SACRED HEART COLLEGE (AUTONOMOUS), THEVARA KOCHI, KERALA, 682013

CURRICULUMAND SYLLABI

CHOICE   BASED COURSECREDIT AND SEMESTER SYSTEM

(CBCSS)

B.Sc. PROGRAMME

INTRODUCED FROM 2015 ADMISSION ONWARDS

BOARD OF STUDIES IN STATISTICS

Sacred Heart College, Thevara, Kochi, Kerala

Board of Studies in Statistics

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   MRF Ltd., Kottayam

7   Mrs.Lakshmipriya(Special invitee)

   Assistant Professor

   Sacred Heart College (Autonomous)Thevara, Kochi

The Board of Studies (BoS) in Statistics held its meeting at Sacred Heart College(Autonomous)Thevara, Kochi on 01-11-2014 and discussed in detail about the syllabi of the complementary course in Statistics, the core course for B.Sc. computer applications and finalized the course structure and contents for each course.

CONTENTS

1.   **Curriculum**

2.   **Syllabus**

CURRICULUM

1.1 SCOPE

This curriculum is applicable to all regular Under Graduate Programmes conducted by the Sacred Heart College (Autonomous) Thevara with effect from 2015-16 admissions.

1.2 STUDENT ATTRIBUTES

The curriculum and syllabus are framed to develop the students' skills, knowledge and understandings beyond the disciplinary level and intends to shape them to serve the society, the academia and for employability

1.3 DEFINITIONS.

1.3.1. **'Programme'** means a three year programme of study and examinations spread over six semesters, according to the regulations of the respectiveprogramme, thesuccessful completion of which would lead to the award of a degree.

1.3.2. **'Semester'** means a term consisting of a minimum of **450** contact hours distributed over 90 working days, inclusive of examination days, within **18** five-day academic weeks.

1.3.3. **'Academic Week'** is a unit of five working days in which distribution of work is organized from day-one today-five, with five contact hours of one hour duration on each day. A sequence of 18 such academic weeks constitutes a semester.

1.3.4. **'Common Course 'I'** means a course that comes under the category of courses for English And**'Common Course 'II'** means additional language, a selection of both is compulsory for all students undergoing undergraduate programmes.

1.3.5. **'Core course'** means a course in the subject of specialization within a degree programme.

1.3.6. **'Complementary Course'** means a course which would enrich the study of core courses.

1.3.7. **'Open course'** means a course outside the field of his/her specialization, which can beopted by a student.

1.3.8. **'Additional core course'**means a compulsory course for all under graduate students (as perthe UGC directive) to enrich their general awareness.

1.3.9. **'Additional Course'**is acourse registered by a student over and above the minimum required courses.

1.3.10. Credit'is the numerical value assigned to a course according to the relative importance of the content of the syllabus of the programme**.**

1.3.11. 'Additional credit'is the numerical value assigned to Club activities, Social service, Internship etc. which is not added with the total academic credits of the students.

1.3.12. '**Internship'**is job training for professional careers.

1.3.13 'College Co-ordinator' is a teacher nominated by the College Principal to co-ordinate the continuous evaluation undertaken by various departments within the college.

1.3.14. **'Department'** means any teaching department in a college.

1.3.15 Parent Department'means the department which offers core courses within a degree programme.

1.3.16. **'Department Council'**means the body of all teachers of a department in a college.

1.3.17. 'Department Co-ordinator'is a teacher nominated by a Department Council to co-ordinate the continuous evaluation undertaken in that department.

1.3.18. 'Faculty Advisor' means a teacher from the parent department nominated by the Department Council, who will advise the student in the choice of his/her courses and other academic matters.

1.3.19. Grace Marks shall be awarded to candidates as per the University Orders issued from time to time.

1.3.21. 'Grade' means a letter symbol (e.g., A, B, C, etc.), which indicates the broad level of performance of a student in a course/ semester/programme.

1.3.20. **'Grade point'**(GP) is the numerical indicator of the percentage of marks awarded to a student in a course.

 Note: Words and expressions used and not defined in this regulation shall have the same meaning assignedto them in the Act andStatutes.

