M. C. E. Society's

Abeda Inamdar Senior College of Arts, Science and Commerce, Camp, Pune-1

(An Autonomous college Affiliated to Savitribai Phule Pune University)

Three-Year B.Sc. Degree Program in Computer Science

(Faculty of Science & Technology)

F.Y.B.Sc. Statistics (Computer Science)

Choice Based Credit System Syllabus

To be implemented from Academic Year 2021-2022

Title of the Course: B.Sc. (Computer Science)

Aims and Objectives of the Course:

Sr. No.	Aims
1.	Give the students sufficient knowledge of fundamental principles, methods, and a clear perception of statistical ideas and tools and know-how to use them by modeling, solving, and interpreting.
2.	Reflecting the broad nature of the subject and developing statistical tools and techniques for continuing further study in various fields of science and technology.
3.	Enhancing students' overall development and equipping them with Statistical techniques in computer-based techniques.
4.	Enabling students to develop a positive attitude towards statistics as an interesting and valuable

Sr. No.	Objectives
1.	A student should be able to recall basic concepts and terminology in Statistics and covers basic tools and methods required for data analysis from their studies.
2.	A student should demonstrate knowledge of probability, standard statistical distributions, and computational techniques.
3.	A student must be able to apply statistical tools and techniques that is, translate information presented verbally into Statistics form, select and use appropriate statistical formulae or techniques to process the information and draw the relevant conclusion

Expected Course Specific Learning Outcome

Sr. No.	Objectives
1.	Know the basic concepts, analyze statistical data graphically using frequency distributions and cumulative frequency distributions, analyze data using measures of central tendency, use the basic probability rules, independent and mutually exclusive events, translate real-world problems into probability models, derive the probability density function, calculate probabilities, analyze statistical data using MS-Excel.
2.	Use discrete and continuous probability distributions, mean and variance, and making decisions, define binomial outcomes and compute the probability of getting X successes in N trials, use Poisson, exponential distributions to solve statistical problems
3.	Calculate and interpret the correlation between two variables, calculate the simple linear regression equation for a set of data, principles of linear regression and correlation, including least square method, predicting a particular value of Y for a given value of X and significance of the correlation coefficient, know the association between the attributes

Structure of F.Y.B.Sc. Statistics (Computer Science) Course

Sr. No.	Courses		Continuous Internal Evaluation (CIE) (Internal Marks)	End Semester Exam (External Marks)	Total Marks	Credits
	Semester-I	Semester-II				
1.	21SBCS111S: Descriptive Statistics	21SBCS121S: Methods of Applied Statistics	20	30	50	2
2.	21SBCS112S: Mathematical Statistics	21SBCS122S: Continuous Probability Distributions and Testing of Hypotheses	20	30	50	2
3	21SBCS113S: Practical Based on Descriptive Statistics and Mathematical Statistics	21SBCS123S: Practical Based on Methods of Applied Statistics and Testing of Hypothesis	20	30	50	1.5

For Continuous Internal Evaluation (CIE):

Evaluation will be done continuously. Internal assessment will be of **20** marks for a paper of 50 Marks. These 20 marks are divided as follows:

a) There will be a compulsory Test on Demand MCQ Examination of **20** marks of each subject which would be converted into **5 Marks.**

b) Two Class Tests 10 Marks Each. Converted to 5 Marks.

c) Mid Sem Exam of 20 Marks converted to 05 Marks

d) Participation in two activities at department/ college level 05 Marks

e) In case of students failing to score under category (d), the attendance can be considered to give marks.

f) There will be a compulsory Mock Practical Examination, Viva Voce of subjects mentioned in for **20 Marks**.

g) The subject teacher needs to adopt anyone out of the following methods for internal assessment:

Methods of Internal Assessment

Written exam	Quiz
Presentations	Projects
Assignments	Tutorials
Oral examination	Open Book Test and Others

Course/ Paper Title	Descriptive Statistics
Course Code	21SBCS111S
Semester	I
No. of Credits	2

