FACULTY OF SCIENCE

SYLLABI

FOR

STATISTICS SUBSIDIARY
FOR
B.Sc. ( HONOURS SCHOOL)MATHEMATICS,
MATH & COMPUTING, BIPHYSICS &
MICROBIOLOGY

EXAMINATIONS 2011-2012

--:O:--
SEMESTER-I

Paper I: SC 101S-Probability and Statistical Methods –I

Distributions of marks:

<table>
<thead>
<tr>
<th>Theory:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) final paper</td>
</tr>
<tr>
<td>(ii) Internal Assessment</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td><strong>Time</strong></td>
</tr>
</tbody>
</table>

NOTE: Theory paper will have two sections. Section-I will have five questions and Section-II will have three questions. A candidate is required to attempt FIVE questions by selecting at least two questions from each section.

SECTION - I

Sample space, algebra of events, axiomatic definition of probability, combinatorial problems. Independent events, conditional probability. Partition of sample space, total probability theorem, Bayes theorem. Random variables: discrete and continuous, density and distribution functions, expectation, variance, moments, probability generating and moment generating functions, reproductive property.

Bernoulli, binomial, Poisson, hypergeometric, geometric, negative binomial, uniform, exponential, normal, gamma, beta, Cauchy and Laplace distributions.

Chebyshev’s inequality, weak law of large numbers, De-Moivre Laplace and Lindeberg-Levy Central limit theorems.

SECTION – II


Fitting of binomial, Poisson and normal distributions.

SUGGESTED READINGS:


PRACTICAL

<table>
<thead>
<tr>
<th>Marks</th>
<th>: 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>: 4 Hours</td>
</tr>
</tbody>
</table>

The practicals will be based on topics from both the sections.

NOTE: 1. There will be five questions in the practical paper. A candidate is required to attempt three questions.
2. The distribution of marks in practical will be as under:

- Practical Exercises : 15 marks
- Record of Practicals : 05 marks
- Viva-Voce : 05 marks

**SEMESTER-II**

**Paper I: SC 121S-Probability and Statistical Methods –II**

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**Distributions of marks:**

<table>
<thead>
<tr>
<th>Type</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Final paper</td>
<td>60</td>
</tr>
<tr>
<td>(ii) Internal Assessment</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td><strong>3 Hours</strong></td>
</tr>
</tbody>
</table>

**NOTE:** Theory paper will have two sections. Section-I will have five questions and Section-II will have three questions. A candidate is required to attempt FIVE questions by selecting at least two questions from each section.

**SECTION - I**

Two dimensional random variable, marginal and conditional distributions, conditional expectation, covariance and correlation, bivariate moment generating function, product moments. Multinomial distribution and bivariate normal distribution.

Correlation and simple regression, rank correlation.

Idea of population, parameter, sample, statistic. Independence and distributions of the sample mean and variance from a normal distribution. Sampling distributions: Chi-square, t and F-distributions and their relations. Exact and asymptotic distributions of the sample mean from Binomial and Poisson populations.

**SECTION – II**

Need for sampling, census and sample surveys, basic concepts in sampling. Sample selection and sample size. Sampling and non-sampling errors.

Some-basic sampling methods: simple random sampling (SRS) with and without replacement, stratified random sampling under various allocations. Estimation of population mean and total, variance and standard error of estimators under simple and stratified sampling schemes.

**SUGGESTED READINGS:**


**PRACTICAL**

<table>
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The practicals will be based on topics from both the sections.

**NOTE:**

1. There will be five questions in the practical paper. A candidate is required to attempt three questions.
2. The distribution of marks in practical will be as under:

   - Practical Exercises : 15 marks
   - Record of Practicals : 05 marks
   - Viva-Voce : 05 marks
Outlines of Text, Syllabi & Courses of Reading in the subject of Statistics Subsidiary for B.Sc. (Hons. School) in Mathematics 3rd Semester Examination, December 2011.

Semester III
PAPER: Applied Statistics-I
(Theory: 75 Marks & Practical 25 Marks)

Distributions of marks:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td>Final paper</td>
<td>60</td>
</tr>
<tr>
<td>Theory</td>
<td>Internal Assessment</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>

Note: Theory paper will have 8 questions. A candidate is required to attempt any FIVE questions.

Outline of Syllabus

Concepts of estimation, unbiasedness, sufficiency, consistency and efficiency. Factorization theorem (statement and applications to standard distributions). Complete statistic (definition and examples).


