SYLLABUS FOR B.Sc. STATISTICS

(CBCS Pattern)

Effective from the Academic Year 2019-2020
The revised syllabus shall be effective from the academic year 2019-2020 onwards.

**DURATION OF THE COURSE**

The duration for the B.Sc., Statistics shall be of six consecutive semesters (three years). The maximum duration allowed for each student to acquire prescribed number of credits in order to complete the Programme of Study shall be twelve consecutive semesters (six years).

**AGE LIMIT**

The rules as applicable to other Under Graduate courses as prevailing in Pondicherry University.

**ELIGIBILITY FOR ADMISSION**

Candidates for admission to the first year of the B.Sc. (Statistics) degree shall require to have passed Higher Secondary course with Mathematics/Statistics as one of the subject conducted by the Government of Tamil Nadu or any other equivalent system recognized by the Government of Puducherry based on the admission criteria laid down by Pondicherry University are eligible to apply.

**PROGRAM OBJECTIVES**

The degree of Bachelor of Science in Statistics aims to train the students in the development and application of statistical techniques for analyzing data arising in scientific investigation.

- **Employability**
  Statistics graduates shall be suitably employed in Central/State government organizations, financial and banking industries, corporate and insurance sectors for data analysis and drawing conclusions for socio-economic issues.

- **Higher Education**

- **Professional and Ethical Values**
  Statistics graduates cultivate professional and ethical attitudes with effective communication skills, teamwork and multidisciplinary approach related to data analysis.
PROGRAM OUTCOMES
Graduating students of Statistics from Pondicherry University will
(i) gain necessary Mathematical skills
(ii) be capable of analyzing any numerical data and thereby drawing valid
conclusions for making decision related to problems arising from industry,
corporate sector, banking and finance, insurance and health industries
and Central/State government organizations.
(iii) get predictive analytical skills
(iv) be able to conduct sample survey for many socio-economic problems.

MEDIUM OF INSTRUCTION

The medium of instruction for all the courses, except Arabic, Bengali, French,
Hindi, Malayalam, Sanskrit, Tamil, and Telugu, shall be English.

CREDITS

- Every course (core/elective/foundation) is assigned certain credits. A
credit is equated with one period of teaching for theory or two periods
for laboratory/practical course work per week in a Semester.
- One teaching period shall be for 60 minutes duration.
- One credit shall be assigned to one week of field training wherein the
students spend the entire duration in the field and supervised by the
faculty member(s).
- Maximum two credits shall be assigned to one month of Internship
undergone in Institutions/industry/company of high repute as
approved by the Chairman of BOS.
- Minimum number of credits to be earned by a student for the award of
any UG Programme in Arts, Science, and Commerce disciplines is 120.
Out of these, minimum 72 credits are mandatory from Discipline
Specific Core Courses (DSC) and Discipline Specific Elective Courses
(DSE) put together for obtaining a degree in a particular discipline.
- Minimum number of credit requirements as defined by respective BOS
may go beyond 120 for certain Programmes of Study, but not less than
120 credits. It is not mandatory that the total number of credits is
evenly distributed among all the six semesters.

COURSE STRUCTURE

- A course also referred to as ‘subject’ is a component of a given
Programme of Study. All the courses need not have same weightage in
terms of credits allotted to them.
- Every Programme of Study has Discipline Specific Core (DSC) Courses,
Discipline Specific Elective (DSE) Courses, Ability Enhancement
Compulsory Courses (AECC), Skill Enhancement Courses (SEC), and
Generic Elective (GE) courses apart from Modern Indian Language (MIL) and English.

- A course may be designed to cover lectures/tutorials/laboratory work/field work/outreach activities/project work/vocational training/viva/seminars/term papers/assignments/presentations/self-study or a combination of some of these.

<table>
<thead>
<tr>
<th>Course</th>
<th>Course Name</th>
<th>Number of credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL (2 or 4 Semesters)</td>
<td>MIL</td>
<td>6-12 Credits</td>
</tr>
<tr>
<td>English (2 or 4 Semesters)</td>
<td>English</td>
<td>6-12 Credits</td>
</tr>
<tr>
<td>DSC</td>
<td>DSC Course</td>
<td>48-60 Credits</td>
</tr>
<tr>
<td>DSE</td>
<td>DSE Course</td>
<td>24-30 Credits</td>
</tr>
<tr>
<td>AECC (2 Semesters)</td>
<td>AECC</td>
<td>(2x2)=4 Credits</td>
</tr>
<tr>
<td>SEC (4 Semesters)</td>
<td>SEC</td>
<td>(4x2)= 8 Credits</td>
</tr>
<tr>
<td>GE (2 Semesters)</td>
<td>GEC</td>
<td>(2x3) =6 Credits</td>
</tr>
</tbody>
</table>

- At least 60% (72 Credits) of the total minimum credit requirement must be earned by the student in DSC and DSE courses put together as defined by respective Boards of Studies (BOS) in order to obtain a degree in a specific discipline.

**PATTERN OF EXAMINATION**

- The End-Semester examination for each course in a Programme of Study shall be conducted by the Pondicherry University for a maximum of **75 marks** and Internal Continuous Assessment for **25 marks**.

- Internal assessment for all theory courses shall be done on the basis of two Internal Assessment tests (15 marks from the average of two test marks), term papers/assignments/seminars/case demonstrations/presentations/write-ups/viva etc. (5 marks) and attendance (5 marks). The following weightage shall be given to attendance:
  - 95% - 100% (5 marks)
  - 90% - 94% (4 marks)
  - 85% - 89% (3 marks)
  - 80% - 84% (2 marks)
  - 75% - 79% (1 mark)

- Internal Assessment for practical courses involving Laboratory/Field work/Project work, appropriate distribution of marks for Practical Record/Project Report, Practical end-semester exam, Viva shall be decided by the BOS.

- A schedule of Internal Assessment tests shall be prepared by each College commonly to all departments in the beginning of each semester.
Internal Assessment marks shall be displayed a week before the commencement of end-semester examinations.

- End-semester examination shall be conducted for all courses offered. The duration of the end-semester examination shall be 3 hours.

- Every student has to pay examination fee per Credit basis as fixed by the University.

- A schedule of end-semester examinations will be prepared and displayed by the University much in advance.

- No student with less than 75% in any particular course shall be permitted to attend the end-semester examination and shall be given grade FA-failure due to lack of attendance. However, an overall condonation of 10% is permitted for valid reasons (NCC, NSS, Swachh Bharat, Sports) or valid medical reasons. A student who has been awarded FA shall repeat the course when offered. The Principal/Head of the Department shall ensure that the candidate is informed about the lack of attendance before the commencement of end-semester examination and confirm that such candidates are not permitted to write the examination.