1.4. DURATION

The duration of U.G. programmes shall be **6 semesters.** The duration of odd semesters shall be from **June to October** and that of even semesters from **November to March.**

A student may be permitted to complete the Programme, on valid reasons, within a period of 12 continuous semesters from the date of commencement of the first semester of the programme.

1.5. REGISTRATION

The strength of students for each course shall remain as per existing regulations, except in case of open courses for which there shall be a minimum of 15 and maximum of 75 students per batch, subject to a marginal increase of 10. For non-core compulsory courses the student strength shall be decided by the Academic Council of the College from time to time.

Note: Those students who possess the required minimum attendance and progress during a semester and could not register for the semester examination are permitted to apply for Notional Registration to the examinations concerned enabling them to get promoted to the next semester.

1.6. SCHEME AND COURSES

The U.G. programmes shall include (a) Common courses I and II, (b) Core courses, (c) Complementary Courses, (d) Open Course (e) Additional core course. (f) Study tour (g) Internship for English copy editor.

1.6.1 Additional credit components

(a) Talent & career club activity (optional)
(b) Social service (mandatory)
(c) Internship for Commerce, Communication and Computer applications (mandatory).
(d) Internship (desirable for other programmes).

1.7. PROGRAMME STRUCTURE FOR MODEL-I

A	Programme Duration	6 Semesters
B	Minimum credits required from common courses	38
C	Minimum credits required from Core + complementary + vocational* courses including Project	79
D	Minimum credits required from Open course	03
E	Additional core course (Environmental studies)	04
	Total Credits required for successful completion of the programme	124
F	Club activity (desirable)	01
G	Social service (mandatory)	01
H	Internship (desirable)	02
I	Minimum attendance required	75%

1.8. EXAMINATIONS.

The evaluation of each course shall contain two parts:

(i) CONTINUOUS INTERNAL ASSESSMENT (CIA)

(ii) END-SEMESTER EXAMINATION (ESE)

The internal to external assessment ratio shall be 1:3, for both courses with or without practical. There shall be a maximum of 75 marks for external evaluation and maximum of 25 marks for internal evaluation.

1.9. Computation of Grade and Grade points.

For all courses (theory & practical), grades are given on a 07-point scale based on the total percentage of marks**(CIA+ESE)**as given below

Percentage of Marks	Grade	Grade Point
90 and above	A+ - Outstanding	10
80-89	A - Excellent	9
70-79	B - Very Good	8
60-69	C - Good	7
50-59	D - Satisfactory	6
40-49	E - Adequate	5
Below 40	F - Failure	0

Note: Decimal are to be rounded to the next whole number

1.9.1 Computation ofSemester Grade Point Average (SGPA)

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses and the sum of the number of credits of all the courses undergone by a student in a semester.

$$\textbf{SGPA}\ (Si) = \sum(C_i \times G_i) / \sum C_i$$

Where$C_i$is the number of credits of the ith course and $G_i$is the grade point scored by the student in the ith course.

1.9.2 Computation of Cumulative Grade Point Average (CGPA)

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme.

$$\textbf{CGPA} = \sum(Ci \times Si) / \sum Ci$$

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

Note: The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration of Computation of SGPA and CGPA

(i) Illustrationfor **SGPA**

Course	Credit	Grade letter	Grade point	Credit Point (Credit x Grade
Course 1	3	B	8	3 X 8 = 24
Course 2	4	C	7	4 X 7 = 28
Course 3	3	D	6	3 X 6 = 18
Course 4	3	A^+	10	3 X 10 = 30
Course 5	3	E	5	3 X 5 = 15
Course 6	4	D	6	4 X 6 = 24
	20			139

Thus, **SGPA =139/20 =6.95**

(ii)Illustrationfor **CGPA**

Semester 1	Semester 2	Semester 3	Semester 4
Credit : 20 SGPA:6.9	Credit : 22 SGPA:7.8	Credit : 25 SGPA: 5.6	Credit : 26 SGPA:6.0
Semester 5	**Semester 6**		
Credit : 26 SGPA:6.3	Credit : 25 SGPA: 8.0		

Thus,**CGPA** $= \dfrac{20 \text{ x } 6.9 + 22 \text{ x } 7.8 + 25 \text{ x } 5.6 + 26 \text{ x } 6.0 + 26 \text{ x } 6.3 + 25 \text{ x } 8.0}{144} =$ **6.73**

