Sant Gadge Baba Amravati University, Amravati

Faculty of Science and Technology

Programme : B.Sc. III (Statistics)

POs

At the time of graduation, Students will be able to

- Understand and apply the fundamental principles, concepts and methods in key areas of science and multidisciplinary fields
- Demonstrate problem solving, analytical and logical skills to provide solutions for the scientific requirements.
- Develop the critical thinking with scientific temper.
- Communicate the subject effectively.
- Understand the importance and judicious use of technology for the sustainable growth of mankind in synergy with nature.
- Understand the professional, ethical and social responsibilities.
- Enhance the research culture and uphold the scientific integrity and objectivity.
- Engage in continuous reflective learning in the context of technological and scientific advancement.

PSOs:

Upon completion of the programme, students would be able to

1. Recall basic facts about statistics and should be able to display knowledge of conventions such as notations, terminology.
2. Get adequate exposure to global and local concerns that explore them many aspects of mathematical sciences.
3. Be equipped with statistical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
4. Apply their skills and knowledge that is translate information presented verbally into statistical form, select and use appropriatestatisticalformulaeortechniquesinordertoprocesstheinformationanddrawthereleva ntconclusion.
5. Develop a positive attitude towards statistics as an interesting and valuable subject ofstudy.
6. Acquire basic knowledge of diagrammatic & graphical representation of Data with and withoutsoftware.

Employability Potential of the programme:

The programme offers many such scenarios where one statistician can work. By completing this programme, students are able to:

- Analyze the things
- Understand patterns in them by asking different questions toit
- Compete with the current demand of field
- To solve a specific problem

This “skill” is a key requirement for many analysis type jobs like,

1. Statisticians
2. Business Analyst
3. Mathematician
4. Professor

5. Risk Analyst
6. Data Analyst
7. Content Analyst
8. Statistic Trainer

Besides all these students can work in various banking sector.

Students can also work in government sector :

- Indian statistical services(ISS)
- Staff selection services(SSC)
- Reserve Bank of India (Junior

statistical officer) By taking the course,
students are able to:

- Analyse numbers
- Understand patterns in them by asking different questions toit
- Go about it in a systematic fashion
- To solve a specific problem

This “skill” is a key requirement for many analysis type jobs.

Career Options::

Data Analytics #1: Students could get into any Analytics firm, and can assist customers in getting patterns out of data.

Data Analytics #2: For Data Analytics in banks, there can be algorithms developed for fraud deduction using the digital imprints. This requires analysing large amounts of data. That could a career choice - Digital Forensics.

Market Research: For doing a survey for customer expectations and behaviors, the data pours in, from online and offline channels - how students draw meaningful, actionable conclusions? Students need to use the statistical methods learnt. So, Market Research in a MR firm or a corporate entity can be a large area of focus.

Software Programmer: With analytical bent of mind, Students could take up a software programming job. It might not leverage learning but will leverage the “bent of mind” cultivated out of the education.

Students could focus on areas like: Visual Representation of Data (Tableau, Quilk, PowerBI), Data Reporting (Crystal Reports) - that are aligned to the core skills.

Government Statistician: Our country requires a lot of econometric and statistical data for its running. Acreage, Yields, Health Statistics and the like. Bright young idealistic people are required to run our country too.

Students could be a District Statistical Officer, who is in charge of collecting information from the district, analyzing it and sharing with the State Authorities.

B.A/B.Sc. III Year Semester V (CBCS)

Statistics Syllabus

Name of the paper : Sampling theory and Design of experiment

No. of theory classes : 6 per week **Total credits – 6 credits**

Unit I Demand Analysis:

Definition of Demand and supply, necessities and luxuries goods Law of demand and supply, Equilibrium price, Price elasticity of demand, Price elasticity of supply Income elasticity, Cross elasticity of demand, Partial elasticity of demand, Competitive and substitute goods, numerical problems based on price elasticity

Unit II SampleSurveys

Sample surveys-Concept of population and sample, need for sampling, sampling unit and sampling frame, Principal steps in sample surveys, Sampling and non- Non sampling errors, Types of sampling and limitations of sampling ,Simple random sampling ,properties of SRS, methods of selecting a random sample, merits and limitations of SRS, Concept of srswor and srswr, theorems on sample mean, sample variance and sample mean square, comparison of srswor and srswr.