- To pass a course, the student must secure a minimum of 40 out of 100 marks (40%) in the internal and the end-semester examination put together.

- A student who has earned the required number of 120 credits by clearing all the required courses shall be declared as pass even if he/she could not clear optional courses which were taken in excess of the required number of courses.

- Result Passing Board for each Programme of Study shall be constituted by the Pondicherry University from time to time.

- Revaluation and re totaling of the answer scripts shall be allowed within the stipulated period of time as decided by the Controller of Examinations (COE) after paying the required amount of fee.

**SUPPLEMENTARY EXAMINATION**

- A failed student who meets the attendance requirement may be permitted to register for the next end-semester examination in the following semester itself.
• Students who have failed due to insufficient attendance and/or less than 40% Internal Assessment marks should repeat the course as and when offered.

**GRADING AND GRADE CARD**

Letter grades shall be used to assess the performance of students in each course by converting final marks (out of 100) into grades. In case of fractions the marks shall be rounded off to next integer. The following shall be used to convert marks into awarding grades:

<table>
<thead>
<tr>
<th>Range of Marks</th>
<th>Letter Grade</th>
<th>Grade Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>96-100</td>
<td>O</td>
<td>10</td>
</tr>
<tr>
<td>86-95</td>
<td>A+</td>
<td>09</td>
</tr>
<tr>
<td>76-85</td>
<td>A</td>
<td>08</td>
</tr>
<tr>
<td>66-75</td>
<td>B+</td>
<td>07</td>
</tr>
<tr>
<td>56-65</td>
<td>B</td>
<td>06</td>
</tr>
<tr>
<td>46-55</td>
<td>C</td>
<td>05</td>
</tr>
<tr>
<td>40-45</td>
<td>P</td>
<td>04</td>
</tr>
<tr>
<td>Below 40</td>
<td>F</td>
<td>00</td>
</tr>
<tr>
<td>Lack of attendance</td>
<td>FA</td>
<td>00</td>
</tr>
</tbody>
</table>

The Semester Grade Point Average (SGPA) shall also be calculated by taking all courses taken by the student in the semester and Cumulative Grade Point Average (CGPA) shall also be calculated by taking all the courses taken by the student in all the semesters (refer computation of CGPA and SGPA section).

The University shall award “class” to students who acquired 120 (or Minimum number of credit requirements as defined by respective BOS may go beyond 120 for certain Programmes of Study, but not less than 120 credits) according to the following:

<table>
<thead>
<tr>
<th>CGPA</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00 – 10.00</td>
<td>First Class with Distinction (should not have failed in any course)</td>
</tr>
<tr>
<td>7.00 – 8.99</td>
<td>First Class</td>
</tr>
<tr>
<td>5.50 – 6.99</td>
<td>Second Class</td>
</tr>
<tr>
<td>4.00 – 5.49</td>
<td>Pass</td>
</tr>
</tbody>
</table>

The Grade card shall be issued to the students containing grades obtained by the student in the previous SGPA and CGPA.

The Grade card shall list the following:

a. Title of the course taken by the student
b. Number of credits allotted to the course

c. The grades secured by the student in each course

d. Total number of credits earned by the student in that semester

e. SGPA of the student

f. Total number of credits earned by the student till that semester

g. CGPA of the student

FAIRNESS IN ASSESSMENT

To ensure fairness of examination and evaluation following shall be followed.

- In case of at least 50% of core courses offered in different programmes across the disciplines, the assessment of the theoretical component towards the end of the semester should be undertaken by external examiners from outside the university conducting examination, who may be appointed by the Controller of Examinations. In such courses, the question papers will be set as well as assessed by external examiners.

- In case of the assessment of core practical courses, the team of examiners should be constituted on 50 – 50% basis. i.e., half of the examiners in the team should be invited from outside the University for conducting examination.

- In case of the assessment of project reports / thesis / dissertation etc. the work should be undertaken by internal as well as external examiners.

COMPUTATION OF SGPA AND CGPA

Following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) shall be followed:

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 taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

\[ \text{SGPA (S_i)} = \frac{\sum (C_i \times G_i)}{\Sigma C_i} \]

where \( C_i \) is the number of credits of the \( i^{th} \) course and \( G_i \) is the grade point scored by the student in the \( i^{th} \) course.

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, i.e.
CGPA = \( \frac{\sum (C_i \times S_i)}{\sum C_i} \)

where \( S_i \) is the SGPA of the \( i \)th semester and \( C_i \) is the total number of credits in that semester.

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

**ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA AND FORMAT FOR TRANSCRIPTS**

**Illustration 1 for calculation of SGPA**
The illustration is for a student who has taken six courses of given credits in a semester and performance is given in grade letter which carry certain grade point.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
<th>Grade letter</th>
<th>Grade point</th>
<th>Credit Point Credit x Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course 1</td>
<td>3</td>
<td>A</td>
<td>08</td>
<td>3x08 = 24</td>
</tr>
<tr>
<td>Course 2</td>
<td>4</td>
<td>B+</td>
<td>07</td>
<td>4x07 = 28</td>
</tr>
<tr>
<td>Course 3</td>
<td>3</td>
<td>B</td>
<td>06</td>
<td>3x06 = 18</td>
</tr>
<tr>
<td>Course 4</td>
<td>3</td>
<td>O</td>
<td>10</td>
<td>3x10 = 30</td>
</tr>
<tr>
<td>Course 5</td>
<td>3</td>
<td>C</td>
<td>05</td>
<td>3x05 = 15</td>
</tr>
<tr>
<td>Course 6</td>
<td>4</td>
<td>B</td>
<td>06</td>
<td>4x06 = 24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>139</td>
</tr>
</tbody>
</table>

\[ \text{SGPA} = \frac{139}{20} = 6.95 \]

**Illustration 2 for calculation of SGPA**
A student registered for 6 (six) courses in a semester. At the end of the semester the student got A grade in a 4 credit course, A grade in a 2 credit course, B+ in a 3 credit course another B+ in a 3 credit course, B in a 3 credit course and F grade in a 3 credit course. Calculation of SGPA of this student is:

\[ \text{SGPA} = \frac{(8\times4+8\times2+7\times3+7\times3+6\times3+0\times3)}{(4+2+3+3+3+3)} = \frac{(32+16+21+21+18+00)}{18} = \frac{108}{18} = 6.00 \text{ out of 10.00.} \]

SGPA of the student is 6.00.
Illustration for calculation of CGPA (Example)

The illustration is for calculation of CGPA of a student who studied six semesters in a UG program.