Grades for the different semesters and overall programme are given based

On the corresponding SGPA/ CGPA as shown below:

SGPA/CGPA	Grade
Above 9	A+ - Outstanding
Above 8, but below or equal to 9	A - Excellent
Above 7, but below or equal to 8	B -Very Good
Above 6, but below or equal to 7	C – Good
Above 5, but below or equal to 6	D – Satisfactory
Above 4, but below or equal to 5	E – Adequate
4 or below	F – Failure

Note: A separate minimum of 30% marks each for internal and external (for both theory and practical) and aggregate minimum of 40% are required for a pass for a course.

For a pass in a programme, a separate minimum of Grade E is required for all the individual courses. If a candidate secures **F** Grade for any one of the courses offered in a Semester/Programme only **F** grade will be awarded for that Semester/Programme until he/she improves this to **E** grade or above within the permitted period. Candidate secure **E** grade and above will be eligible for higher studies.

1.10. Detailed Distribution of Courses in Statistics

Statistics (Complementary) for BSc. Mathematics Programme

Semester	Title of the Course	Hours per Week	Credit	Marks		Total
				Internal	External	
I	Descriptive Statistics	4	3	25	75	100
II	Probability and Statistics	4	3	25	75	100
III	Probability Distributions	5	4	25	75	100
IV	Statistical Inference	5	4	25	75	100

Statistics (Core) for BSc. Computer Applications

Semester	Title of the Course		Credit	Marks	Total

		Hours per Week		Internal	External	
I	Descriptive Statistics	4	3	25	75	100
II	Probability and Statistics	4	3	25	75	100
III	Probability Distributions	5	4	25	75	100
IV	Statistical Inference	5	4	25	75	100
	Sample Survey analysis and Design of Experiments	5	4	25	75	100
V	Statistical Quality Control and Operations Research	5	4	25	75	100
VI	Computer aided data analysis using Excel and R	5	4	25	75	100

1.11. MARKS DISTRIBUTION FOR EXTERNAL EXAMINATION AND INTERNAL EVALUATION

Marks distribution for external and internal assessments and the components for internal evaluation with their marks are shown below:

Components of the internal evaluation and their marks are as below.

a)   Marks of external Examination   :   75

b)   Marks of internal evaluation :   25

Components of Internal Evaluation	MARKS

Attendance	**5**
Assignment (Written assignments, preparation of models, charts, posters etc., field survey, field work)	**5**
Seminar/Viva/mini project	**5**
Test papers-2	**10**
Total	**25**

All the four components of the internal assessment are mandatory

Attendance Evaluation

% of attendance	Marks
90 and above	5
85 – 89	4
80-84	3
76-79	2
75	1

(Decimals are to be rounded to the next higher whole number)

1.12. CONDONATION OF SHORTAGE OF ATTENDANCE

Candidate can seek condonation of shortage of attendance only **once** in a 2 year course and **twice** in other courses of longer duration. Following are the rules regarding attendance requirement:-

1. Every candidate is to secure 75% attendance of the total duration of the course.

2. A candidate having a shortage of 10% can apply for condonation of shortage in prescribed form on genuine grounds. Condonation of shortage of attendance if any should be obtained at least 7 days before the commencement of the concerned semester examination.

3. It shall be the discretion of the Principal to consider such applications and condone the shortage on the merit of each case in consultation with the concerned course teacher and Head of the Department (HoD).

4. Unless the shortage of attendance is condoned, a candidate is not eligible to appear for the examination.

1.13 PATTERN OF QUESTIONS

Questions shall be set to assess knowledge acquired, standard application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. He/She shall also submit a detailed scheme of evaluation along with the question paper.

A question paper shall be a judicious mix of objective type, short answer type, short essay type /problem solving type and long essay type questions.

Pattern of questions for external examination for theory paper

without practical.

Total no. of questions	Number of questions to be answered	Marks of each question	Total marks
10	10	1	10
10	8	2	16
7	5	5	25
4	2	12	24
31	**25**	x	**75**

1.14 GRIEVANCE REDRESSAL MECHANISM

In order to address the grievance of students regarding Continuous internal assessment (CIA) a three-level Grievance Redressal mechanism is envisaged. A student can approach the upper level only if grievance is not addressed at the lower level.