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	**Data Condensation and Presentation of Data**	**08**
	1. Definition, importance, scope, and limitations of statistics.	2
	2. Data Condensation: Types of data (Primary and Secondary), attributes and variables, discrete and continuous variables.	3
	3. Graphical Representation: Histogram, Ogive curves, steam and leaf chart.	3
Unit II	**Descriptive Statistics**	**13**
	1. Measures of central tendency: Concept of central tendency, requisites of good measures of central tendency.	4
	2. Arithmetic mean, Median and Mode.	3
	3. Partition Values: Quartiles, Box-plot.	3
	4. Measures of dispersion: Range and quartile deviation, variance, and standard deviation.	3
Unit III	**Moments, Skewness, and Kurtosis**	**09**
	1. Concept of raw moments, central moments, and the relation between raw and central moments.	3
	2. Measures of skewness: Types of skewness, Pearson's and Bowley's coefficient of skewness, measures of skewness based on moments.	3
	3. Measures of kurtosis: Types of kurtosis, measures of kurtosis based on moments.	3

Unit IV	Fundamentals of R-Software	06
	1. Introduction to R, features of R, Starting and ending R session, getting help in R, commands, and case sensitivity.	2
	2. Vectors and vector arithmetic: a) creation of vectors, b) Arithmetic operations on vectors, c) Numerical functions.	1
	3. Data frames: creation using data frame, subset, and transform commands.	1
	4. Computation of measures of central tendency (for ungrouped data).	1
	5. Commands for finding Probabilities.	1

Text Book:

Statistical Methods, S.P.Gupta, Sultan Chand and Sons Educational Publishers.

UNIT I: Volume I: Chapter 1 and chapter 6
UNIT II: Volume I: Chapter 7 and chapter 8
UNIT III: Volume I: Chapter 9

Reference:

1. Books:

1. Fundamentals of Statistics, Sixth Revised and Enlarged Edition, S.C. Gupta, Himalaya Publishing House.

2. Introduction to Statistics and Data Analysis With Exercises, Solutions and Applications in R, Christian Heumann, Michael Schomaker Shalabh.

2. Weblinks:

1. https://cran.r-project.org/doc/contrib/usingR.pdf

2. https://open.umn.edu/opentextbooks/textbooks/459

Course/ Paper Title	Mathematical Statistics
Course Code	21SBCS112S
Semester	I
No. of Credits	2

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	**Theory of Probability**	**09**
	1. Counting Principles, Permutation, and Combination	3
	2. Deterministic and non-determination models	1
	3. Random Experiment, Sample Spaces (Discrete and continuous)	1
	4. Events: Types of events, Operations on events	2
	5. Probability: classical definition, probability models, axioms of probability, probability of an event, theorems of probability(without proof)	3
Unit II	**Conditional Probability and Independence:**	**07**
	1. Concepts and definitions of conditional probability, multiplication theorem $P(A \cap B) = P(A).P(B|A)$	3
	2. Bayes' theorem (without proof). True positive, false positive and sensitivity	1
	3. Concept of Posterior probability, problems on posterior probability	1
	4. Concept and definition of independence of two events	2
Unit III	**Functions of Random Variable and Mathematical Expectation**	**09**
	1. Definition of a random variable (r.v.), discrete variable r.v.	1
	2. Definition of probability mass function (P.m.f.) of discrete r.v. and cumulative distribution function (c.d.f.) of discrete r.v.	2
	3. Definition of mathematical expectation and variance of discrete	2

	r.v. and theorems based on mathematical expectation & variance.	
	4. Definition of probability mass function (P.m.f.) of continuous r.v. and cumulative distribution function (c.d.f.) of continuous r.v.	2
	5. Definition of mathematical expectation and variance of continuous r.v. and theorems based on mathematical expectation and variance	2
Unit IV	**Standard Discrete Distribution**	**11**
	1. Discrete Uniform Distribution	2
	2. Binomial Distribution	3
	3. Geometric Distribution	3
	4. Poisson Distribution	3

Text Book:

Fundamentals of Statistics, Sixth Revised and Enlarged Edition , S.C. Gupta, Himalaya

Publishing House.