<table>
<thead>
<tr>
<th>Semester</th>
<th>Credits</th>
<th>SGPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 1</td>
<td>20</td>
<td>6.95</td>
</tr>
<tr>
<td>Semester 2</td>
<td>22</td>
<td>7.80</td>
</tr>
<tr>
<td>Semester 3</td>
<td>18</td>
<td>5.65</td>
</tr>
<tr>
<td>Semester 4</td>
<td>21</td>
<td>6.04</td>
</tr>
<tr>
<td>Semester 5</td>
<td>19</td>
<td>7.21</td>
</tr>
<tr>
<td>Semester 6</td>
<td>20</td>
<td>7.85</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
\text{Total} & = 120 \\
\text{CGPA} & = \frac{(20 \times 6.95 + 22 \times 7.80 + 18 \times 5.65 + 21 \times 6.04 + 19 \times 7.21 + 20 \times 7.85)}{120} \\
& = 139.00 + 171.60 + 101.70 + 126.84 + 136.99 + 157.00 \\
& = 833.13 \\
& = 6.94275 \text{ Rounded off to 6.94}
\end{align*}
\]

CGPA = 6.94. The student has passed in the program and is placed in 2nd Class.
SCHEME OF EXAMINATION
(Theory Paper)
Total Marks: 100
(Internal: 25 & External: 75)

INTERNAL EXAMINATION
- Maximum Marks: 25.
- Two internal examinations should be conducted and average of the two internal tests shall be taken: 15 Marks
- Assignments: 5 Marks
- Attendance: 5 Marks

EXTERNAL EXAMINATION
- Duration of exam - 3 hours
- Maximum Marks: 75.
- Examinations shall be in two sections.
- Section - A for 15 Marks and Section - B for 60 Marks.

SECTION – A: (5 x 3 = 15 Marks)
- It is of short answer type. Each question carry 3 marks.
- 10 questions to be given by setting 2 questions from each unit.
- Candidate should Answer 5 questions out of 10 questions.

SECTION – B: (5 x 12 = 60 Marks)
- It is of essay answer type. Each question carry 12 Marks.
- 5 questions to be given on internal choice (either or type). One question from each unit. Candidate should answer ALL questions.

SCHEME OF EXAMINATION
(Practical Paper)
Total Marks: 100
(Internal: 25 & External: 75)

INTERNAL EXAMINATION
- Maximum Marks: 25
- Model Internal Examination by the course teacher: 15 Marks.
- Practical observation book: 5 Marks.
- Attendance: 5 Marks

EXTERNAL EXAMINATION
- Duration of exam - 3 hours
- Maximum Marks: 75
- Six questions to be set and each question carry 15 Marks.
- Candidates should answer any four questions.

- Marks for practical: 60.
- Marks for record: 15
- Record submission for practical paper is mandatory
# PONDICHERRY UNIVERSITY

## STRUCTURE OF COURSES

### CHOICE BASED CREDIT SYSTEM IN

### B.Sc. (STATISTICS) PROGRAMME

To be implemented from 2019-20 Onwards

<table>
<thead>
<tr>
<th>COURSE</th>
<th>SUBJECT CODE</th>
<th>TITLE OF THE PAPER</th>
<th>CREDITS ALLOTED</th>
<th>No. of Hours/week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Theory</td>
<td>Tutorial/Practical</td>
</tr>
<tr>
<td><strong>SEMESTER – I</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIL-1</td>
<td>LBEN/LHIN/ LMAL/LSAN/ LTAM/LTEL/ LFRE 111</td>
<td>Bengali/Hindi/Malayalam/Sanskrit/Tamil /Telugu/ French</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>ENGLISH-1</td>
<td>ENGL 112</td>
<td>English – I</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>DSC-1A</td>
<td>STAT 111</td>
<td>Basic Statistics</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DSC-2A</td>
<td>STAT 112</td>
<td>Fundamentals of Probability</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DSC-3A</td>
<td>STAT 113</td>
<td>Mathematics for Statistics</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DSC-4A</td>
<td>STAT 114</td>
<td>Practical -1 (based on the courses STAT 111 &amp; STAT 112)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>AECC-1</td>
<td>PADM 115</td>
<td>Public Administration</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>22 Credits</td>
</tr>
</tbody>
</table>

<p>| <strong>SEMESTER – II</strong> | | | | |
| MIL-2  | LBEN/LHIN/ LMAL/LSAN/ LTAM/LTEL/ LFRE 121 | Bengali/Hindi/Malayalam/Sanskrit/Tamil/Telugu/ French | 3           | 4 |
| ENGLISH-2 | ENGL 122 | English – II | 3           | 4 |
| DSC-1B   | STAT 121   | Probability Theory | 4           | 5 |
| DSC-2B   | STAT 122   | Distribution Theory | 4           | 5 |
| DSC-3B   | STAT 123   | Health and Vital Statistics | 4           | 5 |
| DSC-4B   | STAT 124   | Practical -2 (based on the courses STAT 121 &amp; STAT 122) | 2           | 4 |
| AECC-2   | ENVS 125   | Environmental Studies | 2           | 3 |
|          |             |                    | <strong>Total</strong> | 22 Credits | 30 Hrs. |</p>
<table>
<thead>
<tr>
<th>COURSE</th>
<th>SUBJECT CODE</th>
<th>TITLE OF THE PAPER</th>
<th>CREDITS ALLOTED</th>
<th>No. of Hours /week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Theory</td>
<td>Tutorial/Practical</td>
</tr>
</tbody>
</table>

**SEMESTER – III**

| MIL-3  | LBEN/LHIN/LMAL/LSAN/LTAM/LTEL/LFRE 231 | Bengali/Hindi/Malayalam/Sanskrit/Tamil/Telugu/French | 3          | 4          |
|        | ENGLISH-3 ENGL 232 | English – III | 3          | 4          |
| DSC-1C | STAT 231 | Sampling Methods | 4          | 5          |
| DSC-2C | STAT 232 | Estimation Theory | 4          | 5          |
| DSC-3C | STAT 233 | Real Analysis | 4          | 5          |
| DSC-4C | STAT 234 | Practical -3 (based on the courses STAT 231 & STAT 232) | 2          | 4          |
| SEC-1  | STAT 235 | Statistical Computing with C | 2          | 3          |
|        |        | **Total** | **22 Credits** | **30 Hrs.** |