Level 1: At the level of the concerned course teacher

Level 2: At the level of a department committee consisting of the Head of the Department,acoordinator of internal assessment for each programme nominated by the HoD and the course teacher concerned.

Level 3: A committee with the Principal as Chairman, Dean of the concerned Faculty, HOD of concerned   department and one member of the Academic council nominated by the principal every year as members.

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Syllabi

Syllabus of B.Sc. Statistics
(complementary course for B.Sc. Mathematics)

SEMESTER I

Descriptive Statistics

(Common for B.Sc. Mathematics and Computer Applications programmes)

- Course code:15U1CPSTA01   Total 60 hours

Aim: Statistics plays a pivotal role in decision making. Collection, classification, analysis and presentation of data are some of the important functions of Statistics. This course is designed to enable the students to understand the basic functions of statistics

Bridge course(5 hours)

(N.B. No questions shall be asked for the end semester examination from this section)

Meaning and scope of statistics, Population and sample, Census and Sampling, Advantages of sampling compared to census,Collection of data,   Primary and Secondary data,Questionnaire, Types of data – quantitative and qualitative data; Classification and Tabulation, Frequency distributions – discrete, continuous and cumulative frequency distributions; Representation of Statistical data – Bar diagrams, Pie diagrams, Histograms, Frequency polygons and frequency curves, ogives; stem and leaf charts

Module I (20 hours)

Measures of central tendency – Mean, Median, Mode, Geometric Mean, Harmonic Mean - their properties; Quantiles – quartiles, quintiles, deciles, percentiles; Absolute and relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation- their properties; Coefficient of Variation, Box plots, Lorenz Curve

Module II(10 hours)

Moments – Raw moments, Central moments, Absolute moments- Inter Relations; Skewness, Measures of skewness – Pearson, Bowley and Moment measure; Kurtosis – Moment measure of kurtosis

Module III (10) hours)

Scatter diagram, Curve fitting – Method of least squares, fitting of a straight line, second degree curve, exponential curve, power curve.

Module IV (15 hrs)

Index numbers – Simple and Weighted index numbers – Laspeyre's, Paasche's, Bowley's and Fisher's index numbers; Test for index numbers; Cost of living index numbers and their constructions.

Time series- Components of a time series data, Determination of trend- Moving average and curve fitting methods; Computation of and seasonal indices – Method of simple averages.

References

1   S.C. Gupta and V. K.Kapur. Fundamentals of Mathematical Statistics, Sultan Chand and sons New Delhi

2   S.P. Gupta. Statistical Methods ,Sultan Chand & Sons Delhi

3   B.L. Agarwal. Basic Statistics, New Age International (p) Ltd.

4   S.C.Gupta and V.K.Kapoor. Fundamentals of Applied Statistics,Sultan Chand & Sons Delhi

SEMESTER II

Probability and Statistics

(Common for B.Sc. Mathematics and Computer Applications programmes)

Course code: 15U2CPSTA02   Total 60 hours

Aim: Theory of probability plays a very important role in statistics for data analysis. Similarly, the concept of correlation and regression are some important tools to study the relationships between different characteristics of a data. This course is purported to enable the students in elementary methods of data analysis

Module I (20 hours)

Random Experiments,Sample Space, Events, Algebra of events, Borel field of events. Approaches to probability- Statistical, Classical and Axiomatic; Addition theorem of probability, Conditional probability, Multiplication theorem, Independence of events, Theorem of total probability,Bayes' theorem.

Module II (15 hours)

Random variables, probability distributions and their properties, Distribution functions,Reliability functions, change of variables (univariate case only)

Module III (10 hours)

Joint distribution of a pair of random variables, marginal and conditional distributions, Independence of random variables

Module IV (15 hours)

Correlation and its properties, Rank correlation, Regression equations and their identification.Probable error, Coefficient of determination,Linear regression(Three variables case), partial and multiple correlations, their expressionsand properties (no derivation)

References

1.   S.P. Gupta: Statistical Methods .Sultan Chand and Sons Delhi.
2.   S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3.   B.L. Agarwal: Basic Statistics, New Age International (p) Ltd.
4.   ParimalMukhopadhya: Mathematical Statistics, New Central Book Agency (p) Ltd, Calcutta

5. Murray R Spiegel, John Schiller, R. AluSrinivassan: Theory and problems of PROBABILITY AND STATISTICS, Schaum's Outlines, Tata McGraw-Hill Publishing Company Ltd

SEMESTER III

Probability Distributions

(Common for B.Sc. Mathematics and Computer Applications programmes)

Course code: 15U3CPSTA03   Total 75 hours

Aim: This course is designed to enable the students to understand the types of distributions and hence to determine the correct tools to be used for data analysis.

