributes with rectification, Acceptance Quality level (AQL), Lot tolerance proportion defectives (LTPD), Consumer's risk, Producers risk, Operating Characteristic (OC) curve, Average Outgoing Quality Limit (AOQL) for Single Sampling Plan. Introduction to Double Sampling Plan, Comparison between Single Sampling Plan and Double Sampling Plan, Concept of Six Sigma, Total Quality Management (TQM), Taguchi's Method.

Scope of Syllabi:

1. S.C. Gupta, V.K. Kapoor: Fundamentals of Applied Statistics; (Sultan Chand and Sons, New Delhi), 4th Edition.

2. Motgomery D.C- Introduction to Statistical Quality Control; **(**John Wiley & Sons, Inc). 17th Edition

Reference Books:

1) M. Mahajan: Statistical Quality Control, (Dhanpat Rai & Co.(P) Ltd), 3rd edition.
2) Grant. E. L : Statistical Quality Control-
3) Duncaan A. J.: Quality Control and Industrial Statistics, (D.B. Tataporewala and Sons Co Mumbai)
4) Berges J.O.: Statistical Decision Theory and Bayesian Analysis.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure

B.A/B.Sc. (III) Third Year (SEMESTER –VI)

STATISTICS

DSES - II (Section - A)

DESIGN OF EXPERIMENTS

Paper No. - XIV (Compulsory)

Credits: 02 (Marks 50) **Periods: 45**

- **Salient features:** The techniques in this paper useful in real life to overcome planning and development problems.
- **Utility:** The techniques useful in agriculture, production and planning control in all kinds of industries.
- **Learning objectives:** Students should able to have skills of designing various kinds of techniques at different situations.
- **Prerequisites:** Awareness of test of significance, hypothesis testing.

Unit I: Analysis of Variance (ANOVA): Introduction, One way classification, two way classification with one observation per cell, Mathematical Model, ANOVA table, Degrees of freedom Hypotheses to be tested.

Unit II: Design of Experiments: Introduction, Notation and terminology, Principles of an Experimental Design, Replication, Randomization, Local control, Size of plot, Statistical Analysis of Completely Randomized Design (CRD), Randomized Block Design (RBD), Comparison of CRD with RBD in terms of efficiency, Missing value in RBD.

Unit III: Latin Square Design: Statistical Analysis of Latin Square Design, Advantages and disadvantages of Latin Square Design, efficiency of LSD compared with CRD and RBD, Missing value in LSD.

Unit IV: Factorial Experiments: Concept of Factorial Experiment, Need, advantages of factorial Experiments, Analysis of 2^2 and 2^3 Factorial Experiments, Yates correction method of computing factorial effect total, ANOVA table.

Scope of Syllabi:

1. Fundamentals of Applied Statistics - S. C. Gupta V. K. Kapoor (Sultan Chand and Sons), 4^{th} Edition.

Reference Books:

1) Motgomery D.C: Design and Analysis of Experiments; 8th edition.
2) Das. M. N. and Giri : (1986): Design and Analysis of Experiments,(Springer, Verlag)
3) Kemppthorne O : The Design and Analysis of Experiments
4) Singh D and Chaudhri F.S: Theory and Analysis of Sample Survey Design.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure

B.A/B.Sc. (III) Third Year (Semester - VI)

STATISTICS

DSES - II (Section - B)

OPERATIONS RESEARCH TECHNIQUES - II

Paper No. - XV (B_1) (Elective)

Credits: 02 (Marks 50) **Periods: 45**

- **Salient features:** This paper helps to develop advanced optimization techniques in government, private sector.
- **Utility:** The techniques learn in this paper will be useful in war, government offices, hospitals, production industries etc.
- **Learning objectives:** Students should able to have skills of such kinds of techniques to improve in the societal problems occurred at different situations.
- **Prerequisites:** Linear programming, distribution theory, tabulation of data.

Unit I: Sequencing Problem: Introduction, Sequencing problem, General Assumptions, Sequencing Decision problem for n-jobs on two Machines, Traveling salesmen problem, Solution of Traveling salesmen problem, Numerical examples.

Unit II: Concept of Queue: Introduction to Queuing Theory, Queue discipline, Inter - arrival time distribution, service time distribution, waiting time, queue length, System length, Busy and ideal period, M/M/1/N and M/M/1/∞ Queue Models, Numerical examples.

Unit III: Game Theory: Introduction, Competitive game, Finite and Infinite Game, Zero-sum game, Two Person zero-sum game, Payoff Matrix, Strategy, Solution of a game, value of a game, Saddle point, Solution of a rectangular game with Saddle point, Solution of 2 x 2 game without Saddle point, Dominance Property, Graphical Method for the Solution of 2 x n and m x 2 games, Numerical examples.