**SEMESTER – IV**

<p>| MIL-4  | LBEN/LHIN/LMAL/LSAN/LTAM/LTEL/LFRE 241 | Bengali/Hindi/Malayalam/Sanskrit/Tamil/Telugu/French | 3          | 4          |
|        | ENGLISH-4 ENGL 242 | English – IV | 3          | 4          |
| DSC-1D | STAT 241 | Testing of Hypotheses | 4          | 5          |
| DSC-2D | STAT 242 | Statistical Computing with C++ | 4          | 5          |
| DSC-3D | STAT 243 | Numerical Methods | 4          | 5          |
| DSC-4D | STAT 244 | Practical -4 (based on the courses STAT 241, STAT 242&amp; STAT 243) | 2          | 4          |
| SEC-2  | STAT 245 | Official Statistics | 2          | 3          |
|        |        | <strong>Total</strong> | <strong>22 Credits</strong> | <strong>30 Hrs.</strong> |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
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<td>Theory</td>
<td>Tutorial/Practical</td>
</tr>
<tr>
<td>SEC-3</td>
<td>STAT 351</td>
<td>Data Analysis using SPSS</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>DSE-1A</td>
<td>STAT 352</td>
<td>Design of Experiments</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DSE-2A</td>
<td>STAT 353</td>
<td>Applied Statistics</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DSE-3A</td>
<td>STAT 354</td>
<td>Statistical Quality Control</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DSE- P</td>
<td>STAT 355</td>
<td>Regression Analysis</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>GE-1</td>
<td>STAT 356</td>
<td>Practical – 5 (based on DSE-1A, DSE-2A&amp;DSE-3A)</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>GE-1</td>
<td>STAT 357</td>
<td>Industrial Statistics</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total** 20 Credits 30 Hrs.

Any **THREE** papers can be selected from STAT 352, STAT 353, STAT 354 & STAT 355

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Theory</td>
<td>Tutorial/Practical</td>
</tr>
<tr>
<td>SEC-4</td>
<td>STAT 361</td>
<td>Statistical Analysis using R</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>DSE-1B</td>
<td>STAT 362</td>
<td>Stochastic Processes</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DSE-2B</td>
<td>STAT 363</td>
<td>Operations Research</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DSE-3B</td>
<td>STAT 364</td>
<td>Psychology and Educational Statistics</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>GE-2</td>
<td>STAT 365</td>
<td>Project Work*</td>
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<td>STAT 366</td>
<td>Total Quality Management</td>
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**Total** 19 Credits 30 Hrs.

Any **TWO** papers can be selected from STAT 362, STAT 363, STAT 364

#STAT 365 is Compulsory paper. A Project team consisting maximum of 5 students.

Two hours per week will be allotted to project supervisor per project team.

**Distribution of Credits**

<table>
<thead>
<tr>
<th>Course</th>
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DSC-1A
STAT-111: BASIC STATISTICS

Course Objectives: To learn the basic concepts of Statistics such as types of data and graphical approach to data. To learn averages, deviation measures and relations

Course Outcomes: Students will be able to classify and analyze the data

UNIT 1
Introduction to Statistics – Primary and Secondary data – Nominal, Ordinal, Ratio, and Interval scale (with examples) - Graphical Representation of data – Bar-charts, Pie-diagrams, Histograms, Frequency polygon, Ogives

UNIT 2
Measures of central tendency – properties – merits and demerits – mean, weighted mean –median, quartiles, deciles, percentiles and mode – relation between arithmetic mean, geometric mean and harmonic mean.

UNIT 3
Measures of dispersion – characteristics – Coefficient of dispersion – Coefficient of variation – Moments –central moments in terms of raw moments and moments about arbitrary points

UNIT 4
Skewness and Kurtosis – Pearson’s coefficient of skewness – Bowley’s coefficient of skewness – coefficient of skewness based upon moments – Curve fitting – Principle of least squares – Fitting of straight line, parabola, exponential and power curve.

UNIT 5
Simple correlation – Karl Pearson’s coefficient of correlation – Rank correlation — Multiple and Partial correlation coefficient in three variables

Books for Study:
4. S.P.Gupta (2014), Statistical Methods, Sultan Chand & sons

Books for Reference:
SEMESTER – I

DSC-2A

STAT 112: FUNDAMENTALS OF PROBABILITY

Course Objectives: To learn the concept of probability and random variables

Course Outcomes: Students will be able to define sample space for random experiment and also compute the probability for events in the sample space.

UNIT 1


UNIT 2

Relations - operations of Relations - Partial orders – Functions - Inverses and composition – One-to-one correspondence and the cardinality of a set –The addition and multiplication rules

UNIT 3

Introduction to probability theory – Random experiments, Events, Sample space, Algebra of events, Operations on events – Classical approach to probability – Axiomatic approach to probability – Simple problems.

UNIT 4

Addition theorem - Conditional Probability – Independence of events – Multiplication theorem – Bayes theorem and its applications

UNIT 5


Books for Study


Books for Reference

DSC-3A
STAT 113: MATHEMATICS FOR STATISTICS

Course Objectives:
To learn the basic concepts of matrices and Linear Equations
To learn partial differentiation, Gamma Integral and Laplace transform

Course Outcomes: On completion of the course, students will be able to apply mathematical techniques for deriving statistical distributions.

UNIT 1
Matrices: Elementary, scalar, Hermitian, skew-Hermitian, symmetric, skew-symmetric, Unitary, triangular, equivalent and similar matrices- Transpose and conjugate of a matrix – Rank of a matrix

UNIT 2

UNIT 3

UNIT 4
Definitions of Beta and Gamma Integrals – Recurrence Formula for Gamma Integral Properties of Beta Integral– Application of Beta Gamma Integrals – Relation between Beta and Gamma Integrals.

UNIT 5
Laplace Transform: Introduction - definition - properties - Laplace transforms of standard functions - derivatives and integrals of transforms - transform of derivatives and integrals

Books for Study:

Books for Reference:
Course Objectives: To provide practical application of visualization techniques and statistical methods

Course Outcomes: Students will be able to analyze and interpret results of visualization tools besides developing computational skills.

BASIC STATISTICS

1. Diagrammatic Representation Bar Chart, Pie Diagram
2. Construction of Discrete and Continuous Frequency Tables from raw data
3. Graphical Representation - Histogram
4. Summary Statistics
5. Two way tables and plots
6. Simple correlation
7. Rank correlation
8. Fitting of straight line, second degree
9. Fitting of exponential and power curves
SEMESTER – II

DSC-1B

STAT-121: PROBABILITY THEORY

Course Objectives: To learn the concepts of random variables, marginal and conditional distributions. To learn convergence in probability and Central Limit theorem

Course Outcomes: On completion of the course, students will be able to know the characteristic properties of distributions.