Module I (20hours)

Mathematical Expectation- Moments, Moment generating functions(m.g.f.) and its properties, Characteristic function and its properties, Conditional expectation, Cauchy Schwartz inequality, Bivariate moments, Correlation between two random variables

Module II (20 hours)

Probability distributions -Uniform, Bernoulli, Geometric, Exponential, Gamma, Beta, Binomial, Poisson,– their properties, mean, variance, m.g.fs; Lack of memory property(LMP). Fitting of binomial and Poisson distributions
Normal, Standard normal and Lognormal distributions – their properties, mean, variance, m.g.fs; Fitting of a normal distribution

Module III (15 hours)

Tchebycheff's inequality, Bernoulli's law of large numbers, Weak law of large numbers, Central limit theorem (Lindberg Levy form with proof),Limiting distributions of binomial and Poisson distributions

Module IV(20hours)

Methods of sampling – Simple random sampling, systematic sampling and stratified sampling, Statistic and Parameter, Sampling distributions, standard error, Sampling distribution of mean and Variance, Chi-square, t and F – their properties and interrelations

References

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons

2. Hogg, R.V. and Craig A.T. (1970). Introduction to Mathematical Statistics, Amerind Publishing Co, Pvt. Ltd.

3. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.

4. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.

5. Johnson, N.L, Kotz, S. and Balakrishnan N. (1994). Continuous Univariate Distribution, John Wiley, New York.

6. Johnson, N.L, Kotz, S. and Kemp, A.W. :Univariate Discrete Distributions, John Wiley, New York.

7. Daroga Singh, F.S.Chaudhary :Theoryand Analysis of Sample survey DesignsNew Age International (p) Ltd.

8. Murthy M.N.: Sampling theory and Methods, Statistical Publishing Society, Calcutta.

SEMESTER IV

STATISTICAL INFERENCE

(Common for B.Sc. Mathematics and Computer Applications programmes)

Course code:15U4CPSTA04   Total 75 hours

Aim: Making inference based on statistical data is the key of any research activity. This course mainly focus on statistical inference consisting of estimation techniques and testing of hypothesis The mini project using statistical softwares like SPSS, R etc will certainly enable the students to handle huge data set in a professional manner

Module I (15 hours)

Concepts of Estimation, Types of Estimation - Point Estimation, Interval Estimation; Properties of Estimation -Unbiasedness, Efficiency, Consistency and Sufficiency

Module II (15hrs)

Methods of Estimation MLE, Methods of Moments, Method of Minimum Variance, Cramer-Rao Inequality (without proof), Interval Estimation for Mean, Variance and Proportion.

Module III(20 hours)

Testing of hypothesis,Statistical hypothesis, Simple and composite hypothesis , Null and Alternate hypotheses, Type I and Type II errors, Critical Region, Size of the test, P value, Power, Neyman-Pearson approach(without proof) , Small sample tests – Z-test,, t- test, Paired t –test, Chi-square test for testing variance and F test for testing equality of variances

Module IV (15 hours)

Large Sample test- Z test for testing population means, equality of population means; Testing population proportion, equality of two population proportions; Chi-Square test - goodness of fit, test of independence; Analysis of Variance (one way classification), Non- parametric tests Wilcoxon signed rank test, Mann Whitney U test

Mini Project (10 hrs) [internals only[*]]

Data Analysis using statistical software – Excel/R/SPSS.

*The mini project carries 10 marks and replaces the internal components, namely assignments and seminar

References

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons

2. Richard Johnson (2006): Probability and Statistics for Engineers (Miller and Freund). Prentice Hall.

3. S.C Gupta : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

4. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.

5. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.

Syllabus of B.Sc. Statistics
(core course for B.Sc. Computer Applications)

SEMESTER I

Descriptive Statistics

(Common for B.Sc. Mathematics and Computer Applications programmes)

Course code:15U1CRSTA01   Total 60 hours

Aim: Statistics plays a pivotal role in decision making. Collection, classification, analysis and presentation of data are some of the important functions of Statistics. This course is designed to enable the students to understand the basic functions of statistics

Bridge course(5 hours)

(N.B. No questions shall be asked for the end semester examination from this section)

Meaning and scope of statistics, Population and sample, Census and Sampling, Advantages of sampling compared to census,Collection of data,   Primary and Secondary data,Questionnaire, Types of data – quantitative and qualitative data; Classification and Tabulation, Frequency distributions – discrete, continuous and cumulative frequency distributions; Representation of Statistical data – Bar diagrams, Pie diagrams, Histograms, Frequency polygons and frequency curves, ogives; stem and leaf charts

Module I (20 hours)

Measures of central tendency – Mean, Median, Mode, Geometric Mean, Harmonic Mean - their properties; Quantiles – quartiles, quintiles, deciles, percentiles; Absolute and relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation- their properties; Coefficient of Variation, Box plots, Lorenz Curve

Module II(10 hours)

Moments – Raw moments, Central moments, Absolute moments- Inter Relations; Skewness, Measures of skewness – Pearson, Bowley and Moment measure; Kurtosis – Moment measure of kurtosis

Module III (10) hours)

Scatter diagram, Curve fitting – Method of least squares, fitting of a straight line, second degree curve, exponential curve, power curve.

Module IV (15 hrs)

Index numbers – Simple and Weighted index numbers – Laspeyre's, Paasche's, Bowley's and Fisher's index numbers; Test for index numbers; Cost of living index numbers and their constructions.

Time series- Components of a time series data, Determination of trend- Moving average and curve fitting methods; Computation of and seasonal indices – Method of simple averages.

References

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2   S.P. Gupta. Statistical Methods ,Sultan Chand & Sons Delhi

3   B.L. Agarwal. Basic Statistics, New Age International (p) Ltd.

4   S.C.Gupta and V.K.Kapoor. Fundamentals of Applied Statistics,Sultan Chand & Sons Delhi

SEMESTER II

Probability and Statistics

(Common for B.Sc. Mathematics and Computer Applications programmes)

Course code:15U2CRSTA02   Total 60 hours

Aim: Theory of probability plays a very important role in statistics for data analysis. Similarly, the concept of correlation and regression are some important tools to study the relationships between different characteristics of a data. This course is purported to enable the students in elementary methods of data analysis

Module I (20 hours)

Random Experiments, Sample Space, Events, Algebra of events, Borel field of events. Approaches to probability- Statistical, Classical and Axiomatic; Addition theorem of probability, Conditional probability, Multiplication theorem, Independence of events, Theorem of total probability, Bayes' theorem.

Module II (15 hours)

Random variables, probability distributions and their properties, Distribution functions, Reliability functions, change of variables (univariate case only)

Module III (10 hours)

Joint distribution of a pair of random variables, marginal and conditional distributions, Independence of random variables

Module IV (15 hours)

Correlation and its properties, Rank correlation, Regression equations and their identification. Probable error, Coefficient of determination, Linear regression(Three variables case), partial and multiple correlations, their expression sand properties (no derivation)

References

1.   S.P. Gupta: Statistical Methods .Sultan Chand and Sons Delhi.

2.   S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

3.   B.L. Agarwal: Basic Statistics, New Age International (p) Ltd.

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5.   Murray R Spiegel, John Schiller, R. AluSrinivassan: Theory and problems of PROBABILITY AND STATISTICS, Schaum's Outlines, Tata McGraw-Hill Publishing Company Ltd

SEMESTER III

Probability Distributions

(Common for B.Sc. Mathematics and Computer Applications programmes)

Course code:15U3CRSTA03   Total 75 hours

Aim: This course is designed to enable the students to understand the types of distributions and hence to determine the correct tools to be used for data analysis.