UNIT I: Chapter 12
UNIT II: Chapter 12
UNIT III: Chapter 13
UNIT IV: Chapter 14

References:

1. Books:

1**.** Statistical Methods, S.P. Gupta, Sultan Chand and Sons Educational Publisher
2. Fundamentals of Statistics. Vol I, A.M.Goon, M.K. Gupta, B.Das Gupta, World press

2. Weblink:

1. https://open.umn.edu/opentextbooks/textbooks/459

Course/ Paper Title	Practical Based on Descriptive Statistics and Mathematical Statistics
Course Code	21SBCS113S
Semester	I
No. of Credits	1.5

Syllabus

Sr. No.	Title of the Practical	No. of Practicals
1	Tabulation and construction of frequency distribution.	1
2	Fitting of Binomial distribution and computation of expected frequencies.	1
3	Fitting of Poisson distribution and computation of expected frequencies.	1
4	Measures of skewness and kurtosis based on moments.	1
5	Diagrammatic and graphical representation using EXCEL and data interpretation.	1
6	Summary statistics for ungrouped data and comparison for consistency using EXCEL.	1
7	Practical Based on R-Software 1	1
8	Practical Based on R-Software 2	1
9	Practical Based on R-Software 3	1
10	Practical Based on R-Software 4	1
11	Practical Based on R-Software 5	1
12	Project(Part-I) -Data collection, its condensation and representation.	1

Course/ Paper Title	Methods of Applied Statistics
Course Code	21SBCS121S
Semester	II
No. of Credits	2

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	**Theory of Attributes**	**05**
	1. Attributes: Classification, the notion of manifold classification, dichotomy, class-frequency, order of a class, positive class frequency, negative class frequency, ultimate class frequency, relationship among different class frequencies up to attributes)	2
	2. Consistency of data up to 2 attributes	1
	3. Concepts of independence and association of two attributes	1
	4. Yule's coefficient of association (Q), $-1 \leq Q \leq 1$, interpretation	1
Unit II	**Correlation (For ungrouped data)**	**10**
	1. Concept of bivariate data, scatter diagram, its interpretation, positive correlation, negative correlation, zero correlation	4
	2. Karl Pearson's coefficient of correlation, properties of the correlation coefficient, interpretation of correlation coefficient, coefficient of determination with interpretation	4
	3. Spearman's rank correlation coefficient	2
Unit III	**Regression (for ungrouped data)**	**11**
	1. Concept of linear and nonlinear regression	2
	2. Illustrations, appropriate situations for regression and correlation	2
	3. Linear regression: Fitting of lines of regression using least	2

	square method	
	4. Concept of regression coefficients and Properties of regression coefficients	2
	5. Nonlinear regression models	3
Unit IV	**Multiple Regression and Partial Correlation**	**10**
	1. Concept of multiple regressions, Yule's Notations	2
	2. Fitting of multiple regression planes	2
	3. Concept of partial regression coefficients, interpretations	2
	4. Concept of multiple correlations	2
	5. Concept of partial correlation	2

Text Book:

Statistical Methods, S.P.Gupta, Sultan Chand and Sons Educational Publishers.