Principles of test of significance: Null and alternative hypotheses (simple and composite), Type-I and Type-II errors, critical region, level of significance, idea of p-value, size and power, best critical region, most powerful test, uniformly most powerful test, Neyman Pearson Lemma (statement and applications to construct most powerful test) and its generalization to construct UMP test for simple null against directional composite alternative hypothesis. Likelihood ratio criterion. Tests of significance for the mean(s) and variance(s) of normal distribution(s) (one sample and two sample problems). Chi-square test of goodness of fit, test for independence of two attributes (2x2 and pxq contingency tables). Tests of significance for correlation and regression coefficients.

General methods of constructing confidence intervals for parameters of normal distribution (one and two sample problems).

References:


Additional References:


PRACTICAL

<table>
<thead>
<tr>
<th>Marks</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>4 Hours</td>
</tr>
</tbody>
</table>

The practicals will be based on topics covered in the syllabus.

NOTE:
1. There will be five questions in the practical paper. A candidate is required to attempt three questions.
2. The distribution of marks in practical will be as under:
   - Practical Exercises : 15 marks
   - Record of Practicals : 05 marks
   - Viva-Voce : 05 marks
Outlines of Text, Syllabi & Courses of Reading in the subject of Statistics Subsidiary for B.Sc. (Hons. School) in Mathematics 4th Semester Examination, May/June 2012.

**Semester IV**

**PAPER: Applied Statistics-II**

(Theory: 75 Marks & Practical 25 Marks)

Distributions of marks:

<table>
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<tr>
<td>(ii) Internal Assessment : 15 marks</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong> : 75 marks</td>
<td></td>
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**Note:** Theory paper will have 8 questions. A candidate is required to attempt any FIVE questions.

**Outline of Syllabus**

Design of Experiments, assignable and un-assignable sources of variation, treatments, blocks. Fixed, mixed and random effect models. One way analysis of variance, two way analysis of variance (with one and multiple but equal observations per cell), estimates of main effects, tests of significance for equality of effects. Principles of design of experiments. Common designs- CRD, RBD, their layout, analysis, merits and demerits.

Importance of Statistical methods in industrial research and practice. Meaning of quality, quality assurance and process control. General theory of control charts, causes of variations in quality, control limits, sub-grouping, summary of out of control criteria. Control Charts for variables - \( \bar{X} \) and R charts. Control charts for attributes - np, p, c and u - charts. Process capability indices: \( C_p \), \( C_{pu} \), \( C_{pl} \), \( C_{pk} \).

Principle of acceptance sampling- problem of lot acceptance, stipulation of good and bad lots, concepts of producer’s and consumer’s risks, AQL, LTPD, AOQL, ATI, ASN and OC functions. Single and double sampling plans and their ATI, ASN and OC functions.

**References:**


**Additional References:**


**PRACTICAL**

<table>
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<th>Marks</th>
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<tbody>
<tr>
<td>Time</td>
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The practicals will be based on topics covered in the syllabus.

**NOTE:** 1. There will be five questions in the practical paper. A candidate is required to attempt three questions.

2. The distribution of marks in practical will be as under:

   - Practical Exercises : 15 marks
   - Record of Practicals : 05 marks
   - Viva-Voce : 05 marks
Statistics subsidiary syllabi for B.Sc.(Hons. School) in Bio-Physics

Paper: BIOSTATISTICS-I

Distributions of marks:

<table>
<thead>
<tr>
<th></th>
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<th>Practical:</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>(i)</td>
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</tr>
<tr>
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<td>Assessment: 15</td>
<td>Assessment: 5</td>
</tr>
<tr>
<td>Total</td>
<td>75 marks</td>
<td>Total: 25 marks</td>
</tr>
</tbody>
</table>

Time: 3 hours theory and 4 hours practical paper.

Note: (i) Theory paper will have 8 questions. A candidate is required to attempt any five questions.
(ii) Practical paper will have 5 questions. A candidate is required to attempt any three questions.

SYLLABUS


Intuitive concept of probability as a limit of relative frequency, equally likely outcomes, some elementary combinatorial problems, conditional probability, Bayes theorem and its applications. Sensitivity, specificity and predictive value positive and negative. Random variables, probability mass function and probability density function. Expectation and variance of a random variable variance. Bernoulli trials, binomial, Poisson, negative binomial, exponential and normal distributions. Fitting of binomial, Poisson and normal distributions.

Scatter diagram, correlation and linear regression, Spearman’s rank correlation coefficient.

SUGGESTED READINGS:


SUPPLEMENTARY READINGS:


NOTE: The distribution of 25 marks of End Semester practical examination will be as under:

- Practical Questions: 15 marks
- Record of practicals: 5 marks
- Internal Assesment: 5 marks
- Viva-Voce: 5 marks
Statistics subsidiary syllabi for B.Sc.(Hons. School) in Bio-Physics
Fourth Semester Examination May 2012

Paper: BIOSTATISTICS-II

Distributions of marks:
Theory:  (i) Final paper : 60 marks
         (ii) Internal Assessment : 15 marks
       Total : 75 marks
Practical (i) Final paper : 20 marks
         (ii) Internal Assessment : 5 marks
        Total : 25 marks

Time : 3 hours theory and 4 hours practical paper.

Note: (i) Theory paper will have 8 questions. A candidate is required to attempt any five questions.
      (ii) Practical paper will have 5 questions. A candidate is required to attempt any three questions.

SYLLABUS
Estimation of population means, confidence intervals for the parameters of normal distribution under different conditions (two sample problems also).

The basic idea of significance test. Null and alternative hypothesis. Type I & II errors, level of significance. Tests of hypotheses for the parameters of a normal distribution (two sample problems also). Tests for the significance of correlation coefficient. Sign test for median, Sign test for symmetry, Wilcoxon two-sample test.

Categorical data: Tests of proportions, tests of association, goodness-of-fit using Chi-square test, Yates’ correction.

Analysis of variance, one-way and two-way classifications. Brief exposure of three basic principles of design of experiments, treatment, plot and block. Analysis of completely randomized design, randomized complete block design. Bioassay.

SUGGESTED READINGS:

SUPPLEMENTARY READINGS:

NOTE: The distribution of 25 marks of End Semester practical examination will be as under:
       Practical Questions : 15 marks
       Record of practicals/ : 5 marks
       Internal Assessment
       Viva-Voce : 5 marks
Statistics subsidiary syllabi for B.Sc. (Hons. School) in Microbiology  

Paper: BIOSTATISTICS-I

Distributions of marks:

Theory:  
(i) Final paper : 60 marks  
(ii) Internal Assessment : 15 marks  
Total : 75 marks

Practical:  
(i) Final paper : 20 marks  
(ii) Internal Assessment : 5 marks  
Total : 25 marks

Time: 3 hours theory and 4 hours practical paper.

Note:  
(i) Theory paper will have 8 questions. A candidate is required to attempt any five questions.  
(ii) Practical paper will have 5 questions. A candidate is required to attempt any three questions.

SYLLABUS


Intuitive concept of probability as a limit of relative frequency, equally likely outcomes, some elementary combinatorial problems, conditional probability, Bayes theorem and its applications, Sensitivity, Specificity and predictive value positive and negative. Random variables, probability mass function and probability density function. Expectation and variance of a random variable. Bernoulli trials, binomial, Poisson, negative binomial, exponential and normal distributions. Fitting of binomial, Poisson and normal distributions.

Scatter diagram, Correlation and linear regression, Spearman’s rank correlation coefficient.

SUGGESTED READINGS:


SUPPLEMENTARY READINGS:


NOTE: The distribution of 25 marks of End Semester practical examination will be as under:

Practical Questions : 15 marks  
Record of practicals/ Internal Assessment : 5 marks  
Viva-Voce : 5 marks
Statistics subsidiary syllabi for B.Sc.(Hons. School.) in Microbiology

Paper: BIOSTATISTICS-II

Distributions of marks:

Theory:
(i) Final paper : 60 marks
(ii) Internal Assessment : 15 marks
Total : 75 marks

Practical:
(i) Final paper : 20 marks
(ii) Internal Assessment : 5 marks
Total : 25 marks

Time: 3 hours theory and 4 hours practical paper.

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SYLLABUS

Estimation of population means, confidence intervals for the parameters of normal distribution under different conditions (two sample problems also).

The basic idea of significance test. Null and alternative hypotheses, Type I and Type II errors, level of significance. Tests of hypotheses for the parameters of a normal distribution (two sample problems also). Tests for the significance of correlation coefficient. Sign test for median. Sign test for symmetry, Wilcoxon two-sample test.

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SUGGESTED READINGS:

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NOTE: The distribution of 25 marks of End Semester practical examination will be as under:

Practical Questions : 15 marks
Record of Practicals/ : 5 marks
Internal Assessment
Viva-Voce : 5 marks

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