Module I (20hours)
Mathematical Expectation- Moments, Moment generating functions(m.g.f.) and its properties, Characteristic function and its properties, Conditional expectation, Cauchy Schwartz inequality, Bivariate moments, Correlation between two random variables

Module II (20 hours)
Probability distributions -Uniform, Bernoulli, Geometric, Exponential, Gamma, Beta, Binomial, Poisson,– their properties, mean, variance, m.g.fs; Lack of memory property(LMP). Fitting of binomial and Poisson distributions
Normal, Standard normal and Lognormal distributions – their properties, mean, variance, m.g.fs; Fitting of a normal distribution

Module III (15 hours)
Tchebycheff's inequality, Bernoulli's law of large numbers, Weak law of large numbers, Central limit theorem (Lindberg Levy form with proof),Limiting distributions of binomial and Poisson distributions

Module IV(20hours)
Methods of sampling – Simple random sampling, systematic sampling and stratified sampling, Statistic and Parameter, Sampling distributions, standard error, Sampling distribution of mean and Variance, Chi-square, t and F – their properties and interrelations

References

1.   S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons

2.   Hogg, R.V. and Craig A.T. (1970). Introduction to Mathematical Statistics, Amerind Publishing Co, Pvt. Ltd.

3.   V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.

4.   Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.

5.   Johnson, N.L, Kotz, S. and Balakrishnan N. (1994). Continuous Univariate Distribution, John Wiley, New York.

6.   Johnson, N.L, Kotz, S. and Kemp, A.W. :Univariate Discrete Distributions, John Wiley, New York.

7   Daroga Singh, F.S.Chaudhary :Theoryand Analysis of Sample survey DesignsNew Age International (p) Ltd.

8   Murthy M.N.: Sampling theory and Methods, Statistical Publishing Society, Calcutta.

SEMESTER IV

STATISTICAL INFERENCE

(Common for B.Sc. Mathematics and Computer Applications programmes)

Course code:15U4CRSTA04   Total 75 hours

Aim: Making inference based on statistical data is the key of any research activity. This course mainly focus on statistical inference consisting of estimation techniques and testing of hypothesis The mini project using statistical softwares like SPSS, R etc will certainly enable the students to handle huge data set in a professional manner

Module I (15 hours)

Concepts of Estimation, Types of Estimation - Point Estimation, Interval Estimation; Properties of Estimation -Unbiasedness, Efficiency, Consistency and Sufficiency

Module II (15hrs)

Methods of Estimation MLE, Methods of Moments, Method of Minimum Variance, Cramer-Rao Inequality (without proof), Interval Estimation for Mean, Variance and Proportion.

Module III(20 hours)

Testing of hypothesis, Statistical hypothesis, Simple and composite hypothesis , Null and Alternate hypotheses, Type I and Type II errors, Critical Region, Size of the test, P value, Power, Neyman- Pearson approach(without proof) , Small sample tests – Z-test,, t- test, Paired t –test, Chi-square test for testing variance and F test for testing equality of variances

Module IV (15 hours)

Large Sample test- Z test for testing population means, equality of population means; Testing population proportion, equality of two population proportions; Chi-Square test - goodness of fit, test of independence; Analysis of Variance (one way classification), Non- parametric tests Wilcoxon signed rank test, Mann Whitney U test

Mini Project (10 hrs) [internals only[*]]

Data Analysis using statistical software – Excel/R/SPSS.

*The mini project carries 10 marks and replaces the internal components, namely assignments and seminar

References

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons

2. Richard Johnson (2006): Probability and Statistics for Engineers (Miller and Freund). Prentice Hall.

3. S.C Gupta : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

4. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.

5. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.

SEMESTER IV

SAMPLE SURVEY ANALYSIS AND DESIGN OF EXPERIMENTS

(For B.Sc. Computer Applications programme only)

Course code:15U4CRSTA05   Total 75 Hours

Aim: The success of any statistical investigation depends on the proper selection of samples from the area of study. This course introduces the various methods of sampling and estimation techniques. It also introduces various experimental designs, criteria of selecting appropriate designs.

Module   I (20 hours)

Types of sampling – Probability and non probability sampling- Judgment, Mixed Sampling, Quota sampling, Sampling and Non sampling errors

Simple random sampling: Simple random sampling with and without replacement, procedures of selecting a sample, unbiased estimates of the population mean and population total-their variances and estimates of the variances, confidence interval for population mean and total, simple random sampling for attributes, estimation of sample size based on desired accuracy for variables and attributes.