　　Unit I: Volume I: Chapter 12

　　Unit II: Volume I: Chapter 10

　　Unit III: Volume I: Chapter 11

　　Unit IV: Volume II: Chapter 9

References:

1. Books:

1. Fundamentals of Statistics, Sixth Revised & Enlarged Edition, S.C. Gupta, Himalaya Publishing House.

2. Introduction to Linear Regression Analysis: Douglas C. Montgomery, Elizabeth A. peck, G. Geoffrey Vining, Wiley

2. Weblink:

1. https://open.umn.edu/opentextbooks/textbooks/459

Course/ Paper Title	Continuous Probability Distributions and Testing of Hypotheses
Course Code	21SBCS122S
Semester	II
No. of Credits	2

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	**Standard Continuous Probability Distributions**	**10**
	1. Uniform Distribution	2
	2. Exponential Distribution	3
	3. Normal Distribution	5
Unit II	**Concepts and definitions related to testing of hypothesis**	**06**
	1. Concepts of population and sample	2
	2. Definitions: random sample from a probability distribution, parameter, statistic, standard error of estimator	2
	3. Concept of the null hypothesis and alternative hypothesis (Research hypothesis), the critical region, level of significance, type I and type II error, one-sided and two-sided tests, a test of hypothesis, p-value	2
Unit III	**Parametric Tests**	**10**
	1. Large Sample Tests	2
	2. $H_0: \mu = \mu_0$ Vs $H_1: \mu \neq \mu_0$ or $H_1: \mu < \mu_0$ or $H_1: \mu > \mu_0$ (One sided and two-sided tests)	2
	3. $H_0: \mu_1 = \mu_2$ Vs $H_1: \mu_1 \neq \mu_2$ or $H_1: \mu_1 < \mu_2$ or $H_1: \mu_1 > \mu_2$ (One-sided and two-sided tests)	2
	4. $H_0: P = P_0$ Vs $H_1: P \neq P_0$ or $H_1: P < P_0$ or $H_1: P > P_0$ (One sided and two-sided tests)	2
	5. $H_0: P_1 = P_2$ Vs $H_1: P_1 \neq P_2$ or $H_1: P_1 < P_2$ or $H_1: P_1 > P_2$ (One	2

	sided and two-sided tests)	
Unit IV	**Test Based on F distribution, t distribution & Chi-square**	**10**
	1. Test based on F- distribution, F-test for testing significance of equality of two population variances	2
	2. Tests based on t –distribution	2
	3. $H_0: \mu_1 = \mu_2$ Vs $H_1: \mu_1 \neq \mu_2$ or $H_1: \mu_1 < \mu_2$ or $H_1: \mu_1 > \mu_2$ (One-sided and two-sided tests)	1
	4. Paired t-test	1
	5. Tests based on Chi-square distribution, Chi-square test for the goodness of fit	2
	6. Test for the independence of attributes (mxn and2x2)	2

Text Book:

Fundamentals of Statistics, Sixth Revised and Enlarged Edition, S.C. Gupta , HimalayaPublishing House.
  Unit I: Chapter 14
  Unit II: Chapter 16
  Unit III: Chapter 17
  Unit IV: Chapter 18 and Chapter 19

References:

 1.Book:

  Statistical Methods , S.P. Gupta, Sultan Chand and Sons Educational Publishers.

 2. Weblink:

  1. https://openstax.org/books/introductory-business-statistics/pages/5-1-properties-of-continuous-probability-density-functions

Course/ Paper Title	Practical Based on Methods of Applied Statistics and Testing of Hypothesis
Course Code	21SBCS123S
Semester	II
No. of Credits	1.5

Syllabus

Sr. No.	Title of the Practical	No. of Practical
1	Karl Pearson's coefficient & Spearman's rank correlation using EXCEL	1
2	Fitting of the linear regression model (Simple and Multiple) and non-linearregression models and finding the best fit by using EXCEL.	1
3	Model sampling from continuous uniform, exponential and normaldistributions using EXCEL.	1
4	F test, and t-test using EXCEL	1
5	χ^2 test using EXCEL	1
6	Linear correlation and regression.	1
7	Fitting of non-linear regression.	1
8	Measures of attributes.	1
9	Fitting of normal distribution and computation of expected frequencies.	1
10	Large sample tests.	1
11	Write a report on the application of some statistical techniques in the fieldof computers. (individual activity)	1
12	Project (Part-II) - Analysis of data collected in semester-I	1