Unit IV: Network Analysis: Introduction, Network and its basic components, Activity, Event, Logical sequencing, Rules for network construction, Critical path analysis Forward pass calculation, backward pass calculation. Critical path, Float of an activity and Event, Probability consideration in PERT, Distinguish between PERT and CPM, Replacement Theory introduction.

Scope of Syllabi:

i. Kanti Swarup, P. K. Gupta, Man Mohan: Operations Research (Sultan Chand & Sons) 16th Edition.

Reference Books:

1) Gass E.: Linear Programming Method and Application. (Narosa Publishing House New Delhi).
2) Dr. R. K. Gupta : Operations Research (Krishana Prakashan Media(P) Ltd .11- Shivaji Road Meerut)
3) Sharma S. D.: Operations Research, (Kedarnath Ramnath and Co. Meerut)
4) Manju Sharma : Linear Programming (Ramprasad and Sons Ag ra-3)
5) G. Gopikuttan: Quantitative Methods and Operations Research (Himalaya Publishing House.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure

B.A/B.Sc. (III) Third Year (Semester - VI)

STATISTICS

DSES - II (Section B)

DEMOGRAPHY

Paper No. - XV (B_2) (Elective)

Credits: 02(Marks 50) **Periods: 45**

- **Salient features:** This paper helps to develop various techniques in population studies in public sector.
- **Utility:** The techniques learn in this paper are useful in measurement of census surveys.
- **Learning objectives:** Students should have knowledge of such techniques to handle the social problems which helps in their living standard development studies.
- **Prerequisites:** Descriptive statistics, Index number, Graphical representation of data.

Unit - I - Elements of Demography: Introduction and uses of vital statistics, Methods of obtaining vital statistics by registration and census method ,Measurement of population Rates and Ratios of vital events.

Unit - II - Measurement of Mortality: Crude Death Rate(CDR), Specific Death Rates (SDR), Age Specific Death Rates (ASDR), Infant Mortality Rate (IMR), Standardized Death rate (STDR), Force of Mortality, Fertility and Reproduction Rates, Fertility Rate, Sex ratio ,Crude Birth Rate (CBR), Merits and Demerits, General Fertility Rate (GFR), Age Specific Fertility Rate, Total Fertility Rate (TFR),

Unit - III- Gross Reproduction Rate (GRR): Net reproduction rate (NRR), Stationary Population, Stable Population, Life table, Construction of Life table and uses, Central Mortality rate. Measurement of population growth, Abridged life tables.

Unit - IV- National Income: Definition, concepts of national Income, Gross National Product (GNP), Net National Product (NNP), Personal Income, disposable income, Per capita income, Gross Domestic Product (GDP), National income at market price, factor cost, current prices, constant prices, method of its estimation, Importance and Difficulties in the calculation of national income.

Scope of Syllabi:

1. Fundamentals of Applied Statistics-S. C. Gupta, V. K. Kapoor (Sultan Chand and Sons), 4^{th} Edition.

Reference Books:

1) Shrivastava O.S: A Textbook of Demography
2) S. P. Gupta : Statistical Methods.
3) Benjamin. B: Elements of Vital Statistics.

STATISTICS
B.A. / B.Sc. Third Year
Practical Paper - XVI (Annual Practical)
DSESP – IV (Compulsory)

(Based on Theory Papers XII & XIV

Sr. No.	Title of Experiments	No. of Experiments
1	Drawing Simple Random Sample	1
2	Estimation of population mean using SRS	2
3	Estimation of Variance using SRS	1
4	Estimation of population mean and variance Using different allocations in Stratified random sampling	1
5	Estimation of gain in precision due to Stratification	1
6	Determination of sample size in stratified Sampling	1
7	Estimation of population mean and variance In systematic sampling	1
8	ANOVA One Way classification	2
9	ANOVA Two Way classification with one entry per cell	2
10	Analysis of Completely Randomized Design	1
11	Analysis of Randomized Block Design	1
12	Analysis of Latin Square Design	1
13	Missing plot Technique of RBD	1
14	Missing plot Technique of LSD	1
15	Efficiency of LSD over RBD	1
16	2^2 Factorial Experiment	1
17	2^3 Factorial Experiment	1

STATISTICS
B.A. / B.Sc. Third Year
Practical Paper - XVII (A) (Annual Practical)
DSESP – V (A) (Elective)

(Based on Theory Papers XIII (A) & XV (A))

Sr. No.	Title of Experiments	No. of Experiments
1	Formulation of Linear Programming Problem	2
2	Solution of L.P.P. by Graphical Method	2
3	Basic Feasible Solution of L.P.P.	1
4	Solution of L.P.P. by Simplex Method	2
5	Solution of L.P.P. by Two Phase Method	1
6	Solution of L.P.P. by Big - M Method	1
7	Unbalanced Transportation Problem	1
8	North-West Corner Rule Method	1
9	Matrix Minima Method	1
10	Vogel's Approximation Method	1
11	Optimality Test	1
12	Assignment Problem	2
13	Game with and without Saddle point	2
14	Graphical method to solve 2 x n and m x2 Game	2
15	Dominance Property	1
16	Sequencing	2
17	Queuing	2
18	Simulation	1
19	Traveling Salesman Problem	1
20	PERT	1
21	CPM	1

STATISTICS
B.A. / B.Sc. Third Year
Practical Paper - XVII (B) (Annual Practical)
DSESP – V (B) (Elective)

(Based on theory papers XIII (B) & XV (B))

Sr. No.	Title of Experiments	No. of Experiments
1	X - bar and R chart	2
2	P and C chart	2
3	O.C. curve for single Sampling plan	1
4	O.C. curve for double Sampling plan	1
5	AOQ and ASN curve	1
6	Crude Death Rate (CDR	1
7	Specific Death Rate (SDR)	1
8	Age Specific Death Rate (ASDR	1
9	Standardized Death Rate (STDR)	1
10	Life table	2
11	Crude Birth Rate (CBR)	1
12	General Fertility Rate (GFR)	1
13	Specific Fertility Rate (SFR)	2
14	Total Fertility Rate (TFR)	1
15	Gross Reproduction Rate (GRR)	1
16	Net Reproduction Rate (NRR)	1

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure

B.A/B.Sc. (III) Third Year (Semester - V)

STATISTICS

SKILL ENHANCEMENT COURSE SECS - III (A)

DATA MANAGEMENT AND ANALYSIS WITH ADVANCED EXCEL

- **Salient features:** This course introduces the handling of data using excel software.
- **Utility:** Data handling and processing helps in management to perform the analysis.
- **Learning objectives:** To have knowledge of management and analysis of various kinds of data.
- **Prerequisites:** Descriptive statistics, data tabulation and representation, introduction of elementary MS - Excel.

Introduction, Using Excel lists, Creating a List, Sorting, to perform a Simple Sort To Sort by Multiple Columns, Data Forms: Adding Data Using the Data Form, Finding Records Using Criteria Filtering Data, AutoFilter, Advanced Filters, Special Features for Filtered Lists. Totals and Subtotals Total Row, Subtotals, Managing Windows, Multiple Windows Splitting Windows, Freezing Panes, Linking Data, Analysis tool pack
Analysis by goal seek, Analysis by pivot tables

Object-orientated programming, Working across applications, File System Objects Using built-in file dialog boxes, Macro security, Protecting applications ,ActiveX controls, Class modules ,Good programming techniques ,Customizing menus and toolbars Debugging, Handling errors, Recording macros ,Running macros ,Customizing menus and toolbars, Writing macros ,Selecting cells and ranges, Talking to your user, Variables, Subroutines, arguments and functions, Loops and logic, Debugging, Handling errors, Event-handling, The Visual Basic rabbit-hole, Looping over collections, Creating forms, Using forms, Advanced form controls, Programming menus and toolbars, Working across applications, Crib sheet.

References:

1. Learn Excel 2016 Expert Skills with The Smart Method: Courseware Tutorial teaching Advanced Techniques, Mike Smart
2. Advance Excel 2016 Training Guide by Rita Arora
3. Microsoft Excel Data Analysis and Business Modeling, Wayne Winston.
4. Six Sigma Statistics with EXCEL and MINITAB, Issa Bass

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure

B.A/B.Sc. (III) Third Year (Semester-V)

STATISTICS

SKILL ENHANCEMENT COURSE SECS - III (B)

DATA MINING USING WEKA

- **Salient features:** This course introduces the handling of large scale data using Weka software.
- **Utility:** It is useful in IT sector to analyze and to find hidden information of available large scale data.
- **Learning objectives:** Students should have elementary information of data mining techniques and their handling using Weka software.
- **Prerequisites:** Descriptive and Inferential statistics, distribution theory.

Fundamentals of Data Mining: Data mining: what is it?, Data mining strategies. Popular Data mining techniques, Data mining applications, Challenges of data mining, The feature of data mining, Data processing and data warehouse: Data, information and knowledge: what are they? Types of Data, Data Warehouses, Data cleaning, Data transformation, Data quality measure, OLAP: What is it? Data sampling

WEKA: An attractive data mining tool Introduction, Installing Weka, Weka data file format Starting Weka, Data Visualization, Data Filtering, Selecting attributes, Data mining With Weka. The estimation task: Scatter plots and correlation, Liner regression models, Logistic regression, Regression analysis through Weka.