UNIT 1
Distributions of functions of random variables - transformations of random variables of discrete and continuous type – Jacobian transformation – simple problems

UNIT 2
Mathematical Expectation of random variables and its properties - Moment generating function – Cumulant generating function and their properties

UNIT 3
Characteristic function – Definition - their properties and uses for discrete and continuous variates – Simple problems

UNIT 4
Bivariate distributions – Discrete and Continuous type - Joint Density Function - Marginal distributions – Conditional distributions – Conditional Expectation and their properties

UNIT 5
Chebyshev’s inequality - Definition of convergence in probability and distributions - Weak Law of Large numbers (WLLN) - Central Limit theorem for i.i.d case (statement only)

Books for Study:

Books for Reference:
SEMESTER – II

DSC-2B

STAT-122: DISTRIBUTION THEORY

Course Objectives: To learn the concepts of Discrete distribution, Binomial, Poisson and continuous distribution. To learn the basic concepts of sampling distribution and order statistics

Course Outcomes: On completion of the course, students will be able to know the characteristic properties of various discrete and continuous distributions and deriving the distribution of order statistics.

UNIT 1
Discrete Distributions – Uniform, Bernoulli, Binomial, Poisson, Negative Binomial, Geometric, Hypergeometric distribution and their characteristics.

UNIT 2
Continuous distributions - Uniform, Exponential, Gamma, Beta, Cauchy, Pareto Distributions – Characteristics Properties of these distributions

UNIT 3
Normal distribution and its characteristics - Bivariate Normal distribution – Marginal and conditional distributions

UNIT 4
Sampling Distributions – t, F and Chi-square – derivation of their probability density functions – relation among t, F and chi-square distributions- characteristic properties of t, F and chi-square

UNIT 5
Order Statistics – Distribution of minimum, maximum and rth order statistics – joint distribution of rth and sth order statistics – distribution of range and mid-range.

Books for Study:

Books for Reference:
Course Objectives: To learn the basic concepts of health statistics and utilization of data. To learn the measures of mortality and fertility.

Course Outcomes: Students will gain sufficient theoretical knowledge pertaining to population dynamics.

UNIT 1

UNIT 2

UNIT 3
Measures of fertility – CBR, ASBR, GFR and TFR - cohort fertility analysis measures of migration - crude, specific and standardized rates - survival ratio - National growth rate method.

UNIT 4
Forces of mortality - Gompertz and Makeham law - Abridged life table - Construction by Reed Merril King and Graville methods.

UNIT 5

Books for study

Books for Reference
Course Objectives: To provide practical application of discrete, continuous distributions and measures of population statistics

Course Outcomes: On completion of the course, students will be able to demonstrate the computational aspects of various distributions and Health, Vital statistics

**DISTRIBUTION THEORY**
1. Fitting of distributions - Binomial, Poisson, Geometric
2. Fitting normal distribution – Area method and ordinate method

**HEALTH AND VITAL STATISTICS**
1. Crude specific and Standardized death rates
2. Construction of life tables
3. Crude specific and general fertility rates
Course Objectives: To learn the importance of Sampling and different methods of sampling techniques.

Course Outcomes: Students will be competent to design and conduct sample surveys.

UNIT 1

Concept of sampling – Need for sampling – Population and sample – sampling unit and sample frame – types of population – basic properties of population – sample survey and census – Principal steps in a Sample Survey – Notion of sampling and non-sampling errors.

UNIT 2

Simple random sampling with and without replacement – Estimation of Population mean and proportion and their variances

UNIT 3

Stratified sampling – Principles of stratification – estimation of population mean and its variance – allocation techniques: Proportional, optimal and Neyman – estimation of gain due to stratification - Determination of sample size

UNIT 4

Systematic Sampling – Estimation of population mean and its sampling variance – comparison of systematic, simple random and stratified random sampling

UNIT 5

Cluster sampling with equal sized clusters – estimation of population mean and variance.

Books for study:

Books for Reference:
Course Objectives: This course focuses on point and interval estimation techniques.

Course Outcomes: Students will gain sufficient knowledge in estimating various population characteristics using different estimating procedures.

UNIT 1

Point estimation – Properties of estimators – Unbiasedness – Consistent estimators - Properties of consistent estimators – sufficient condition for consistency – Simple problems

UNIT 2


UNIT 3

Methods of moments – Method of Maximum Likelihood (M.L.E.) – Properties of Maximum Likelihood Estimators (without proof) – Simple Problems

UNIT 4

Method of Least Squares – Method of Minimum Chi-square – Properties - Simple problems

UNIT 5

Interval Estimation - Concepts of Confidence Interval and Confidence Coefficient – Exact Confidence Intervals for mean, difference of means, variance, ratio of variance of two independent normal populations - Proportions (single and difference) – Large sample confidence interval.

Books For Study:


Books for Reference:

DSC-3C

STAT233: REAL ANALYSIS

Course Objectives: To learn Real number system, convergence and divergence
To learn functions, algebra of functions and Riemann integration

Course Outcomes: Students will learn the mathematical concepts pertaining to sequences and series, functions, its derivative and integration.

UNIT 1
Real valued functions – Equivalence – Countability – Real numbers – Least upper bound – Greatest lower bound. Sequence of real numbers : Limit of a sequence - Convergent sequences, Divergent sequences - Bounded sequences - Monotone sequences – Cauchy’s first and second theorem on limits – Cauchy’s general principle of convergence

UNIT 2
Series of real numbers : Convergence and divergence - series with non-negative terms – comparison test – p-test, D’Alembert’s ratio test, Cauchy’s Root test - Alternating series - Conditional convergence and absolute convergence – Leibnitz test (proof of the test can be omitted, only problems).

UNIT 3
Functions : Limit of real valued function in one variable, continuity – types of discontinuities – algebra of continuous functions – Extreme value theorem – Intermediate value theorem – Uniformly Continuous functions

UNIT 4
Increasing and Decreasing functions – Differentiability – Darboux’s Theorem – Rolle’s Theorem – Mean value theorem for derivatives – Taylor’s Series expansion

UNIT 5
Riemann Integration – Definition and existence of the integral – refinement of partitions – Darboux’s theorem – Conditions of Integrability – Integrability of sum and modulus of integrable functions – Integration and Differentiation – Fundamental Theorem of Calculus

Books for Study:


Books for Reference:

Course Objectives: To provide practical applications of sampling and estimation theory.

Course Outcomes: Students will gain hands on training in solving numerical examples pertaining to sampling techniques and estimation theory.

**SAMPLING METHODS**

1. Simple random sampling
2. Stratified random sampling Proportional allocation
3. Stratified random sampling Optimum allocation
4. Systematic sampling

**ESTIMATION THEORY**

1. Estimation of the parameters for the discrete and continuous distribution by the
   - Method of Moments
   - Method of Maximum Likelihood.