Unit III Stratified Random Sampling and Systematic sampling

Concept of stratified random sampling and its advantages Mean and variance of stratified sample mean, Various allocations in stratified sampling and their corresponding sample sizes, Comparison of various allocations with SRSWOR, Concept of systematic sampling with examples, Mean and variance of systematic sample mean.Comparison of systematic sampling with SRSWOR and stratified random sampling.

Unit IVAnalysis of Variance (ANOVA)

Introduction to ANOVA, One way classification and its analysis, Two way classification with one observation per cell. Two way classification with multiple but equal number of entries per cell.

Unit V Design of experiment

Introduction to design of experiments ,need for design of experiments, Fundamental principles of design of experiments, Uniformity trials. Analysis of Completely Randomized Design(C.R.D.), Analysis of a Randomized Block Design (R.B.D.).Comparison of C.R.D.with R.B.D.interms of efficiency.

Unit VI Skill enhancement Course

Introduction to python: Language introduction, Python source code, Imports, command- line, argument, and len(), User defined functions, Indentation, variable names, Python standard library functions, help(), dir(), Operators in Python : Assignment, Logical, Arithmatic, conditional statement, Basic exercises in python.

Examination Duration : 3 Hrs.

Theory marks : Theory + MCQ : 80 + Internal : 20 = 100

Books Recomonded

1. S.C.Gupta,V.K.Kapoor:FundamentalsofAppliedStatistics,Sul-tanChandandsons.
2. CochranW.G.andCoxG.M.(1957):ExperimentalDesigns,JohnWileyandSons.
3. Das M.N. and Giri (1986):Design and Analysis of Experiments,SpringerVerlag.
4. GoonA.N.,GuptaM.K.,DasGuptaB.(1986):FundamentalsofStatistics,Vol.II,WorldPress

Calcutta.
5. Kempthorne O. (1965):The Design and Analysis of Experiments,WileyEastern
6. BrownleeK.A.(1960):StatisticalTheoryandMethodologyinSci-enceandEngineering,JohnWil
7. Damodar Gujrathi: Basic Econometrics
8. J.M.Henderson&R.E.Quandt:Microeconomics.
9. A.A.Walter:An Introduction to Econometrics
10. MurthyM.N.(1967):SamplingTheoryandMethods,StatisticalPublishingSociety,Calcutta .
11. Sampath S.(2000):Sampling Theory and Methods, Narosa Pub-lishing House.
12. SukhatmeB.V.(1984):SampleSurveyMethodsanditsApplica-tions,IndianSocietyofAgriculturalStatistics.
13. DesRaj(2000):Sample Survey Theory, Narosa Publishing House.
14. Singh D.Chaudhary F.S.: Theory and Analysis of Sample Survey Designs.
15. Primal Mukhopadhyaya:TheoryandMethodsofSurveySam-pling,PrenticeHall.
16. SukhatmeP.V.andSukhatmeB.V.:SamplingTheoryofSurveyswithApplications.

Course Outcome (CO)

Upon completion of this course successfully, students would be able to

1. Develope econometrics knowledge of the student
2. Develop sampling knowledge of the student.
3. Testing knowledge of various sampling designs is developed.
4. Apply concepts regarding statistical analysis.
5. Elaborative concept of Design of experiment and analysis of variance is being developed.
6. CO for skill enhancement Course : Computer knowledge of the students is developed.

B.Sc. III Semester VI Practical Subject : STATISTICS

Practical credits : 2.25

Cos

Upon completion of this course successfully, students would be able to solve/perform/demonstrate the following

List of Practical's

1. Calculation of various elasticities of demand
2. Estimation of population mean and variance by using SRS
3. Estimationofpopulationmeanandvarianceusingvariousallocationsofstratifiedrandomsampling.
4. Estimation of population mean and variance using systematic sampling.
5. ANOVA: One way classification.
6. ANOVA: Two way classification with one observation per cell.
7. ANOVA:Twowayclassificationwithmultiplebutequalnumberofobservationspercell.
8. Analysis of completely randomized design.
9. Analysis of randomized block design
10. Basic exercises in python
11. Operators in python

Practical examination duration : 3 Hrs

Practical total marks : Internal : 25 + External : 25 = 50

B.A/B.Sc. III Year Semester VI(CBCS)
Statistics Syllabus
Name of the paper :Optimization& Research Methodology

No. of theory classes : 6 per week Total credits – 6 credits

Unit I : Latin Square Design and Factorial Experiment

Concept and complete analysis of L.S.D, Efficiency of LSD as compared with CRD and RBD, Introduction of Factorial Experiments ,it's purpose ,need and advantage ,Definition of contrast and orthogonal contrast, Analysis of 2^2 factorial experiment, computation of main effects and interaction effects, Yate's method(up to two factors).

Unit II : Linear Programming Problem

Convex set and their properties, Definition of general LPP, mathematical formulation of LPP with examples, Examples of LPP, problems occurring in various fields, Slack, surplus and artificial variables, Graphical and simplex method of solving LPP,dual problem and primal problem

Unit III : Transportation and Assignment problem

Definition and example of a T.P., Mathematical formulation of a T.P, Existence of feasible solution to a T.P. ,matrix form of a T.P., transportation table, loops in a T.P, The initial basic feasible solution, transportation problems with balanced cases only, Methods to find initial basic feasible solution to a T.P.

Assignment Problem : Definition and example of a A.P.,mathematical formulation of a A.P,Hungarian assignment Algorithm.

Unit IV : Sequencing problem and Theory of games

Sequencing problem with n jobs and 2 machines, Introduction to theory of games, two person zero sum games, The maximin-minimax principle, Definition of a saddle point, games with saddle points, pure strategies and mixed strategy, games with mixed strategies

Unit V : Research Methodology

Introduction, Meaning of Research, Objective of Research, Types of Research, Research problem, Necessity of defining the problem, Meaning of Research Design, Need for Research design, Different Research design, Basic principles of Research design

Unit VI: Advance Python Concept

Map function, itertools, Lambda function, Exceptions, Decorators, Collections, Generators, Magic methods, Usage of Common Python libraries, Python Shell, Data Related skills

Examination duration : 3 HrsTheory marks : Theory + MCQ : 80 + Internal : 20 = 100

Books Recommended

1] Fundamentals of statistics (Vol. I) by Goon A. M, Gupta M.K, Dasgupta B, World Press (Pvt Ltd) Kolkata

2] Fundamental of Applied Statistics- V.K. Kapoor& S.C. Gupta Sultan Chand & Sons New Delhi
3]Gauss S.L.(1975):Linear Programming Methods and Applica-tions,McGraw Hill.
4] Taha .H.A.(1989):Operations Research: An Introduction, Macmillan Publishing Company.
5] Kanti Swaroop, Manmohan, Gupta: Operations Research.
6] Goyal and Mittal: Operations Research.
7] C. R. Kothari, Gaurav Garg : Research Methodology Methods and Techniques, New Age International Publishers.
8] John W. Creswell : Research Design, Qualitative, Quantitative and Mixed Method Approach SAGE Publications
9] UWE FLICK : Introducing Research Methodology SAGE Publications
10] Martin C. Brown : Python The complete reference Mcgraw Hill Education
11] Allen Downey: Learning with Python Dreamtech press

Course Outcome (CO)

Upon completion of this course successfully, students would be able to
1. Apply statistical knowledge and skills relating to design of experiment
2. Coherent understanding of the concepts of linear programming problem
3. Procedural knowledge that creates different types of professionals related to various optimization problem
4. skills in statistics and emerging development in the field of optimization methods
5. Advance knowledge of use of statistical concept in the field of Research.
6. CO for skill enhancement Course : Advance computer knowledge of the students is developed.

B.Sc. II I Semester VI Practical Subject : STATISTICS

Practical credits : 2.25

Cos

Upon completion of this course successfully, students would be able to
solve/perform/demonstrate the following

List of Practical's

1] Analysis of Latin square design.
2] Analysis of 2^2 factorial experiments arranged in RBD.
3] Solution of LPP by Graphical Method.
4] Solution of LPP by Simplex Method.
5] Computation of Initial basic feasible solution to transportation problem by various methods.
6] Problems on assignment problem.
7] Problems on sequencing problem with n jobs with two machines.
8] Problems on two-person zero sum games with saddle points.
9] Construction of Qualitative Research Design
10] Construction of Quantitative Research Design

11] Basic Exercises in Python

Practical examination duration : 3 HrsPractical total marks : Internal : 25 + External : 25 = 50

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