References:

1. Instant Weka How-to by Botjan Kalua
2. Data Analysis with Open Source Tools: A Hands-On Guide for Programmers and Data Scientists by Philipp K. Janert
3. Exploring Geological Data with Weka, CoDaPack, and iNZight: Graphical Instructions

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure

B.A/B.Sc. (III) Third Year (Semester-VI)

STATISTICS

SKILL ENHANCEMENT COURSE SECS - IV (A)

IBM SPSS SOFTWARE FOR DATA ANALYSIS

- **Salient features:** This course introduces the handling of large scale data using IBM SPSS software.
- **Utility:** It is useful in large scale in industrial sector to analyze available actionable data.
- **Learning objectives:** Students should have knowledge of statistical techniques and their implementation using comprehensive IBM SPSS software.
- **Prerequisites:** Descriptive and Inferential statistics.

An Overview of SPSS: Mouse and keyboard processing, frequently –used dialog boxes, Editing output, Printing results, Creating and editing a data file. Managing Data: Listing cases, replacing missing values, computing new variables, recording variables, exploring data, selecting cases, sorting cases, merging files. Graphs: Creating and editing graphs and charts. Frequencies: Frequencies, bar charts, histograms, percentiles.

Descriptive Statistics: measures of central tendency, variability, deviation from normality, size and stability. Cross Tabulation and chi-square analyses, The means procedure.

Bivariate Correlation: Bivariate Correlation, Partial correlations and the correlation matrix. The T-test procedure: Independent–samples, paired samples, and one sample tests The one way ANOVA procedure: One way analysis of variance. General Linear model: Two –way analysis of variance. Simple Linear Regression, Multiple regression analysis.

References:

1. SPSS Statistics for Data Analysis and Visualization by Jason Verlen, Andrew Wheeler, Jon Peck, Jesus Salcedo, Keith McCormick, John Wiley & Sons
2. How to Use SPSS A Step-by-Step Guide to Analysis and Evaluation 1st Edition by Brian C. Cronk, Cronk Brian C

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
Choice Based Credit System (CBCS) Course Structure

B.A/B.Sc. (III) Third Year (Semester-VI)

STATISTICS

SKILL ENHANCEMENT COURSE SECS - IV (B)

STATISTICAL ANALYSIS OF CLINICAL TRIALS

- **Salient features:** This course introduces the handling of data in pharmaceutical sector.
- **Utility:** It is useful in pharmaceutical industrial sector to analyze drug discovery data.
- **Learning objectives:** Students should have knowledge of statistical techniques implementation using clinical trials.
- **Prerequisites:** Descriptive and Inferential statistics, Distribution theory.

Introduction to Clinical Trials: need and ethics of clinical trials, bias and random error in clinical studies, conduct of clinical trials, overview of Phase I-IV trials, multi-center trials. Data management: data definitions, case report forms, database design, data collection systems for good clinical practice, Bioavailability.

Design of Clinical Trials: parallel vs. cross-over designs, cross-sectional vs. longitudinal designs, objectives and endpoints of clinical trials, design of Phase I trials, design of single-stage and multi-stage Phase II trials. Design and monitoring of Phase III trials with sequential stopping; design of bio-equivalence trials. Inference for 2x2 crossover design: Classical methods of interval hypothesis testing for bioequivalence, Bayesian methods, nonparametric methods.

Determining sample size, multiplicative (or log-transformed) model, ML method of estimation, assessment of inter and intra subject variability's, detection of outlying subjects. Optimal crossover designs: Balaam's design, Two-sequence dual design. Optimal four period designs. Assessment of bioequivalence for more than two drugs

References:

1. Chow S.C. and Liu J.P. (2009). Design and Analysis of Bioavailability and bioequivalence. 3rd Edn. CRC Press.
2. Chow S.C. and Liu J.P. (2004). Design and Analysis of Clinical Trials. 2nd Edn. Marcel Dekkar.
3. Fleiss J. L. (1989). The Design and Analysis of Clinical Experiments. Wiley.
4. Friedman L. M. Furburg C. Demets D. L.(1998). Fundamentals of Clinical Trials, Springer.
5. Jennison .C. and Turnbull B. W. (1999). Group Sequential Methods with Applications to Clinical Trials, CRC Press.
6. Marubeni .E. and Valsecchi M. G. (1994). Analyzing Survival Data from Clinical Trials and Observational Studies, Wiley.