2. Confidence Intervals for the parameters of Normal distribution
   - Single Mean
   - Two Population Means
   - Single Variance
   - Two Population Variances

3. Confidence Interval for Single Proportion and Two Proportions
STAT 235: STATISTICAL COMPUTING WITH C

Course Objectives: To learn the fundamental concepts of “C” Programming

Course Outcomes: On completion of the course, students will be able to write programs in C independently.

UNIT 1
Introduction – C character set, Identifiers and keywords. Data Type, Declarations, Expressions, statements and symbolic constants, Input-Output: getchar, putchar, scanf, printf, gets, puts, functions, pre-processor commands, #include, define preparing and running a complete C program.

UNIT 2
Operators and expressions: Arithmetic, Unary, Logical, bit-wise, assignments and conditional Operator, Library functions.

UNIT 3
Control statements: while, do-while statement, nested loops, if-else, nested if-else, switch, break, continue and goto statements, comma operator.

UNIT 4
Arrays: declaration of one and two dimensional arrays –Strings and operations on strings, String Library functions.

UNIT 5
Functions: Defining and accessing: Passing arguments, Call by reference, Call by Value, Function Prototypes, Recursion. Use of library functions. Structures, Array of Structures

Books for Study:

Books for Reference:
Course Objectives: To learn the concepts of Hypotheses and derive test statistics using different test procedures.

Course Outcomes: Students will gain theoretical knowledge in deriving test procedures for simple and composite hypothesis under parametric and non-parametric methods.

UNIT 1

UNIT 2
Monotone Likelihood Ratio Property – Examples - Uniformly most powerful tests – definition – UMP test for one parameter exponential family and simple applications –.

UNIT 3
Likelihood Ratio tests – Definition and properties - simple applications- Test of significance: Exact and Asymptotic test based on Normal distribution.

UNIT 4
Tests based on Student’s t, Chi-square and F-distributions, Chi-square test for goodness of fit and independence of attributes.

UNIT 5
Non-parametric methods: Sign test – Wilcoxon Signed rank test- Mann Whitney U test - Median test - Run test – Kolmogrov-Smirnov test for one sample and two samples

Books For Study:


Books for Reference:

STAT 242: PROGRAMMING IN C++

Course Objectives: To learn the concept of fundamental concepts of OOPs and C++ programming.

Course Outcomes: On completion of the course, students will be able to write programs in C++ independently.

UNIT 1
Introduction to C++ - Applications of C++ - Structure of a Simple C++ Program – Compiling and Executing C++ programs. Keywords – Identifiers – Constants – Basic Data Types – Variable declaration – Operators – Precedence – Array Handling.

UNIT 2
Introduction to Functions – Library Functions - Steps in writing user defined functions – Inline Functions – Recursion – Default parameters – Call by value – Call by reference.

UNIT 3
Object oriented programming paradigm – Basic OOP concepts – Benefits – Object Oriented Programming languages – Applications – Class definition – Member functions – Static members – Constructor and destructors : various types .

UNIT 4

UNIT 5

Books for Study:

Book for Reference:
SEMESTER – IV

DSC-3D

STAT 243: NUMERICAL METHODS

Course Objectives: To learn the solution of Algebraic and transcendental equations, Finite differences, interpolation techniques

Course Outcomes: Students will gain sufficient knowledge in using interpolation techniques for finding roots of polynomial equations and evaluating integrals of functions.

UNIT 1


UNIT 2

Finite differences: Forward and backward differences – Differences of a polynomial – Relation between the Operators E, Δ, δ, μ and backward difference operator, and their basic properties – Application to summation of series.

UNIT 3

Interpolation with equal intervals: Newton’s forward and backward differences formulae. Central differences: Gauss’s forward and backward differences formulae – Stirling’s, Bessel’s and Laplace-Everett’s formula – Simple problems only.

Interpolation with unequal intervals: Divided differences and their properties – Newton’s divided difference formula – Lagrange’s formula – simple problems only.

UNIT 4

Inverse interpolation: Iteration or successive approximation method – Lagrange’s method — simple problems.

Numerical Integration: Trapezoidal rule – Simpson’s 1/3 and 3/8 rules – Weddle’s rule – Euler’s summation formula

UNIT 5


Books for Study:


Books for Reference:

SEMESTER – IV

DSC-4D

STAT 244: PRACTICAL -4

(based on the courses STAT 241 using Calculator / SPSS)

Course Objectives: To provide practical applications of small and large sample tests.

Course Outcomes: Students will gain hands on training in solving numerical examples pertaining to various test procedures.

1. Large Sample Tests: Means, Variances and Proportions

2. Test based on Chi-square distribution: Population variance, testing the goodness of fit, independence of attributed

3. Test based on t distribution: Single mean, Difference of means, Paired t test, Correlation coefficient

4. Test based on F distribution: Equality of two population variance

Course Objectives: This course will enlighten about statistical organizations in India and statistics pertaining to agriculture and industry.

Course Outcomes: Students will gain knowledge about the applications of statistics in Agriculture, index numbers for national development and the methods of conducting census.

UNIT 1

UNIT 2
Industrial statistics – ASI – Indices of Industrial Production and profits

UNIT 3
Price statistics – Price index numbers – Labour Bureau; Index number of Retailprices – Indices of security prices.

UNIT 4

UNIT 5
National sample surveys – Activities and publications of CSO and the Governmental Departments- National Income compilation.

Books for Study
1. Gupta SP (2017), Statistical Methods (Sultan Chand & Sons)
SEMESTER – V  

SEC-3  

STAT 351: DATA ANALYSIS USING SPSS (DSE)  

Course Objectives: to learn the different statistical analysis with the help of the statistical software SPSS  

Course Outcomes: Students will get equipped with handling and analyzing the data. Also it enables software and programming skills  

Unit 1  
Basic of SPSS – Importing and Exporting of files – value labels, Recoding and Computing new variables – visual binning - Selection of cases (simple and multiple selection) – splitting and merging of files  

Unit 2  
Graphical plots: Box Plot both simple and multiple, Scatter plot – 2D and 3D, Histogram both simple and paneled by rows and columns using categorical variables, Bar and Pie charts, Frequencies, Custom tables – two way and multi way, Cross Tabulations.  

Unit 3  

Unit 4  
Testing of Hypotheses – one sample, two sample and paired samples t – test; F-test for two sample variances;Chi-square test for independence of attributes, Sign Test, Mann-Whitney U test, Wilcoxon-Sign rank test, Median test.  