Module II (20 hours)

Stratified random sampling: Estimation of the population mean and population total-their variances and estimates of the variances, proportional allocation and Neyman allocation of sample sizes, cost function, optimum allocation and comparison with simple random sampling.

Module III(15 hours)

Fundamental principles of experimentation, need for design of experiments, analysis of one way, two way and three way classified data.

Module IV(20 hours)

Basic Designs- CRD, RBD, LSD and their analysis.

References

1.   Daroga Singh, F.S.Chaudhary :Theory and Analysis of Sample survey Designs,New Age International (P) Ltd.

2.   S.C. Gupta and V.K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand & Co. New Delhi.

3.   Cochran W.G.: Sampling Techniques, Wiley Eastern Ltd.

4   D.D.Joshi: Linear Estimation And Design of Experiments,New Age International (P) Ltd.

SEMESTER V

STATISTICAL QUALITY CONTROL AND OPERATIONS RESEARCH

(For B.Sc. Computer Applications programme only)

Course code:15U5CRSTA06   Total 75 Hours

Aim: This course introduces the control chart techniques as a tool to see whether a production process is in control or not. Also it enables the students to gain knowledge about various optimization techniques relating to business and management

Module I (15 hours)

Aims and Objectives of statistical process control and product control, importance of SQC in industry, Control charts, OC curve for control charts, probability limit, tolerance limit, 3 sigma limit and warning limit.

Module II (20 hours)

Control charts for variables – $\overline{X}$, R chart determining trial control limit and out of control limit and their interpretation.
Control Charts for attributes – p ,np and c chart(Introduction only)

Module III(20 hours)

O R – Introduction, applications, advantages and disadvantages; Linear Programming Problems (LPP – graphic method review, simplex method, duality

Module IV(20 hours)

Transportation and assignment problems – North West, least cost, Vogel's and UV method
Game Theory – Introduction, Two person zero sum game, pure and mixed strategies, saddle point solution.

References

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand and Sons.

2. M. Mahajan: Statistical Quality Control

3. R.C. Gupta: Statistical Quality Control

4. KantiSwarup, Gupta P.K., Manmohan: Operations Research, Sultan Chand and Sons, New Delhi.

5. Gupta R.K.: Operations Research, Krishna PrakashanMandir, Meerut.

6. Schaums Outline Series: Operation Research.

7 Douglass C Montgomery: Introduction to Statistical Quality Control, Wiley India Edition

SEMESTER VI

COMPUTER AIDED DATA ANALYSIS USING EXCEL AND R

(For B.Sc. Computer Applications programmeonly)

Course code:15U6CRSTA07   Total 75 Hours

Aim: This course is intended to get the students an experience in using statistical software such as R and Excel for data analysis.

Module I(20 hours)

Elementary Statistical analysis using Excel: Statistical tests concerning means (One sample Z test for mean, One sample t test for mean, Two sample Z test for means, Two sample t test for means, Paired t test), The F test for variance

Module II (15 hrs)

Correlation Analysis- simple and multiple correlation , Simple Regression analysis, Fitting of Trend line

Module III (20hours)

Introduction to R with history of development of R. R download and library functions. R console, R symbols, functions and terms. Communicating with R using different ways (using word processor, excel, SPSS etc.). Getting data into R. Input data from keyboard using c ( ), scan ( ) functions.

Module IV (20 hours)

Handling of large data using R, combining vectors into a rectangular matrix, use of rbind(), cbind( ) functions. Reading from ASCII text file- read table( ) function, file.choose( ) function. Use of data created by other statistical packages, Data frames, colname( ) function, R workspace, attach( ) function.

References

1. Stephen L Nelson and Julia Kelly (2001) The complete Reference Office XP, Tata McGraw-Hill

2. Sarma KVS (2001), Statistics Made Simple Do It Yourself on PC, Prentice Hall of India.

3. The R book. (2007) Michael J. Crawley.

4. Statistics: An introduction using R (2005) . Michael J. Crawley.

5. Hand book of Statistical analysis using R (2006). Brian S. Everitt and TorstenHothorn.