Unit 5  
One way and Two Way Analysis of Variance, $2^2, 2^3$factorial designs  

Books for Study  

2. Robert Ho (2006), Handbook of Univariate and Multivariate Data Analysis and Interpretation with SPSS, Chapman and Hall, CRC Press  

Books for Reference  

Course Objectives: To learn the basic principles of design of statistical experiments and models. To learn CRD, RBD, LSD and factorial design with suitable real life examples.

Course Outcomes: Students will gain knowledge about different experimental designs

UNIT 1
Basic principles for designing statistical experiments: Randomization, Replication and local control - determination of experimental units and notion of experimental error - Analysis of variance with One way – Two way classification; Models and estimation of parameters

UNIT 2
Completely Randomized Design (CRD) - Model - estimation of parameters and their standard error – Analysis of data arising from such design, multiple comparison test: Least Significant Difference test

UNIT 3
Randomized Block Design (RBD) - Models and estimation of parameters - Estimation of one and two missing observations – Efficiency of RBD relative to CRD

UNIT 4
Latin Square Design (LSD)– Model and estimation of parameters - Estimation of one and two missing observations – Efficiency of LSD relative to CRD and RBD

UNIT 5
Factorial Experiments: 2^2, 2^3 designs - estimation of main effects and interactions and their standard errors

Books for study:

Books for Reference:
SEMESTER – V

DSE

STAT 353: APPLIED STATISTICS

Course Objectives: To learn the concepts of time series, evaluation of trend by various methods. To learn about the measurement of seasonal variations, to learn Index numbers, optimum tests for index number and demand analysis.

Course Outcomes: Students will gain knowledge about time series, index numbers and demand analysis.

UNIT 1
Concept of time series - components of a time series - Additive and Multiplicative models - Resolving the components of a time series - Evaluation of trend by least square method and Methods of moving averages.

UNIT 2

UNIT 3
Index numbers – Definitions and uses – Weighted Index numbers - Laspeyre’s, Paasche’s, Fisher’s, Marshall Edgeworth index numbers – Fixed and Chain base index numbers.

UNIT 4
Optimum tests for index numbers - Cost of living index number - Construction and uses of wholesale price index.

UNIT 5
Demand Analysis - Theory and analysis of consumer’s demand - Law of demand - Price elasticity of demand - estimation of demand curves - forms of demand functions - Demand and Supply utility and indifference maps - determination of price and supply and demand.

Books for Study:

Books for Reference:
SEMESTER – V  
DSE  
STAT 354: STATISTICAL QUALITY CONTROL  

Course Objectives: To understand the concept of quality, process control and product control using control chart techniques and sampling inspection plan. To have an idea about quality management, quality circles, quality movement and standardisation for quality  

Course Outcomes: Students will get to know about the practical applications of quality control techniques and will be able to apply them in industry.  

UNIT 1  
Concept of Quality – Quality movement in India – Standardization for Quality – Quality movement – Quality management – Quality circles  

UNIT 2  
Need for SQC in industries – process control – chance and assignable causes of variations – concepts of specification and tolerance limits – process capability – statistical basis for control charts –  

UNIT 3  
Control chart for variables – \( \bar{X} \), R and S - chart - their construction and analysis.  
Control charts for attributes – p, np, c and U charts – their construction and analysis.  

UNIT 4  
Product control – fundamental concepts of acceptance sampling by attributes – producer’s and consumer’s risk – concepts of AQL, LTPD, AQL and AOQL – Single sampling plan OC, AOQ, ASN, ATI curves.  

UNIT 5  
Double sampling plan for attributes – derivation and construction of OC, AOQ, ASN, ATI curves – notion of sequential sampling plan.  

Books for Study:  

Books for Reference:  
Semester V

DSE

STAT 355: REGRESSION ANALYSIS

Course Objectives: To learn simple regression, transformation of variables and multiple correlation coefficient and multiple regression model and related practical applications.

Course Outcomes: Students will gain knowledge about modeling the data

UNIT 1
Simple Regression model: Description of data model – lines of regression – Properties of regression coefficients – least square estimates and simple problems

UNIT 2

UNIT-3

UNIT 4
Multiple regression model: Description of data model – Properties of least square estimators – R² and adjusted R² – Test for regression coefficients - Predicted values and standard errors

UNIT 5
Multiple correlation coefficient -Selection of variables – Forward selection procedure – Backward elimination procedure – Stepwise method (algorithms only) - Test of hypothesis on the linear model -Multicollinearity – sources, causes and methods of detection of using VIF

Books for study

Books for Reference:
1. S.Chatterjee and Hadi, A (2013): Regression Analysis by Example, 5/e, John Wiley & Sons, New York. Chapter 1,2,3 and relevant portions in chapters 4,5,6,7,8,9
SEMESTER – V

DSE-P

STAT356: PRACTICAL -5

(Based on ANY THREE courses from STAT 352, STAT 353, STAT 354 & STAT 355
Using Calculator and SPSS)

Course Objectives: To provide practical applications of designed experiments, applied
statistics, quality control and regression analysis.

Course Outcomes: Students will gain hands on training in solving numerical examples
through SPSS

DESIGN OF EXPERIMENTS
1. One way classification and Two way classification Model
2. Completely Randomised Design and Multiple Comparison Methods
3. Randomised Block Design and R.B.D. with one or two missing values
4. Latin Square Design and L.S.D. with one or two missing values
5. $2^2$ Factorial Design, $2^3$ Factorial Design

APPLIED STATISTICS
1. Time series: Curve fitting by principle of least squares straight line,
   Exponential and Logistic curves.
2. Seasonal fluctuations: Ratio to trend method, Ratio to moving average method
   and Link relative method.
3. Index numbers: Calculation of indices using Laspeyre’s, Paasche’s, Marshall-
   Edgeworth, Bowley’s and Fisher’s formula.

STATISTICAL QUALITY CONTROL
Problems based on
1. $\bar{x}$, R and S charts
2. p chart,
3. np chart
4. c chart
5. u chart

REGRESSION ANALYSIS
1. Simple Linear Regression
2. Multiple Regression
STAT 357: INDUSTRIAL STATISTICS

Course Objectives: To learn the concepts of inventory control policies and forecasting methods. To learn the concepts of reliability for some specific real life distribution.

Course Outcomes: Students will gain knowledge related to application of forecasting and reliability techniques to industrial problems.

UNIT 1
Inventory planning: Concept of planned inventory policies. Deterministic models. Policy when inventory levels are reviewed continuously and demands occur uniformly with and without shortage costs. Economic order quantity.

UNIT 2
Policy for production planning when inventory levels are reviewed periodically. Stochastic models. Single period model with no set up cost having zero or non-zero initial stock. (s,S) policy. Solving special cases using computer packages.

UNIT 3
Forecasting: Concept of forecasting and its applications in manufacturing and non-manufacturing industrial situations. Different methods of forecasting including average, last value, weighted average (exponential smoothing).

UNIT 4
Forecasting in presence of linear trends using least square methods. Forecasting in presence of seasonal effects. Solving special cases using computer package.

UNIT 5
Reliability: Definitions and relationships between survival function, hazard, function, hazard rate of a non-negative random variable. Life Time distributions: Weibull, Gamma, Lognormal and Exponential distributions.

Books for study:
STAT 361: STATISTICAL ANALYSIS USING R (Lab Based)

Course Objectives: To learn the statistical analysis with the help of the statistical software R

Course Outcomes: On completion of course, students will be able to solve statistical problems using R

UNIT 1
Introduction to R: R as a calculator, statistical software and a programming language, R preliminaries, getting help, data inputting methods (direct and importing from other spread Sheet applications like Excel), data accessing, and indexing, Graphics in R, built in functions, saving, storing and retrieving work.

UNIT 2
Descriptive statistics: diagrammatic representation of univariate and bivariate data, measures of central tendency, partition values, measures of dispersion, summaries of a numerical data, skewness and kurtosis, random sampling with and without replacement.

UNIT 3
Probability Distributions: R as a set of statistical tables - cumulative distribution, probability density function, quantile function, and simulate from the distribution, plotting probability curves for standard distributions.

UNIT 4
Statistical Inference: One- and two-sample tests, z-test, t-test, F-test, chi-square test of independence and goodness of fit, interval estimation for mean, difference of mean and variance, tests for normality.

UNIT 5
Correlation – Simple and Multiple regressions - Analysis of Variance

Books for Study
1. Dr. Mark Gardener (2012), Beginning R The statistical Programming Languages, John Wiley & Sons

Books for References:
1. Michale J. Crawley (2009), THE R BOOK, John Wiley & Sons,
Course Objectives: To learn the concepts of stochastic process - Markov chain - Stationary process, queuing models

Course Outcomes: Students will gain theoretical knowledge and computing skills for solving problems

UNIT 1
Definition of stochastic process - classification of stochastic processes according to time parameter and state space – examples of stochastic processes – definition of stationary process – stationary process with independent increments.

UNIT 2

UNIT 3
Classification of states of Markov chain – Simple problems - Basic limit theorem of Markov chain (statement only) - stationary and limiting distribution for a Markov Chain – Existence of limiting distribution

UNIT 4

UNIT 5
Characteristics of queuing models– Simple queuing models M/M/1–M/M/S - Simple problems

Books for Study

Books for Study and Reference:
**Course Objectives:** To learn about decision theory and optimization techniques
To learn game theory and network analysis

**Course Outcomes:** Students will gain knowledge to allocate resources in an optimal manner and also plan the time-line of projects.

**UNIT 1**

**UNIT 2**
Linear Programming – Graphical Solution – Simplex method - Big M-Method and two-Phase methods – Principle of Duality – Conversion of primal to dual

**UNIT 3**
Transportation Problem: Initial Basic Solution by North West Corner Rule, Least Cost and Vogel’s Approximation Methods – Optimal solution by Modified Distribution Method(MODI) –Assignment problem – Simple problems

**UNIT 4**
Sequencing problem: ‘n’ jobs and 2 machine problem – ‘n’ jobs and ‘m’ machine problems – 2 jobs and ‘m’ machine problem – Game Theory – pure and mixed strategies – saddle point - Optimal solution of two person zero sum game : Dominance property -Graphical Solution of (2 x n and m x 2) games

**UNIT 5**
Network analysis:PERT and CPM -Basic Concepts - Constructions of the network – Concepts of Slack and float in network analysis - Determination of the floats and critical path.

**Books for study:**

**Books for Reference:**
Course Objectives: To learn the applications of statistics in psychology and education and different scoring, Scaling techniques, measuring intelligent quotient, similar concepts.

Course Outcomes: Statistical skills related to psychology and educational research will be enhanced.

UNIT 1
Introduction-scaling procedures- Z or σ scores-standard scores-Normalized scores-T-scores- Percentile score-Scaling of rankings in terms of Normal Probability curve-scaling of ratings in terms of Normal Probability curve

UNIT 2
Reliability of test scores- definition of reliability- index of reliability- Parallel tests-Methods for determining test reliability- the test-retest method- Alternate or parallel formsmethod-split half method- effect of test length on the reliability of the test- effect of different ranges on the reliability of the test

UNIT 3
Estimation of validity- types of validity- validity and test length- comparison between reliability and validity- Intelligence tests- Mental age- Intelligence quotient

UNIT 4
Biserial correlation- correlation from fourfold tables- the contingency coefficient-curvedlinear relationship

UNIT 5
Correlation ratio- intra-class correlation- partial and multiple correlation- definition-formula for three variables- limitations- simple problems

BOOKS FOR STUDY

Books for Reference:
Course Objectives: To provide a mechanism to plan and execute a real-time project independently

Course Outcomes: Students will come to know the real-time application of various statistical techniques as applied in research and industry.

Guidelines for the Project work:

1. A project work shall be normally offered in the third year (sixth semester).
2. A project work shall be assessed for a maximum of 100 marks. The assessment will be based on the project report, presentation and viva-voce.
3. A project may be undertaken by a group of students and the maximum number of students in a team shall not exceed five. However, the project report shall be submitted by each member of the team separately.
4. A project work shall be supervised by a faculty member assigned by the Head of the Department.
5. There shall be an internal examiner and External Examiner for the evaluation of the project work.
6. A project work should encourage a student to be able to interact with the end user.
7. A project work should be chosen such that there is enough scope to apply and demonstrate the statistical techniques learnt in the course.
8. A project work report shall clearly state the problem addressed, the methodology adopted, the assumptions and the hypotheses formulated, any previous references to the study undertaken, statistical analyses performed and the broad conclusion drawn.
GE-2
STAT 366: TOTAL QUALITY MANAGEMENT

Course Objectives: To learn the concept of Total quality Management in production, Service in different industries.

Course Outcomes: On completion of the course, students will be able to implement TQM techniques in industries.

Unit 1:

Unit 2:

Unit 3:

Unit 4:

Unit 5:
Acceptance Sampling: Definition – Lot Acceptance Sampling Plans (LASPs) - Six Sigma : Implementation and its Infrastructure - ISO 9000: 2000: Introduction to EMS

Books for Study:

Books for Reference: