

P.R. GOVERNMENT COLLEGE, KAKINADA

(An Autonomous ,NAAC accredited with 'A' Grade (3.17 CGPA)& ISO certified Institution)



**BOARD OF STUDIES
2022-2023**

**DEPARTMENT
OF
STATISTICS**

INDEX

| S. No | YEAR | Topic | Page No. |
|-------|--|--|---|
| 1 | 2022-23 | List of Members in the board | |
| 2 | | Agenda | |
| 3 | | Objectives of the department | |
| 4 | | Programme and Programme Specific Outcomes(PSO) | |
| 6 | | Blue Print for question Paper Pattern (Semester End, Internal Assessment and Practical Exam) | |
| 7 | First Year | First Semester Syllabus including practical syllabus | |
| 8 | | I Semester blue print for the question paper pattern, question bank and Model Paper | |
| 9 | | II Semester Syllabus including practical syllabus | |
| 10 | | II Semester Blue Print for question paper pattern , question bank, Model Paper | |
| 11 | | II Semester Life Skill Course – Elementary Statistics | |
| 12 | Second Year | III Semester Syllabus including practical syllabus | |
| 13 | | III Semester Blue Print for question paper pattern , question bank, Model Paper | |
| 14 | | IV Semester-Course IV-Syllabus including practical syllabus | |
| 15 | | IV Semester-Course IV- Blue Print for question paper pattern , question bank, Model Paper | |
| 14 | | IV Semester-Course V-Syllabus including practical syllabus | |
| 15 | | IV Semester-Course V- Blue Print for question paper pattern , question bank, Model Paper | |
| 16 | | Third Year | V Semester – paper 6A Syllabus including practical syllabus |
| 17 | V Semester – Paper 6A Blue Print for question paper pattern , question bank, Model Paper | | |
| 18 | V Semester – Paper 7A Syllabus including practical syllabus | | |
| 19 | V Semester – Paper 7A Blue Print for question paper pattern , question bank and Model Paper | | |
| 20 | V Semester – paper 6B Syllabus including practical syllabus | | |
| 21 | V Semester –Paper 6B blue print for the question paper pattern , question bank and model paper | | |
| 22 | V Semester – 7B Syllabus including practical syllabus | | |
| 23 | V Semester –7B blue print for the question paper pattern , question | | |

| | | |
|----|--|--|
| | bank and model paper | |
| 24 | V Semester – 8A Syllabus including practical syllabus | |
| 25 | V Semester –8A blue print for the question paper pattern , question bank and model paper | |
| 26 | V Semester – 8B Syllabus including practical syllabus | |
| 27 | V Semester –8B blue print for the question paper pattern , question bank and model paper | |
| 28 | MOOCS Guidelines | |
| 29 | Workload particulars | |
| 30 | SPSS Certificate Course-Syllabus and model paper | |
| 31 | Descriptive Statistics with R certificate course-syllabus and model paper | |
| 32 | List of Examiners | |

**DEPARTMENT OF COLLEGIATE EDUCATION
GOVERNMENT OF ANDHRA PRADESH**

PROCEEDINGS OF THE PRINCIPAL, PITHAPUR RAJAH'S GOVT. COLLEGE[A]:: KAKINADA

Present: Dr. B.V. TIRUPANYAM, Ph.D.

Rc.No.12A/A.C/BOS/2022-23

Dt.24Sept'2022

Sub:P.R.G.C[A]–AcademicCell-
ConductofBOSMeetingsfortheAcademicYear 2022-23 – Guidelines
issued -Regarding.

Ref: 1. Minutes of IQAC meeting dated 18 September 2022

2. Resolutions adopted in 22nd Staff Council Meeting held on 23 Sept 2022

PREAMBLE

The Autonomous colleges are, as per its vision, mission, stated objectives and core values, mandated to design and develop their own outcome -based curricula keeping in view the societal, local and global industry requirements, employability and industry – ready and transferable skills duly prescribing Course Outcomes (COs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) and suitable learning outcome assessment management system through robust and transparent evaluation system to measure their attainment levels of the students.

The Sustained Developmental Goals (SDG-4)of UNEP recommended assurance of quality to students in HEIs promoting creativity, critical thinking and collaborative skills, while building curiosity, courage, resilience and gender equality among students.

Further, the NEP-2020 recommended that the HEIs shall equip students with such skills that translate them into leaders and potential entrepreneurs too besides credit transfer mechanism through ABC (Academic Bank of Credits).

The HEIs are also, as per the Revised Accreditation Framework [RAF] of NAAC, endowed with the responsibility of rolling out quality and holistic human resources to the modern Indian Economy by ingraining quality in teaching- learning process by facilitating the students experience a wide range of participative and experiential learning strategies including field trips, conferences, integration of technology, community service

programmes, career guidance, certificate and value added courses, research and inquisition based teaching, exchange programmes, gender equity programmes, etc.

Besides, the students shall have social consciousness, regard for constitutional provisions, right perspective on environmental protection, awareness on gender equity, health and hygiene, Yoga and wellness, college social responsibility, culture and values, etc., to mention a few.

Further, the Ministry of India, GoI, through NIRF, prescribes quality research, infrastructure augmentation, enhanced placement and progression to higher education, equipment of employability skills leading to enhanced public perception about the college among the public.

Our institution has, from AY 2022-23, has devised its new vision and mission along with objectives and core values necessitating design and re-orientation of its academic administration in tune with them.

ORDER:

In the light of the above mandate and responsibilities prescribed by institutions vision and mission, SDG-4, NEP – 2020, NAAC, NIRF to the autonomous HEIs, need to customize, design and re-orient their academic and research administration in tune with the policies of above bodies, our insitution is no exception.

Hence, the Chairmen of U.G and P.G Boards of Studies of various Departments are requested to make necessary arrangements for the conduct of the meetings separately between 11 October 2022 and 15 October 2022. They are further requested to prepare curricula and extracurricular activities and devise suitable evaluation system keeping in mind above recommendations to make students a wholesome personality and a 21st century student capable of facing challenges, adaptive to changes, creative and innovative.

Further, the Chairman of the each BOS, in association with the IQAC coordinator, preceding the BOS meeting, is requested to prescribe benchmarking, quality initiatives in pedagogy and learning; in design of curriculum (with 20% change) and optimum utilization of existing human, physical and ICT resources and adopt resolutions to the extent of benchmarks (As per SOP given in Annexure – I). Further, as the regular

attendance of students to the classes is a deciding factor in enhancement of quality in learning, a minimum attendance of 60% for I mid-term examination, 75% for II mid-term examination under CIA component shall be the benchmark for attendance and it shall be approved in the BOS. The Chairmen are also requested to approve the new programmes to be introduced for 2022-23, if any, number of certificate courses, their frequency, Bloom's-Taxonomy based evaluation system for effective learning outcomes as per the Annexure -I

The Chairmen are, therefore, requested to

- Design curricula of Odd and even semesters for the A.Y 2022-23 both for U.G and P.G courses in tune with the stated vision, mission of the institution, RAF of NAAC, NEP-2020 and NIRF.
- Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula and invite suggestions and changes to be made.
- Invite the University nominee, subject experts, industrial nominees, student nominees, parents well in advance along with the date, venue, agenda, etc. A soft copy shall be communicated well in advance to the members to have an idea on the matters.
- Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning experiences, resource utilization by staff and students, etc.,
- Each Department shall approve and recommend additional credits for additional modules, training programmes, N.S.S, N.C.C, participation in cultural programs, sports and games, environmental programs, blood donations camps, etc.
- All meetings shall be offline. Online attendance of members faculty will be permitted only in exceptional cases.
- The Chairmen shall submit minutes of the meeting in the prescribed format only (Annexure – II) in triplicate(hard copies) to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the completion of BOS meeting and besides hosting the soft copy in the college website within the period stipulated.
- Each Chairman of BOS, shall get the rough draft of the curricula verified and approved by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity and commensurate with the stated vision and mission of the college among the departments.
- The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC coordinator will be the additional coordinator.

- The Academic Coordinator and IQAC coordinator shall conduct a meeting with the Chairmen, BOS between 28-29 September 2022 and explain the structure of curricula, uniformity other modalities.
- The Controller of Examinations of the institution shall fund the BOS meetings from the available funds on the condition of reimbursement after receiving autonomous funds from UGC. Initially, he shall pay Rs. 5,000/- uniformly as an advance per Board to the respective Chairman (If BOS meetings for multiple Boards are to be held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of Boards xRs.5000/-).
- The Chairman of each BOS shall apply to the Principal for advance amount for meeting the BOS meetings with head-wise expenditure in the prescribed format (Annexure-III).

Following contents shall be presented in the BOS document in order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the college
4. Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. Table showing the Allocation of Credits in the following table for both theory and Lab in case of science subjects

| S. No | Semester | Title of the Course (Paper) | Hrs./week | Max. Marks (SEE) | Marks in CIA | Credits |
|-------|----------|-----------------------------|-----------|------------------|--------------|---------|
| 1 | III | Abstract Algebra | 6 | 50 | 50 | 4 |

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting (Activities and Benchmarking as per Annexure–I)
7. At the end of each theory paper, each topic shall be mapped as per the Blooms taxonomy and scope of that topic for skill/ employability/ entrepreneurship opportunities in the following table incorporated.

| S. No | Subject | Semester | Title of the Course (Paper) | Topic | Parameter as per Blooms taxonomy (Knowledge/ Application/ Creativity/ Innovation) | Experiential learning component | Scope (Skill/ employability/ entrepreneurship) |
|-------|---------|----------|-----------------------------|------------|--|---------------------------------|---|
| 1 | Botany | III | Plant Physiology | Plant Cell | Knowledge | Shall be shown | |

| | | | | | | | |
|---|---------|-----|---------|-----------------------|-------------|----------------|---------------|
| | | | | | | Microscope | |
| 2 | History | III | Tourism | Tourism management | Application | Apprenticeship | Employability |

8. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification, in the Proforma given in Annexure –I.

9. Attendance of Members present with signatures in the tabular form.


10. List of Examiners & Paper setters

11. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50 marks) for each course with structure.

12. CO-PO mapping /PO attainment data

13. Text & Reference Books

14. e-content links


 PRINCIPAL
 P.R. Govt. College (A)
 KAKINADA



OFFICE OF THE DEAN, ACADEMIC AFFAIRS
ADIKAVI NANNAYA UNIVERSITY
RAJAMAHENDRAVARAM

No. ANUR/DAA/PR Govt. College (A)/Sub. Experts/2021

Date: 22-10-2021

PROCEEDINGS OF THE VICE-CHANCELLOR

Sub:- ANUR- DAA – Nominated University Subject Experts for BOS – PR Govt. College (A), Kakinada – Orders - Issued.

Ref:- 1. Lr. dated 15.09.2021, from the Principal, PR Govt. College (A), Kakinada
2.Proc. No: ANUR/PRG College (A), KKD/UG BoS/2019/09, dated 19.03.2019

Read:-Note for Orders of the Vice-Chancellor dated 21.10.2021

-oo0oo-


ORDERS

Having consider the request cited in the ref. 1, the Vice-Chancellor is pleased to order that the following members be nominated as University Subject Experts for UG Board of Studies of **PR Govt. College (A), Kakinada** for a period of three years from the date of the proceedings issued.

| S.No. | UG Courses | Name of the Subject Expert |
|-------|----------------------------------|--|
| 1 | English | Dr. Prasanthi Sree, AKNU MNS Campus, Kkd, Ph No: 9848297555, sathupathi.sri@gmail.com |
| 2 | Hindi | Dr. N Venkata Ramana, SKBR College, Amalapuram, Ph. No: 9849373773 |
| 3 | Telugu | Dr. P. Nagaraju, GDC, Palakollu, Ph.No: 9052038569, raju00517@gmail.com |
| 4 | Sanskrit | Dr. TGY Acharyulu, SKR Womens College, Rajahmundry, Ph. No: 9848628812 |
| 5 | Mathematics | Dr. V. Anantha Lakshmi, Principal, GDC Pithapuram, Ph. No : 9963786386, ananthamaths@rediffmail.com |
| 6 | Statistics & Actuarial Sciences | Dr. D V Ramana Murthy, HoD of Statistics, SKVT College, Rajamahendravaram, Ph.No: 9949135864, drdvrmurthy@gmail.com |
| 7 | Chemistry & Analytical Chemistry | Dr. K. Jhansi Lakshmi, Principal, Ideal College of Arts & Sciences, KKD, Ph.No: 9441236409, jhansikalisindi@gmail.com |
| 8 | Physics & Electronics | Dr. Paul Diwakar, Sri CRR College (A), Eluru, 9985050696 |
| 9 | Petro Chemicals | Dr. M Trinadh, Lecturer in Chemistry, Govt. College (A), Rajahmundry, Ph. No: 8639551783 |
| 10 | Bio-Chemistry | Dr. M Suvarchala, Lecturer in home science, ASD women's Degree College, KKD, |
| 11 | Food Science | Ph. No: 9346512694, suvarchakamallela@gmail.com |
| 12 | Botany | Dr. J. Sujatha, Leturer in Botany, GDC Rjy, Ph.No: 9441050910, drjsuneetha@grjy.ac.in |
| 13 | Microbiology | Dr. D Aruna, Lecturer in Micro-biology, ASD Women's College, Kakinada, Ph. No: 9182525872 |
| 14 | Zoology | Dr. B. Tejo Murthy, Lecturer in Zoology, GDC Yeleswaram, Ph. No: 9703799970, drmtm2011@gmail.com |
| 15 | Bio Technology | Dr. B. Nageswari, Lecturer in Biotechnology, GDC Rjy, Ph. No: 986621955 |

| | | |
|----|--|--|
| 16 | Commercial Aquaculture | Dr. P Ramamohana Rao, Aquaculture Consultant, KKD, Ph. No: 9885144557, asreenivasulu@gmail.com |
| 17 | Computer Science & Computer Applications | Mr. N. Naga Subrahmanyesweri, Lecturer in Computer Science, ASD Women's College, KKD, Ph. No: 9948438376, yesweri.velugu@asddgcw.ac.in |
| 18 | Commerce | Dr. K. Ratna Manikyam, Govt. College (A), RJY, Ph. No: 8919230362, drkrn@gcrjy.ac.in |
| 19 | Economics | Dr. D. V. Nageshwara Rao, Lecturer, GDC, RJY, Ph. No: 9490919676 |
| 20 | History | Dr. B. Anjani Kumari, Lecturer in charge, GDC (W), Ph. No: 891989337 |
| 21 | Philosophy | Dr. V. Venkatarao, Lecturer in Philosophy, MR College, Vijayanagaram, Ph. No: 9440096609 |
| 22 | Political Science | Dr. Seetha Mahalaxmi, Lecturer in Political Science, GDC, RJY Ph. No: 9491011844 |
| 23 | Journalism & Mass Communication | Prof. DVR Murthy, Dept. of Journalism & Mass Communication, Andhra University, Vishakapatnam, Ph. No: 9985051793, 9440974092 |
| 24 | Horticulture | Dr. J. Sujatha, Lecturer in Botany, GDC, Rjy, Ph. No: 9441050910, drjsuneetha@gcrjy.ac.in |
| 25 | Pharmaceutical Chemistry | Dr. K. Deepthi, Asst. Professor, Dept. of Chemistry, AKNU, Rjy, Ph. No: 9985469607, deepthikorabandi@gmail.com |

(BY ORDERS)


Dean 22/10/21
ACADEMIC AFFAIRS

To
The Principal, PR Govt. College (A), Kkd
PA to R
PS to VC,
OOF

**Proceedings of the Principal, PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A):
Kakinada**

**Present : Dr.B.V.Tirupanyam,Ph.D
Rc.No.12A/A.C/BOS/2022-23, Dated: 24 Sept 2022**

**Sub: P.R.Government College (A), Kakinada-Board of Studies(BOS)-nomination
of Members-orders Isued.**

Ref: UGC Guidelines for Autonomous Colleges – 2018

ORDER:

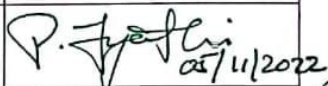
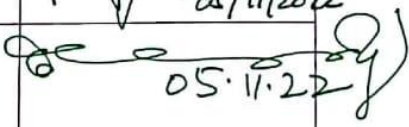



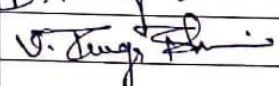
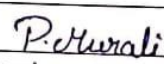
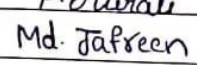
The Principal, P.R.Govt.College(A), Kakinada is pleased to constitute Board of Studies in STATISTICS for framing the syllabi in Statistics subject for all semesters duly following the norms of the UGC Autonomous guidelines.

| S.No | Name with Designation and Address | Designation |
|------|--|--|
| 1 | Smt. P.Jyothi Lecturer in IN CHARGE P. R. Govt College(A),KAKINADA | Chair Person |
| 2 | Dr. D. V. RAMANA Murthy Head, Dept.of statistics,SKVT college,Rajahmundry. | University Nominee |
| 3 | i)Dr. N. Madhavi HOD of statistics, Govt. COLLEGE(A), Rajamahendravaram ii)Sri. Smt .P.Raja Rajaeswari lecturer in Statistics, Aditya Degree College for Women , Kakinada | Subject expert |
| 4 | Sri Ch. Tata Rao, A. O Industrialist LIC, Kakinada. | Industrialist |
| 6 | B.Kalyan kumar | Faculty of the Department |
| 7 | V.Durga Bhavani | Faculty of the Department |
| 8 | STUDENT MEMBERS | |
| 9 | P. Murali II MSCS Md. Jafreen II MSCS N.Venkatesh I MSCS P.Sharon joshna I MSCS | Student Nominee Student Nominee Student Nominee Student Nominee |

P. R. GOVERNMENT COLLEGE (A), KAKINADA

Department of Statistics

The Board of Studies meeting for **Statistics** subject during the academic year 2022-2023 is conducted at the Dept. of Statistics on 05.11.2022 at 10:00 AM with Smt P.JYOTHI , Lecturer In-charge in Statistics the chair along with the following members.

| Name with Designation and Address | | Signature |
|--|---------------------------|--|
| Smt. P.Jyothi Lecturer in IN CHARGE P. R. Govt College(A),KAKINADA | Chair Person |  05/11/2022 |
| Dr. D. V. RAMANA Murthy Head, Dept.of statistics,SKVT college,Rajahmundry | University Nominee |  05.11.22 |
| i)Dr. N. Madhavi HOD of statistics, Govt. COLLEGE(A), Rajamahendravaram ii)Sri. Smt .P.Raja Rajaeswari lecturer in Statistics, Aditya Degree College for Women , Kakinada | Subject expert |  |
| Sri Ch. Tata Rao, A. O LIC, Kakinada. | Industrialist |  05/11/2022 |
| Members from the College | | |
| B.Kalyan kumar | Faculty of the Department |  |
| V.Durga Bhavani | Faculty of the Department |  |
| Student Members | | |
| P. Murali II MSCS | Student Nominee |  |
| Md. Jafreen II MSCS | Student Nominee |  |
| N.Venkatesh I MSCS | Student Nominee | |
| P.Sharon joshna I MSCS | Student Nominee | |

P.R. GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
DEPARTMENT OF STATISTICS

Meeting of the Board of studies is held at 11AM on 05-11-2022 in the Department of Statistics, P.R.Govt. College (A), Kakinada with the following agenda.

Agenda

1. a) To approve the curriculum, blue print and model paper for 1st year B.Sc Course under CBCS based as per the directions of the APSICHE for the admitted batch 2022 -23(I & II Semesters).
b) To approve the curriculum, blue print and model paper of practical examinations for 1st year B.Sc Course under CBCS based as per the directions of the AKNU for the admitted batch 2022 -23.(I & II Semesters).
2. To approve the curriculum, blue print and model paper for 2nd year B.Sc Course under CBCS based as per the directions of the APSICHE for the admitted batch 2021 -22 (III & IV Semesters)
3. To approve the curriculum, blue print and model paper for 3rd year B.Sc Course under CBCS based as per the directions of the APSICHE for the admitted batch 2020 -21(V & VI Semesters)
4. To approve the Two Certificate Courses one for statistics students were introduced in this academic year
5. To approve the incorporation of additional inputs to various courses (where ever it is felt necessary) for enhancing students understanding over the concerned course and this shall not be considered for evaluation purpose.
6. To approve the Examination procedure for the courses for I, II, III years of B.Sc (2022 – 23, 2021-22& 2020-21 admitted batches).
 - a) Each theory subject is evaluated for 100 Marks (I, II&III Years) out of which 50 Marks through semester end examination for I & II year, 60 marks through semester end examination for III year and internal assessment would be for 50 Marks for I & II year and 40 marks for III year.
 - b) The minimum pass mark for both internal and external examinations is 18 marks (36%), but as a whole student is subjected to get 40% marks (40 out of total 100 marks) to pass the subject. (I, II&III Years)
 - c) Internal assessment for 50 Marks is as follows: (I, II&III Years)
Paper I, II, III, IV, V : (First and Second Year)
Weight age for Internal Assessment is 50 marks.
For Mid Semester Examinations - 25 marks
For Continuous Assessment - 25 marks

Two Mid Semester Examinations will be conducted for 50 marks (1 hours15 min) in the following.

Question Paper pattern:

Short answer Questions (5mark) : 03 out of 05 : $3 \times 5 = 15$ marks

Essay answer question (10 marks) : 01 out of 02 : $1 \times 10 = 10$ marks

= 25 marks

The average of two mid examination marks are to be taken for 25 marks.

For continuous assessment – 25 marks distributed in the following way:

Student Project / Assignment - 10 marks (**Assignment**)

Seminar - 10 marks

Viva voce exam - 05 marks

Paper VI-A ; VII-A : (Final Year)

Weight age for Internal Assessment is 40 marks.

For Mid Semester Examinations - 20 marks

For Continuous Assessment - 20 marks

Two Mid Semester Examinations will be conducted for 40 marks (1 hours15 min) in the following.

Question Paper pattern:

Short answer Questions (5mark) : 04 out of 06 : $4 \times 5 = 20$ marks

Essay answer question (10 marks) : 02 out of 04 : $2 \times 10 = 20$ marks

= 40 marks

The average of two mid examination marks are to be taken for 20 marks.

For continuous assessment – 20 marks distributed in the following way:

Student Project / Assignment - 10 marks (**Assignment**)

Seminar - 05 marks

Viva voce exam - 05 marks

d) Internal assessment for 50 Marks is as follows: (For Certificate Courses)

vii) Study Project : 20 Marks

viii) Student Seminar : 10 Marks

ix) Viva-voce : 10 Marks

x) Assignment : 10 Marks

7. Scheme of Valuation for Practical's

- Record - 10 Marks
- Viva voce - 4 Marks
- Test - 36 Marks
- Total - 50 marks

Answer any 3 questions out of Five questions. Each question carries 12 marks.

8. To award two extra credit to students who have registered and completed SWAYAM course successfully.

9. To award 4 credits for each first and second phases of Apprenticeship between 1st and 2nd year and 2nd and 3rd year (two summer vacations).

10. To implement pedagogical strategies to enrich teaching and learning process.

11. To approve the proposed departmental activities for 2022-23.

12. To approve the list of examiners and paper setters for the academic year 2022-23.

13. Any other item with the permission of the chair.

CHAIRMAN
BOARD OF STUDIES

Resolutions taken :

The following resolutions are approved by university nominee and all the members of BOS

After reviewing the existing titles and contents of class I,II,III,IV and V framed by APSHE, the board come out with the following resolutions.

Resolution – I

It is resolved to approve the following changes of course I,II,III,IV and V of Statistics as it is given by APSCHE.

COURSE-I

1. Paper-I model can be changed

Short answer questions : $4 \times 5 = 20M$

Essay answer questions : $3 \times 10 = 30M$

2. Practical exams will be conducted for the students joining the academic year 2022-23.

3. Change of Bi-vairate Random variables topic is deleted in Unit-I

4. Addition of Importance and scope of statistics topic in unit –I

COURSE-II

1. Deletion of contingency tables in unit-v in paper-I

2. Addition of Cauchy distribution in unit-II in paper-II

COURSE-III

Paper-II model can be changed

Short answer questions : $4 \times 5 = 20M$

Essay answer questions : $3 \times 10 = 30M$

2. Wald Wolfowitz test topic is deleted in Unit-V

3. Addition of difference between t & f distribution,ump test,uniform power test and exact sampling distn in unit-I,II,IV.

COURSE – IV

1. sampling and non sampling error, simple steps to sample survey topic is added in Unit-I

2. Comparson of systematic sampling with Stratified and SRSWOR topics are deleted in Unit-II

COURSE – V

1. simple and weighted index numbers topics are deleted in Unit-IV.

2. Adbridge life tables topic is added in unit-V

COURSE – VI

1. It is resolved to approved the curriculum, blue print and model paper for 3rd year B.Sc Course under CBCS based as per the directions of the APSCHE for the admitted batch 2020 -21. (V&VI Semesters)

Resolution – II

1. It is resolved to approved the incorporation of additional inputs to various courses (where ever it is felt necessary) for enhancing students understanding over the concerned course and this shall not be considered for evaluation purpose.
2. Resolved to adopt Community Service Project for all the students at the end of Sem –II.
3. Resolved to send all the final year Statistics students for on job training apprenticeship in connection with industries for off-site Project in the end of Sem V/VI with the industries in accordance with their interest of study.
4. It is resolved to approve the proposed departmental activities for 2022-23.
5. It is resolved to approve the list of examiners and paper setters for the academic year 2022-23.
6. **Streamlining of regularity in attendance. Resolved to make the eligibility to appear for 1st mid is 75% of attendance for the 2nd mid it would be 75% , for 75% of attendance for semester examination and 90% for practical examinations .Also it is resolved that the student should attend at least one internal exam to appear for the Semester end examination.**
7. Resolved to give extra credits for MOOCS courses, N.S.S., N.C.C., winners of zonal level sports and games competitions, participation in state level/ National level competitions, blood donations camps, environmental programs like extending services in facing the natural calamities etc.
8. Resolved to Engaging of 7th hour of time table.
9. Resolved to conduct International / National , Webinar / Seminar like Data Science, etc.,
10. Resolved to introduce new courses of study whenever necessary.
11. Resolved to follow the admission criteria for the programmes offered by the department.
12. Resolved to conduct extension lectures by the eminent persons.
13. It is resolved to conduct a workshop on SPSS,by a eminent persons.
- 14.It is resolved to arrange a filed trip.

P.R.GOVERNMENT COLLEGE (A), KAKINADA

DEPARTMENT OF STATISTICS

Objectives of Department of Statistics:

- To inspire knowledge across different areas in Statistics and Actuarial Science.
 - To impart knowledge on Statistical concepts like Data Collection, Measures of Central Tendency and Dispersion, Probability and Distributions, Statistical Methods, Inference, Sampling methods, Experimental Designs, Economical and Vital Statistics, SQC, reliability and Operations Research.
 - To impart knowledge on Actuarial Science concepts like basics of Economics, Financial Accounting and Mathematics, Surviving models, life contingences, Business communication, Actuarial Statistics , Mortality and Insurance,
 - To equip our students with good quality to appear for competitive examinations.
 - To make the students to understand the needs of Statistics and Actuarial Science in Science, Technology and various industries like manufacturing, construction, insurance, IT, Pharmacy, etc.
 - To inculcate research atmosphere among students by assigning projects.
 - To provide learning environment by organizing industrial/field visits.
 - To conduct remedial classes to slow learners and assign research work to advance learners in collaboration with industries.
 - To organize guest lectures by inviting the resource persons from in and outside of universities for improving quality in education
 - To celebrate significant days like, National/World Statistics Day, Mathematics Day, Science Day, etc
 - To upgrade the students with latest Technology and Statistical softwares.
 - To make the students to join in Post Gradation in the domain of Statistics/Actuarial Science/related subjects in top universities after completion of their UG course
 - To make the students to get placements in Govt. and Private sectors in various positions viz, Assistant Statistical Officer, AD, Statistician, Data Analyst, Data Scientist, Business Analyst, Actuarial Analyst, Actuary, Risk Analyst, Bank PO, etc.
- The Department of Statistics is offering two **B.Sc.** courses **MSCs** and **MSAs**,

PROGRAMME OUTCOMES

For every degree program expectations are listed out by the institution under the Program Outcomes.

PO1. Knowledge and Understanding of:

1. All concepts at under graduate level.
2. Real life applications of these concepts and relationship between them.

PO2. Intellectual skills – be able to:

1. Think logically and arrange real life situations to mathematical form.
2. Assimilate knowledge and ideas based on wide reading and through the internet.
3. Transfer of appropriate knowledge and methods from one topic to another within the subject.
4. Understand the evolving state of knowledge in a rapidly developing field.

PO3. Transferable skills:

1. Use of IT (word-processing, use of internet for doing project).
2. Ability to work as part of a team.
3. Ability to use library resources/Equipment.
4. Time management.

PO4. Problem analysis:

1. Conversion of real life problem to Mathematical model and analyze with suitable Statistical tools.
2. Conduct investigations of complex problems: Use research-based knowledge.

PO5. Ethics:

1. Apply ethical principles, commit environment and responsibilities among students.

PO6. Individual and team work:

1. Function effectively as an individual and as a member in diverse teams, and in multidisciplinary settings.

PO7. Communication:

1. Communicate effectively on complex group activities and with society at large. Speak, read, write and listen clearly in person and through electronic media .

PO8.Critical Thinking:

1. Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO9. Effective Citizenship:

1. Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO10. Life-long learning:

1. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

| S.No. | Programme | PSO |
|-------|--|---|
| 1 | B.Sc. (Mathematics, Statistics, Computer Science) (Code: BS 11) | PSO1: To understand nature, scope, basic concepts and terminology of the three courses of the programme. |
| | | PSO2: To identify and understand the applications of the three courses in different areas like, physical sciences, life sciences, arts and humanities, Business, various industries, etc |
| | | PSO3: To solve various real life problems by developing mathematical model and applying various statistical tools with the help of computer programming knowledge. |
| | | PSO4: To develop research thinking to solve critical problems. |
| 2 | B.Sc. (Mathematics, Statistics, Actuarial Science) (Code: BS 14) | PSO1: To understand nature, scope, basic concepts and terminology of the three courses of the programme. |
| | | PSO2: To identify and understand the applications of the three courses in different areas like, physical sciences, life sciences, arts and humanities, Business, Insurance, various industries, etc |
| | | PSO3: To solve various real life problems by developing mathematical model and applying various statistical tools with the help of suitable economic, finance and risk policies. |
| | | PSO4: To develop research thinking to solve critical problems. |

P.R.Government College(Autonomous), Kakinada, A.P.
STRUCTURE OF C.B.C.S. MODEL CURRICULUM IN STATISTICS

| Yr. | Sem&Course (Th / Lab) | Course Title | Workload Hrs./week | Credits | Max. Marks | | |
|------------|--|---|-----------------------|---------|------------|--------|------|
| | | | | | Intrnl. | Extrnl | Tot. |
| <i>I</i> | I Sem. Course-I Theory | Descriptive Statistics& Probability | 4 Hrs | 4 | 50 | 50 | 100 |
| | I Sem Course-I Lab | Practical – I | 2 Hrs | 1 | – | – | 50 |
| | II sem Course-II Theory | Probability Distributions& Statistical Methods | 4 Hrs | 4 | 50 | 50 | 100 |
| | II sem Course-II Lab | Practical –II | 2 Hrs | 1 | – | – | 50 |
| <i>II</i> | III Sem Course-III Theory | Statistical Inference | 4 Hrs | 4 | 40 | 60 | 100 |
| | III Sem Course- III Lab | Practical-III | 2 Hrs | 1 | – | – | 50 |
| | IV Sem Course IV Theory | Sampling Techniques & Design of Experiments | 4 Hrs | 4 | 40 | 60 | 100 |
| | IV Sem Course IV Lab | Practical-IV | 2 Hrs | 1 | – | – | 50 |
| | IV Sem Course V Theory | Applied Statistics | 4 Hrs | 4 | 40 | 60 | 100 |
| | IV Sem Course V Lab | Practical-V | 2 Hrs | 1 | – | – | 50 |
| <i>III</i> | V Sem Course 6A Theory | Operation Research –I | 4 Hrs | 3 | 40 | 60 | 100 |
| | V Sem Course 6A Lab. | Practical-6A | 2 Hrs | 2 | – | – | 50 |
| | V sem Course 7A Theory | Operation Research –II | 4 Hrs | 3 | 40 | 60 | 100 |

| | | | | | | | |
|-------------------|----------------------------------|--|--------|---|----|----|-----|
| | V sem Course 7A Lab | Practical-7A | 2 Hrs | 2 | - | - | 50 |
| | V sem Course 6B Theory | Statistical process and quality control | 4 Hrs | 3 | 40 | 60 | 100 |
| | V sem Course 6B Lab | Practical-6B | 2 Hrs | 2 | - | - | 50 |
| | V sem Course 7B Theory/Practical | Computational techniques and R programming. | 4 Hrs | 3 | 40 | 60 | 100 |
| | | Practical-7B | 2 Hrs | 2 | - | - | 50 |
| | V sem Course 6C Theory | Econometrics | 4 Hrs | 3 | 40 | 60 | 100 |
| | V sem Course 6C Lab | Practical-6C | 2 Hrs | 2 | - | - | 50 |
| | V sem Course 7C Theory | Regression analysis | 4 Hrs | 3 | 40 | 60 | 100 |
| | V sem Course 7C Theory | Practical-7C | 2 Hrs | 2 | - | - | 50 |
| Life Skill Course | II Sem | Elementary Statistics | 2 Hrs | 2 | | 50 | 50 |
| Open to all | Certificate Course 01 | SPSS | 40 Hrs | | | | 50 |
| Open to all | Certificate Course 02 | Descriptive Statistics with R | 40 Hrs | | | | 50 |

OBJECTIVE OF THE COURSE

Statistics is a key to success in the field of science and technology. Today, the students need a thorough knowledge of fundamental basic principles, methods, results and a clear perception of the power of statistical ideas and tools to use them effectively in modeling, interpreting and solving the real life problems. Statistics plays an important role in the context of globalization of Indian economy, modern technology, computer science and information technology.

The main objectives of the course are

- To build the basis for promoting theoretical and application aspects of statistics.
- To underline the statistics as a science of decision making in the real life problems with the description of uncertainty.
- To emphasize the relevance of statistical tools and techniques of analysis in the study of inter-disciplinary sciences.
- To acquaint students with various statistical methods and their applications in different fields.
- To cultivate statistical thinking among students.
- To develop skills in handling complex problems in data analysis and research design.
- To prepare students for future courses having quantitative components.

This course is aimed at preparing the students to cope with the latest developments and compete with students from other universities and put them on the right track

| | | | | | |
|---------------------|---|---|---|---|---|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester I B.Sc. (I Sem) (2022-23) | | | |
| Course Code 1211 | TITLE OF THE COURSE Descriptive Statistics & Probability | | | | |
| Teaching | Hours Allocated: 60 (Theory) | L | T | P | C |
| Pre-requisites: | Basic Knowledge in Mathematics & Statistics | 4 | - | - | 4 |

Course Objectives:

- This course gives the students to review good practice in presentation and format that most applicable to their own data.
- The measures of central tendency or averages reduce the data to a single value which is highly useful for making comparative studies.
- The measures of dispersion throw light on reliability of average and control of variability
- This paper deals with the situation where there is uncertainty and how to measure that uncertainty by defining the probability, random variable and mathematical expectation which are essential in all research areas.

Course Outcomes:

On Completion of the course, the students will be able to-

| | |
|------------|---|
| CO1 | learn about basic concepts of Statistics |
| CO2 | learn about various measures of Central tendency and also various dispersion |
| CO3 | learn about Skewness and kurtosis |
| CO4 | know about Probability Concept and Random variables |
| CO5 | know about Expectations |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|-------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|-------------------|--|---------------|--|------------------|--|

Module-I (10 Hrs)

Introduction to Statistics: Importance and scope of Statistics. Concepts of primary and secondary data.

Diagrammatic and graphical representation of data: Histogram, frequency polygon, Ogives, Pie. **Measures of Central Tendency:** Mean, Median, Mode, Geometric Mean and Harmonic Mean. Median and Mode through graph.

Module-II (10 Hrs)

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non-Central moments and their inter-relations. Sheppard's correction for moments. Skewness and kurtosis.

Module-III (12 Hrs)

Introduction to Probability: Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 and for n events. Boole's inequality and Baye's theorem and its applications in real life problems.

Module-IV (8 Hrs)

Random variable: Definition of random variable, discrete and continuous random variables, functions of random variable. Probability mass function. Probability density function, Distribution function and its properties. Simple Problems.

Additional Inputs: Bi-variate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.

Module-V (10 Hrs)

Mathematical Expectation : Mathematical expectation of a random variable and its Properties. Moments and covariance using mathematical expectation with examples. Addition and Multiplication theorems on expectation. Definitions of M.G.F, C.G.F, P.G.F, C.F and their properties. Chebyshev and Cauchy - Schwartz inequalities.

Text books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan.
2. BA/BSc I year Statistics-descriptive statistics, probability distribution-Telugu Academy-Dr M. Jagannathan Rao, Dr. N.Srinivasa Rao, Dr P.Tirupathi Rao, Smt. D.Vijayalakshmi.
3. B.A/B.Sc Statistics Descriptive Statistics and Probability, Kalyani Publishers by D.V.L.N. Jogiraju, C. Srikala and L.P. Raj Kumar

Reference books:

1. Willam Feller: Introduction to Probability theory and its applications. Volume –I, Wiley
2. Goon AM, Gupta MK, Das Gupta B: Fundamentals of Statistics, Vol-I, the World Press Pvt.Ltd. Kolkata.

Web Links:

1. <https://conjointly.com/kb/descriptive-statistics/>
2. https://en.wikipedia.org/wiki/Descriptive_statistics
3. <https://www.scribbr.com/statistics/descriptive-statistics/>

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 1 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 1 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 2 |
| CO3 | 1 | 1 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 |

| P.R.GOVERNMENT COLLEGE(A), KAKINADA | | Program & Semester I B.Sc. (I Sem) | | | |
|--|---|---|---|---|---|
| Course Code | TITLE OF THE COURSE Descriptive Statistics & Probability | | | | |
| Practical | Hours Allocated: 30 | L | T | P | C |
| Pre-requisites: | Application of Statistical tools and techniques | - | - | 2 | 1 |

Conduct any SIX (MS-Excel mandatory):

- Graphical presentation of data (Histogram, frequency polygon).
- Construction of Ogive curves
- Computation of measures of central tendency (Mean, Median and Mode)
- Computation of measures of dispersion (Q.D, M.D and S.D)
- Computation of non-central, central moments, β_1 and β_2 for ungrouped data.
- Computation of non-central, central moments, β_1 and β_2 and Sheppard's corrections for grouped data.
- Computation of Karl Pearson's coefficient of Skewness and Bowley's coefficient of Skewness.
- Practicals 1, 2, 3, 4, 6, 7 using MS-Excel.

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

Virtual Lab Links:

- <https://conjointly.com/kb/descriptive-statistics/>
- https://en.wikipedia.org/wiki/Descriptive_statistics
- <https://www.scribbr.com/statistics/descriptive-statistics/>
- <https://byjus.com/maths/probability-and-statistics/>
- <https://oli.cmu.edu/courses/probability-statistics-open-free/>

SEMESTER-I: DISCRIPTIVE STATISTICS& PROBABILITY

Model blue print for the Question Paper setter

Max. Marks: 50

Time: 2 ½ Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|-------------------------------|------------------------|---|
| I | 2 | 1 | 20 |
| II | 1 | 2 | 25 |
| III | 1 | 1 | 15 |
| IV | 1 | 1 | 15 |
| V | 2 | 1 | 20 |
| Total including choice | 7 | 6 | 95 |

Statistics Course–I: DESCRIPTIVE STATISTICS& PROBABILITY
Question Bank

Short answer Questions:

1. Explain the construction of Ogives.
2. Write the merits and demerits of mode.
3. Show that the sum of absolute deviation from median is minimum.
4. State and Prove properties of arithmetic mean
5. Explain an ideal measure of dispersion
6. Write about Sheppard's corrections.
7. Define Kurtosis and explain.
8. State and prove addition theorem of probability for two events.
9. State and prove multiplication theorem for two events.
10. Define Probability density function.
11. Define Probability mass function.
12. Define distribution function and state its properties.
13. Define Marginal and conditional distributions.
14. What is the chance that leap year selected at random will contain 53 Sundays.
15. A problem in statistics is given to the three students A,B and C whose chances of solving it are $1/2$, $3/4$ and $1/4$ respectively. What is the probability that the problem will be solved if all of them solve independently.
16. For a continuous random variable X with p.d.f. $f(x)=3x^2, 0 \leq x \leq 1$. Find a and b such that i) $p(X \leq a) = p(X > a)$ and ii) $p(X > b) = 0.05$
17. Define Mathematical Expectation of a random variable. State its properties?
18. State and prove addition theorem of expectation for 2 variables.
19. Define Characteristic function and state its properties.
20. Explain Cumulative generating function

ESSAY QUESTIONS:

21. Explain the various methods to collect primary data and the sources of secondary data.
22. Explain measures of central tendency.
23. Explain measures of dispersion.
24. Define central and non central moments and establish the relation between them.
25. Explain Karl Pearson's and Bowley's coefficient of Skewness.
26. State and prove addition theorem for n events.
27. State and prove multiplication theorem for n events.
28. State and prove Bayes's theorem.
29. State and prove Boole's inequality.

30. The first four moments about a point 4 are respectively 1, 4, 10 and 45. Find mean, variance, μ_3 and μ_4 .

31. A random variable X has the following probability distributions

| | | | | | | | | | |
|-------|---|----|----|----|----|-----|-----|-----|-----|
| X: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| P(X): | a | 3a | 5a | 7a | 9a | 11a | 13a | 15a | 17a |

Find the values of a) a b) $p(X < 3)$ c) $p(X \geq 3)$ d) $p(0 < X < 5)$ e) $p(X \leq 7)$

32. Suppose that the random variable X takes the values 3, 4 and 5 with probabilities $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{1}{3}$ respectively. Obtain the distribution function of the random variable X.

33. State and prove Cauchy's Schwartz inequality.

34. State and prove Chebyshev's inequality.

35. Define Moment generating function and derive its properties.

36. Define Probability generating function and derive its properties.

P.R. Government College (Autonomous), Kakinada
I year B.Sc., Degree Examinations – Semester-I
Statistics Course–I: DESCRIPTIVE STATISTICS& PROBABILITY
Model Paper

Time: 2 ½ Hrs.

Max. Marks: 50

Section – A

Answer any FOUR of the following questions.

4x5 = 20 M

1. Explain the construction of Ogives.
2. Show that the sum of absolute deviation from median is minimum
3. Write the merits and demerits of mode.
4. State and Prove properties of arithmetic mean
5. Explain an ideal measure of dispersion
6. A problem in statistics is given to the three students A,B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if all of them solve independently.
7. For a continuous random variable X with p.d.f. $f(x)=3x^2, 0 \leq x \leq 1$. Find a and b such that i) $p(X \leq a) = p(X > a)$ and ii) $p(X > b) = 0.05$

Section – B

Answer any THREE questions

3x10 = 30 M

8. Explain the various methods of collecting primary data.
9. Explain measures of central tendency with their relative merits and demerits?
10. Define raw and central moments and establish relationship between them
11. State and prove Baye's theorem probability.
12. A random variable X lies the following probability distributions

| | | | | | | | | | |
|-------|---|----|----|----|----|-----|-----|-----|-----|
| X: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| P(X): | a | 3a | 5a | 7a | 9a | 11a | 13a | 15a | 17a |

Find the values of a) a b) $p(X < 3)$ c) $p(X \geq 3)$ d) $p(0 < X < 5)$ e) $p(X \leq 7)$
13. Define M.G.F state and prove its properties.

| | | | | | |
|-----------------|--|---|---|---|---|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester I B.Sc (II Sem) (2022-23) | | | |
| Course Code | TITLE OF THE COURSE Probability Distributions and Statistical Methods | | | | |
| Teaching | Hours Allocated: 60 (Theory) | L | T | P | C |
| Pre-requisites: | Basic Knowledge in Probability, Distributions and methods in statistics | 4 | - | - | 4 |

Course Objectives:

- This course gives an idea of using various standard theoretical distributions, their chief characteristics and applications in analyzing any data.
- The concept of Correlation and Linear Regression deals with studying the linear relationship between two or more variables, which is needed to analyze the real life problems.
- The attributes gives an idea that how to deal with qualitative data.

Course Outcomes:

| | |
|--|---|
| On Completion of the course, the students will be able to- | |
| CO1 | Learn about Probability, its techniques and applications |
| CO2 | Learn about discrete and continuous distributions and their applications |
| CO3 | To solve the practical examples of both continuous and discrete in their real life |
| CO4 | Know about various statistical methods and their applications |
| CO5 | To learn about qualitative data |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|-------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|-------------------|--|---------------|--|------------------|--|

Module-I (10 Hrs)

Discrete Distributions: Binomial, Poisson, Negative Binomial, Geometric distributions: Definitions, means, variances, M.G.F, C.F, C.G.F, P.G.F, additive property if exists. Poisson approximation to Binomial distribution. Hyper-geometric distribution: Definition, mean and variance.

Module– II (12 Hrs)

Continuous Distributions: Rectangular, Exponential, Gamma, Beta Distributions: mean , variance, M.G.F, C.F. Normal Distribution: Definition, Importance, Properties, M.G.F, , additive property, Cauchy distribution

Module-III (12 Hrs)

Correlation: Meaning, Types of Correlation, Measures of Correlation: Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties), Bi-variate frequency distribution, correlation coefficient for bi-variate data and simple problems.

Regression: Concept of Regression, Linear Regression: Regression lines, Regression coefficients and it's properties, Regressions lines for bi-variate data and simple problems. Correlation vs Regression.

Module- IV (8 Hrs)

Curve fitting: Bi- variate data, Principle of least squares, fitting of degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, Fitting of power curve and exponential curves.

Module-V (8 Hrs)

Attributes : Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data, Conditions for consistency of data for 2 and 3 attributes only , Independence of attributes , Association of attributes and its measures, Relationship between association and colligation of attributes

Textbooks:

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

Chand & Sons, New Delhi.

2 BA/BSc I year statistics - descriptive statistics, probability distribution - Telugu Academy
- Dr M.Jaganmohan Rao, Dr N.Srinivasa Rao, Dr P.Tirupathi Rao, Smt.D.Vijayalakshmi.

3. K.V.S. Sarma: **Statistics Made Simple: Do it yourself on PC**. PHI

Referencebooks:

1. Willam Feller: **Introduction to Probability theory and its applications. Volume –I,**

Wiley

2. Goon AM, Gupta MK, Das Gupta B: **Fundamentals of Statistics, Vol-I, the**

World Press Pvt.Ltd. Kolkata.

WebLinks:

https://en.wikipedia.org/wiki/List_of_probability_distributions#Discrete_distribution/

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 1 | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| CO3 | 1 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO5 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 |

| P.R.GOVERNMENT COLLEGE(A), KAKINADA | | Program & Semester I B.Sc. (II Sem) | | | |
|--|--|--|----------|----------|----------|
| Course Code | TITLE OF THE COURSE | | | | |
| | Probability Distributions and Statistical Methods | | | | |
| Practical | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic Knowledge in Probability, Distributions and methods in statistics | - | - | 2 | 1 |

Conduct any TEN (MS-Excel mandatory):

1. Fitting of Binomial distribution – Direct Method.
2. Fitting of Binomial distribution – Recurrence Relation Method.
3. Fitting of Poisson distribution – Direct Method.
4. Fitting of Poisson distribution - Recurrence Relation Method.
5. Fitting of Negative Binomial distribution.
6. Fitting of Geometric distribution.
7. Fitting of Normal distribution – Areas Method.
8. Fitting of Normal distribution – Ordinates Method.
9. Fitting of Exponential distribution.
10. Fitting of straight line and parabola by the method of least squares
11. Fitting of exponential and power curves by the method of least squares.
12. Computation of correlation coefficient and regression lines for ungrouped data
13. Computation of correlation coefficient, forming regression lines for grouped data
14. Practicals 1, 3, 7, 9, 10, 11, 12 using MS-Excel

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

Virtual Lab Links:

1. https://en.wikipedia.org/wiki/Probability_distribution
2. https://en.wikipedia.org/wiki/List_of_probability_distributions#Discrete_distributions
3. <https://byjus.com/maths/probability-and-statistics/>

SEMESTER-II PROBABILITY DISTRIBUTIONS& STATISTICAL METHODS
Model blue print for the Question Paper setter

Max. marks: 50

Time : 2 ½ Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|-------------------------------|------------------------|---|
| I | 2 | 1 | 20 |
| II | 1 | 2 | 25 |
| III | 2 | 1 | 20 |
| IV | 1 | 1 | 15 |
| V | 1 | 1 | 15 |
| Total including choice | 7 | 6 | 95 |

Question Bank

SHORT QUESTIONS:

1. Find m.g.f. of Binomial distribution.
2. Explain the memory less property of geometric distribution.
3. Obtain mean and variance of binomial distribution.
4. Obtain mean and variance of Poisson distribution.
5. Obtain mean and variance of rectangular distribution.
6. Obtain mean and variance of exponential distribution.
7. Obtain mean and variance of geometric distribution.
8. Define Normal Distribution and find MGF
9. Define correlation and write types of correlation.
10. Write the difference between correlation and regression.
11. Write the properties of regression coefficients.
12. Define rank correlation coefficient
13. Define principle of least squares and write the procedure to fit a straight line.
14. Define attribute and explain association of attributes.
15. Explain the criteria of independence of attributes

ESSAY QUESTIONS:

16. Define Hyper Geometric distribution, find its mean and variance.
17. Derive the recurrence relation for the moments of Binomial distribution.
18. Show that Poisson distribution is limiting case of binomial distribution.
19. In Normal distribution, show that mean = median= mode.
20. In Normal distribution, show that Q.D:MD:SD is approximately 10:12:15.
21. Define Gamma distribution, state and prove additive property of gamma distribution.
22. State and prove memory less property of exponential distribution.
23. Derive mean and variance of Beta distribution of first kind..
24. Derive mean and variance of Beta distribution of second kind.
25. It is found that the average calls received by a lady at a particular helpline centre is 4 per hour. What is the probability that she will receive during a random hour i) no call ii) exactly 4 calls iii) at least one call.
26. In a normal distribution, 7% of items are under 35 and 89% of items are under 63. Find mean and variance of the distribution.
27. Show that the correlation coefficient is independent of change of origin and scale
28. Derive the two regression lines.
29. Obtain rank correlation for the following data.
X 45 55 52 71 84 66 74 42 49 58
Y 48 52 74 65 71 44 85 78 54 65
30. Explain fitting of exponential curve and power curve.
31. Fit a second degree parabola for the following data.

X 5 4 6 2 7 9 4

Y 6 7 4 8 4 1 8

32. Show that $Q = \frac{2Y}{1+Y^2}$

P.R. Government College (Autonomous), Kakinada
I year B.Sc., Degree Examinations - II Semester
Statistics Course–II:PROBABILITY DISTRIBUTIONS& STATISTICAL METHODS
Model Paper

Time: 2 ½ Hrs.

Max. Marks: 50

Section – A

Answer any FOUR of the following questions.

4x5 = 20 M

1. Find m.g.f. of Binomial distribution.
2. Derive variance of Poisson distribution
3. Explain the memory less property of geometric distribution.
4. Write the differences between correlation and regression
5. Define rank correlation coefficient
6. Explain the fitting of straight line
7. Explain the independence of attributes

Section – B

Answer any THREE questions

3x10 = 30 M

8. Define Hyper Geometric distribution, find its mean and variance.
9. Define Normal Distribution and find MGF & hence deduce it's mean and variance.
10. Define Gamma distribution, state and prove additive property of gamma distribution.
11. Show that Correlation coefficient is independent of change of origin and scale.
12. Explain the fitting of second degree parabola.
13. Show that $Q = \frac{2Y}{1+Y^2}$?

| | | | | | |
|------------------------|---|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester II B.Sc. (III Sem) | | | |
| Course Code | TITLE OF THE COURSE ELEMENTARY STATISTICS | | | | |
| Practical | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Sampling concept | 2 | - | - | 2 |

Objective:

To provide basic understating of general statistical tools and their elementary applications and to create awareness on Indian Statistical System.

Course outcomes:

- CO 1: To understand the concept of Statistics and its merits and demerits. Distinguishing primary and secondary data. Classification, Tabulation and Pictorial representation of data.
- CO 2: To understand the basic nature of data and how a single value describes the entire data set. Measuring the degree of departure of a distribution from symmetry and reveals the direction of scatteredness of the items.
- CO 3: To understand the spread of the data and to draw conclusions from the comparison of averages.To understand the concept of correlation and regression and to learn the degree of association between two variables and establishing relationship between the variables.

Syllabus

Unit I: Meaning, scope and limitations of Statistics

Collection of data: Primary and Secondary, Classification and Tabulation, Construction of frequencydistribution.Graphical Representation: Histogram, Bar, Pie and Frequency polygon. (8 Hrs)

Unit II: Measures of Central Tendency: Features of good average, Arithmetic Mean, Median, Mode. Empirical relationship between Mean Median and Mode and skewness based oncentralvalues. (8 Hrs)

Unit III: Measures of Dispersion: Range, Quartile Deviation(QD), Mean Deviation(MD), Variance, Standard Deviation(SD), relationship between QD, MD and SD.Familiarizationof the concepts relating to Correlation and LinearRegressionline. (8 Hrs)

Books for Study:

1. Statistics (Theory, Methods, Application) D C Sancheti, V K Kapoor, Sultan Chand and Sons, NewDelhi
 2. Statistical Methods, S.P. Gupta, Sultan Chand and Sons, NewDelhi
 3. Statistics (Theory and Practice) B.N Gupta, Sahitya Bhavan,Agra
- Web sites for free download books for Statistics

<https://www.pdfdrive.com/introduction-to-statistics-books.html>
<http://www.freebookcentre.net/SpecialCat/Free-Statistics-Books-Download.html>
<https://bookboon.com/en/statistics-ebooks>
http://onlinestatbook.com/Online_Statistics_Education.pdf

Co-curricular activities: (6 Hrs)

Objective is to apply the theoretical concept to real life data which enhances the learning and interpretation ability to the current environment.

CoCA I: (i) Collect primary or secondary data and establish frequency distribution.

(ii) Suitable pictorial/ Graphical representation to the established frequency distribution

CoCA II: (i) Select the data and then calculate AM,Median and Mode and interpret the result.

(ii) Calculate the skewness based on central values and interpret the degree of departure of a distribution from symmetry and the direction of scatteredness of the items.

CoCA III: (i) Calculate the dispersion values of a data for a single or double data sets and to draw conclusions from the comparison of averages.

(ii) Select the bi-variate data (for example, select marks of any two subjects of your course) and calculate the degree of association and establish the linear relationship and find the forecasting value.

CoCA IV: If there is an internet facility at your college/home, go through the Ministry of Statistics and Program Implementationsite www.mospi.gov.in to know about the Indian Statistical System and <https://desap.cgg.gov.in> or www.apdes.in to know about the Andhra Pradesh Directorate of Economics and Statistics(APDES) and its activities.

Life Skill Course/Semester-II

Elementary Statistics

Time: 2 Hrs

Model Paper

Max. Marks: 50

Answer any 5 of the following.

5 x 10 = 50

1. Question from Unit-I
2. Question from Unit-I
3. Question from Unit-I
4. Question from Unit-II
5. Question from Unit-II
6. Question from Unit-III
7. Question from Unit-III
8. Question from Unit-I

| | | | | | |
|---------------------------------|---|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester II B.Sc. (III Sem) | | | |
| Course Code 3211 | TITLE OF THE COURSE Statistical inference | | | | |
| Practical | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Sampling concept | 4 | - | - | 4 |

Objectives:

- To provide basic knowledge on sampling distributions and applications of chi-square, t, and F
- To enhance the knowledge to find the estimators of parameters keeping in view the properties of estimators
- To give an central idea to apply parametric and non-parametric methods to test hypotheses

Course Outcomes:

| | |
|--|---|
| On Completion of the course, the students will be able to- | |
| CO1 | Students would be able to learn about estimation concept |
| CO2 | Students would be able to learn about Hypothesis and its procedure |
| CO3 | Students would be to learn large sample tests and small sample tests |
| CO4 | Students would be able to learn about Non parametric tests |
| CO5 | Students would be to learn computation part |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|-------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|-------------------|--|---------------|--|------------------|--|

UNIT-I (10 Hrs)

Concepts: Population, Sample, Parameter, statistic, Sampling distribution, Standard error. convergence in probability and convergence in distribution, law of large numbers, central limit theorem (statements only). Student's t- distribution, F – Distribution, χ^2 -Distribution: Definitions, properties and their applications, Difference between t and F Distributions.

UNIT-II (10 Hrs)

Theory of estimation: Estimation of a parameter, criteria of a good estimator – unbiasedness, consistency, efficiency, & sufficiency and. Statement of Neyman's factorization theorem. Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE's. Estimation of Binomial, Poisson & Normal Population parameters by MLE method. Confidence Intervals for mean and variance in Normal Distribution.

Additional Inputs: Method of least square, confidence limits, Method of estimation

UNIT-III (8 Hrs)

Testing of Hypothesis: Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests. Neyman-Pearson's lemma. Ump test, uniform most powerful test. Examples in case of Binomial, Poisson, Exponential and Normal distributions.

Additional Inputs: likelihood Ratio test

UNIT – IV (12 Hrs)

Large sample Tests: Large sample test for single mean and difference of two means, confidence intervals for mean(s). Large sample test for single proportion, difference of proportions. standard deviation(s) and correlation coefficient(s).

Small Sample tests: t-test for single mean, difference of means and paired t-test, test for correlation. χ^2 -test for goodness of fit and independence of attributes. F-test for equality of variances, Exact sampling distribution.

UNIT – V (10 Hrs)

Non-parametric tests- advantages and disadvantages, comparison with parametric tests. Measurement scale- nominal, ordinal, interval and ratio. One sample runs test, sign test and Wilcoxon-signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon –Mann-Whitney U test.

Additional Inputs: Sequential analysis introduction.

Textbooks:

1. B.A/B.Sc II Year statistics-statistical methods and inference-Telugu Academy by A.Mohanrao, N.SrinivasaRao, Dr.R.Sudhakara Reddy, Dr.T.C. Ravichandrakumar
2. K.V.S.Sarma Statistics Made simple: Do it yourself on PC, PHI.
3. B.A/B.Sc Statistics Descriptive Statistics and Probability, Kalyani Publishers by D.V.L.N. Jogiraju, C. Srikala and L.P. Raj Kumar.

Reference books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi
2. Goon AM, Gupta MK, Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt.Ltd, Kolkata.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.

WebLinks:

1. <https://conjointly.com/kb/descriptive-statistics/>
2. https://en.wikipedia.org/wiki/Descriptive_statistics
3. <https://www.scribbr.com/statistics/descriptive-statistics/>
4. <https://byjus.com/maths/probability-and-statistics/>

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High]'-':No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 |
| CO2 | 2 | 1 | 2 | 2 | 1 | 1 | 2 | 3 | 1 | 2 | 2 | 2 | 2 |
| CO3 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO5 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 |

| P.R.GOVERNMENT COLLEGE(A), KAKINADA | | Program & Semester II B.Sc. (III Sem) | | | | | | |
|--|---|--|--|--|----------|----------|----------|----------|
| Course Code | TITLE OF THE COURSE Statistical inference | | | | | | | |
| Practical | Hours Allocated: 30 hrs | | | | L | T | P | C |
| Pre-requisites: | Basic knowledge in Sampling concept | | | | - | - | 2 | 1 |

Conduct any TEN (MS-Excel mandatory):

1. Large sample test for single mean and difference of means
2. Large sample test for single proportion and difference of proportions
3. Large sample test for difference of standard deviations
4. Large sample test for correlation coefficients
5. Small sample test for single mean and difference of means
6. Small sample test for correlation coefficient
7. Paired t-test.
8. Small sample test for single variance(χ^2 - test)
9. Small sample test for difference of variances(F-test)
10. χ^2 - test for goodness of fit and independence of attributes
11. Nonparametric tests for single sample(run test, sign test and Wilcoxon signed ranktest)
12. Nonparametric tests for related samples (sign test and Wilcoxon signed ranktest)
13. Nonparametric tests for two independent samples (Median test, Wilcoxon –Mann- Whitney - U test)
14. Practicals 5, 6, 7, 8, 9, 10 using MS-Excel

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

Virtual Lab Links:

1. <https://conjointly.com/kb/descriptive-statistics/>
2. https://en.wikipedia.org/wiki/Descriptive_statistics/

Model blue print for the Question Paper setter

Course-III: STATISTICAL INFERENCE

Max. Marks: 50

Time : 2 ½ Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|-------------------------------|------------------------|---|
| I | 1 | 1 | 15 |
| II | 2 | 1 | 20 |
| III | 1 | 1 | 15 |
| IV | 2 | 2 | 30 |
| V | 1 | 1 | 15 |
| Total including choice | 7 | 6 | 95 |

Statistics Course–III: Statistical Inference

Question Bank

SHORT QUESTIONS:

1. Define i) Population ii) Parameter iii) Sample iv) Statistic v) Sampling distribution vi) Standard error.
2. Write the applications of t-distribution.
3. Explain method of moments
4. Explain the concept of Interval estimation.
5. Define null hypothesis and alternate hypothesis.
6. Explain one tailed tests and two tailed tests.
7. Explain two types of errors, ump test.
8. Define critical region, level of significance and power of test.
9. Write the procedure for testing of hypothesis.
10. Write the procedure for test for single mean.
11. Explain the procedure for single proportion.
12. Explain randomized tests and non randomized tests.
13. Write the procedure for t- test for sample correlation coefficient.
14. Explain the procedure for t-test for single mean.
15. Explain paired t-test for difference of means.
16. Write the advantages and disadvantages of NP tests over parametric tests.
17. Explain the test for randomness.
18. Write the procedure for one sample sign test.

ESSAY QUESTIONS:

19. Define chi square test and write it's properties.
20. Define t-test and write it's properties.
21. Define F-test and write it's properties.
22. Difference between t and F distribution
23. Explain criteria of good estimator.
24. Explain MLE and write it's properties.
25. Prove that the sample mean is consistent estimator of population mean for normal population
26. Find MLE for the parameter of a Poisson distribution on the basis of random sample of size n.
27. Find MLE for the parameters of a Normal distribution on the basis of random sample of size n.
28. State and prove Neyman Pearson's Lemma.
29. Obtain the most powerful critical region for testing $H_0:\mu=\mu_0$ against $H_1:\mu=\mu_1$, in case of Normal population with known variance, using N-P lemma.
30. Explain large sample test for testing equality of two means and two standard deviation of two normal populations.
31. Random samples drawn from two countries gave the following data relating two heights of men.

| | | |
|------------------------|-------|-------|
| Mean heights in inches | 67.42 | 67.25 |
| Standard deviation | 2.58 | 2.5 |

Sizes of samples 1000 2000

i) Is the difference between means significant at 1% los.

ii) Is the difference between standard deviations significant at 1% los.

32. Explain t-test for difference of means.
33. Explain F-test for equality of variances of two populations.
34. Explain run test for equality of two populations.
35. Explain the chi-square test for i) goodness of fit ii) Independence of attributes.
36. Explain one and paired sample signed rank test.
37. Explain U test for equality of two populations.
38. Explain the procedure for two sample sign test.

P.R. Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations - III Semester (w.e.f 2021-22)
For 2021-20 batch
Statistics Course–III: Statistical Inference
Model Paper

Time: 2 ½ Hrs.

Max. Marks: 50

Section – A

Answer **Any Four** of the following questions.

4x5 = 20 M

1. Define 1) standard error 2) Parameter 3) Sampling distribution
2. Write the concept of Interval estimation
3. Define null hypotheses, alternative hypotheses, simple and composite hypotheses
4. Write procedure of test for single mean for large sample.
5. Advantages and disadvantages of non-parametric methods over parametric methods.
6. Explain run test for randomness?
7. Define F-Statistic. state its properties.

Section – B

3x10 = 30 M

Answer **Any Three** of the following questions.

8. Define chi square distribution and write its properties..
9. Explain the criteria of a good estimator
10. Explain the Method of Maximum Likelihood Estimation. And state the properties of MLE
11. State and prove Neyman- Pearson Lemma.
12. Explain the large sample test for testing the difference of two means.
13. Explain the small sample test for testing the difference of two means
14. Explain Mann Whitney Wilcoxon U test.

Note: Provide Statistical table values wherever necessary.

| | | | | | |
|-------------------------------|--|---|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester II B.Sc. (IVSem) Paper-IV | | | |
| Course Code STT204 | TITLE OF THE COURSE Sampling Techniques & Design of Experiments | | | | |
| Practical | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in methods and Statistical inference | 4 | - | - | 4 |

Objectives:

The aim of this paper is to introduce you to the statistical aspects associated with the design and analysis of sample surveys, and to develop your understanding of the principles and methods used to design survey sampling schemes.

2. Basic theory underpinning survey inference will be introduced, focusing on methodology for survey-based estimation for population totals and related quantities for some standard sample designs

Course Outcomes:

| | |
|--|--|
| On Completion of the course, the students will be able to- | |
| CO1 | Students would be able to learn about the sampling methods |
| CO2 | Students would be able to learn about types of sampling |
| CO3 | Students would be able to learn about simple random sampling |
| CO4 | Students would be able to learn about Anova and Designs |
| CO5 | Students would be able to learn about CRD,RBD,LSD |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|-------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|-------------------|--|---------------|--|------------------|--|

UNIT I (10 hours)

Simple Random Sampling (with and without replacement): Notations and terminology, various probabilities of selection. Random numbers tables. Methods of selecting simple random sample, lottery method, method based on random numbers. Estimates of population total, mean and their variances and standard errors, determination of sample size.

UNIT II (12 hours)

Stratified random sampling: Stratified random sampling, Advantages and Disadvantages of Stratified Random sampling, Estimation of population mean, and its variance. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.

Additional Inputs: $\text{var}(\bar{y}_{st})$ is minimum for fixed total sample size n if n_i & N_i

Systematic sampling: Systematic sampling definition when $N = nk$ and merits and demerits of systematic sampling - estimate of mean and its variance.

Additional Inputs: variance of systematic sample mean where intra class correlation coefficient ρ involved.

UNIT III (10 hours)

Analysis of variance: Analysis of variance(ANOVA) –Definition and assumptions. One-way with equal and unequal classification, Two- way classification.

Design of Experiments: Definition, Principles of design of experiments, CRD: Layout, advantages and disadvantages and Statistical analysis of Completely Randomized Design(C.R.D).

Additional Inputs: Cochran's theorem, fixed effect & random effect model.

UNIT IV (10 hours)

Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) with their layouts and Analysis. Missing plot technique in RBD and LSD. Efficiency of RBD over CRD, Efficiency of LSD over RBD and CRD.

UNIT V (8 hours)

Factorial experiments – Main effects and interaction effects of 2^2 and 2^3 factorial experiments and their Statistical analysis. Additional Inputs: Advantages of factorial experiment.

Textbooks:

1. B.A/B.Sc III Year Paper-III Statistics- Applied Statistics- Telugu Academy by Prof. K. Srinivasa Rao, Dr. D. Giri, Dr. A. Anand, and Dr. V. Papaiah Sastry.
2. K.V.S. Sarma: Statistics made simple: do it yourself on PC. PHI
3. B.A/B.Sc Statistics Applied Statistics, Kalyani Publishers by D.V.L.N. Jogiraju, C. Srikala and L.P. Raj Kumar.

Reference books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Applied Statistics. Sultan Chand
2. Parimal Mukhopadhyay: Applied Statistics. New Central Book agency.
3. S.P.Gupta: Statistical Methods. Sultan Chand and Sons.

WebLinks:

<https://conjointly.com/kb/descriptive-statistics/>
https://en.wikipedia.org/wiki/Descriptive_statistics/

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High] '-' :No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 |
| CO3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 |

| P.R.GOVERNMENT COLLEGE(A), KAKINADA | | Program & Semester II B.Sc.(IV Sem) Paper-IV | | | | | |
|--|--|---|--|----------|----------|----------|----------|
| Course Code | TITLE OF THE COURSE Sampling Techniques & Design of Experiments | | | | | | |
| Practical | Hours Allocated: 30 hrs | | | L | T | P | C |
| Pre-requisites: | Basic knowledge in methods and Statistical inference | | | - | - | 2 | 1 |

Conduct any EIGHT (MS-Excel Mandatory)

Sampling Techniques:

Estimation of population mean and its variance by

1. Simple random sampling with and without replacement. Comparison between SRSWR and SRSWOR.
2. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.
3. Systematic sampling with $N=nk$. Comparison of systematic sampling with Stratified and SRSWOR.

Design of Experiments:

4. ANOVA - one - way classification with equal and unequal number of observations
5. ANOVA - Two-way classification with one observation per cell.
6. Analysis of CRD.
7. Analysis of RBD Comparison of relative efficiency of CRD with RBD
8. Estimation of single missing observation in RBD and its analysis
9. Analysis of LSD and efficiency of LSD over CRD and RBD
10. Estimation of single missing observation in LSD and its analysis
11. Analysis of 2^2 with RBD layout
12. Analysis of 2^3 with RBD layout
13. Practicals 4, 5, 6 and 7 using MS-Excel

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MS Word for writing inferences.

Virtual Lab Links:

1. <https://digitalearnings.com/sampling-and-types-of-sampling>. 2. <https://youtu.be/k3IUo0XYG3E>

Model blue print for the Question Paper setter

Course-IV: Sampling Techniques & Designs of Experiments

Max. Marks: 50M

Time : 2 1/2 Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|------------------------|-----------------|------------------------------------|
| I | 2 | 1 | 20 |
| II | 2 | 2 | 30 |
| III | 1 | 1 | 15 |
| IV | 1 | 1 | 15 |
| V | 1 | 1 | 15 |
| Total including choice | 7 | 6 | 95 |

Statistics Course-IV: Sampling Techniques & Design of Experiments Question Bank

SHORT QUESTIONS:

1. Write the difference between sampling versus census.
2. Explain stratified random sampling.
3. Explain systematic sampling.
4. Write a short note on cost function.
5. Explain ANOVA and its basic assumptions.
6. Write a short note on local control.
7. Write a short note on randomization and replication.
8. Write advantages and disadvantages of CRD.
9. Write advantages and disadvantages of RBD.
10. Write the main and interaction effects of 2^2 experimental design

ESSAY QUESTIONS:

11. Explain SRSWR and SRSWOR.
12. Explain stratified random sampling with proportional and optimum allocation.
13. Show that $E(s^2) = S^2$
14. Explain one way classification.
15. Explain two way classification.
16. Explain principles of design of experiments.
17. Define CRD and explain the analysis of CRD.
18. Define RBD and explain the layout and analysis of RBD.
19. Define LSD and explain the layout and analysis of LSD.
20. Discuss the efficiency of RBD over CRD and that of LSD over RBD and CRD.
21. Show that $V(\bar{y}_{opt}) \leq V(\bar{y}_{prop}) \leq V(\bar{y}_{srswor})$
22. Explain the statistical analysis of 2^3 experimental design

P.R.Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations- IV Semester (w.e.f 2021-22)
for 2022-23 Batch

Statistics Course IV: Sampling Techniques & Design of Experiments
(Model paper)

Time: 2 1/2 Hrs.

Max. Marks: 50

Section – A

Answer any four of the following questions.

4x5 = 20 M

1. Write the advantages of sampling over complete enumeration.
2. Define stratified random sampling.
3. List out the basic assumptions involved in ANOVA technique.
4. Explain missing plot technique in LSD
5. Write the advantages of C.R.D.
6. Write the main and interaction effects of 2^2 experimental design.
7. Explain the proportional and optimum allocations.

Section – B

Answer any two questions.

3X10=30M

8. Distinguish SRSWR and SRSWOR.
9. In simple random sampling without replacement prove that sample mean square is an unbiased estimation of population mean square i.e. $E(S^2) = S^2$
10. Explain the method of systematic sampling. Discuss the merits and demerits of systematic sampling.
11. Explain the ANOVA for two-way classification.
12. Explain the principles of experimental designs.
13. Explain the statistical analysis of 2^3 experimental design

| | | | | | |
|------------------------|--|---|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester II B.Sc. (IV Sem) Paper-V | | | |
| Course Code | TITLE OF THE COURSE APPLIED STATISTICS | | | | |
| Theory | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | 4 | - | - | 4 |

Objectives:

1. After completion of this paper the students would be able to learn the applied part of statistics in various disciplines and also learn the opportunities of statistician in different fields.

Course Outcomes:

| | |
|--|--|
| On Completion of the course, the students will be able to- | |
| CO1 | Students would be able to learn about Time series and its components, Determination of trend by least squares, moving averages methods and to determine seasonal indices by Ratio to moving average, ratio to trend and link relative methods. |
| CO2 | Students would be able to know the functions and organization of CSO and NSSO, National income and its computation, |
| CO3 | Students would be able to know about the definition, uses of vital statistics and its sources, Various mortality and fertility rates, Life tables-its construction and uses. |
| CO4 | Students must be able to know about different types of Reproduction rates and abridged life tables. |
| CO5 | Students would able to learn applications of it. |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|----------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|----------------------|--|---------------|--|------------------|--|

UNIT I (10 hours)

Time Series: Time Series and its components with illustrations, additive, multiplicative models. Trend: Estimation of trend by free hand curve method, method of semi averages. Determination of trend by least squares (Linear trend, parabolic trend only), moving averages method.

UNIT II (10 hours)

Seasonal Component: Determination of seasonal indices by simple averages method, ratio to moving average, Ratio to trend and Link relative methods, Deseasonalization.

UNIT III (10 hours)

Growth curves: Modified exponential curve, Logistic curve and Gompertz curve, fitting of growth curves by the method of three selected points and partial sums. Detrending- Effect of elimination of trend on other components of the time series

UNIT IV (10 hours)

Index numbers: Concept, construction, problems involved in the construction of index numbers, uses and limitations. Simple and weighted index numbers. Laspeyres's, Paasche's and Fisher's index numbers, Criterion of a good index number, Fisher's ideal index numbers. Cost of living index number and wholesale price index number.

Additional Inputs: Chain Indices.

UNIT V (10 hours)

Vital Statistics: Introduction, definition and uses of vital statistics, sources of vital statistics.

Measures of different Mortality and Fertility rates, Measurement of population growth. Life tables: construction and uses of life tables.

Additional Inputs: Abridged life tables.

Textbooks:

1. **Fundamentals of Applied Statistics: VK Kapoor and SC Gupta**
2. **B.A/B.Sc III year paper-IV Statistics- Applied Statistics- Telugu Academy by Prof K. Srinivasa Rao, Dr. D. Giri, Dr A. Anand, Dr V. Papaya Sastry.**
3. **B.A/B.Sc Statistics Applied Statistics, Kalyani Publishers by D.V.L.N. Jogiraju, C. Srikala and L.P. Raj Kumar.**

Reference books:

1. **Anuvartita Sankhyaka sastram – Telugu Academy**

Web Links:

1. <https://youtu.be/k3IUo0XYG3E>
2. <https://youtu.be/qSUjVDbKLWQ>

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High]'-':No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2 |
| CO3 | 1 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 |

| | | | | | |
|------------------------|--|---|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester II B.Sc. (IV Sem) Paper-V | | | |
| Course Code | TITLE OF THE COURSE APPLIED STATISTICS | | | | |
| Practical | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | - | - | 2 | 1 |

Conduct any *EIGHT (MS-Excel Mandatory)*

Time Series:

1. Measurement of trend by method of moving averages(odd and evenperiod)
2. Measurement of trend by method of Least squares(linear andparabola)
3. Determination of seasonal indices by method simpleaverages
4. Determination of seasonal indices by method of Ratio to movingaverages
5. Determination of seasonal indices by method of Ratio totrend
6. Determination of seasonal indices by method of Linkrelatives

Index Numbers:

7. Computation of simple index numbers.
8. Computation of all weighted index numbers.
9. Computation of reversal tests.

Vital Statistics:

10. Computation of various Mortality rates
11. Computation of various Fertility rates
12. Computation of various Reproduction rates.
13. Construction of Life Tables
14. Practicals 1, 2, 3, 5, 6, 13 using MS-Excel

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MS Word for writing inferences.

Virtual Lab Links:

1. <https://youtu.be/k3IUo0XYG3E>
2. <https://youtu.be/qSUjVDbKLWQ>
3. <https://youtu.be/8DaOIjuF4BY>

Model blue print for the Question Paper setter

Course-V: Applied Statistics

Max. Marks: 50 M

Time : 2 1/2 Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|------------------------|-----------------|------------------------------------|
| I | 1 | 1 | 15 |
| II | 1 | 1 | 15 |
| III | 1 | 1 | 15 |
| IV | 2 | 1 | 20 |
| V | 2 | 2 | 30 |
| Total including choice | 7 | 6 | 95 |

Statistics Course V: Applied Statistics Question Bank

SHORT QUESTIONS:

1. Define Time series. Write its uses.
2. Explain the models in time series.
3. Explain irregular variations in Time series.
4. Write a brief note on growth curves.
5. Explain about logistic curve.
6. Explain base shifting.
7. Explain splicing & deflating.
8. Write the uses of index numbers.
9. Explain NRR.
10. Explain GRR.
11. Write the uses of life table.
12. Explain the terms-registration method & survey method.

ESSAY QUESTIONS:

13. Explain components of time series.
14. Explain trend in time series and explain different methods to measure trend..
15. Explain link relative method to measure seasonal variations..
16. Explain the method of ratio to moving averages to measure seasonal variations.
17. Explain the methods of fitting modified exponential curve.
18. Explain the method of selecting three points to fit Gompertz' curve.
19. Explain the steps involved in construction of index numbers.
20. Explain weighted price index numbers.
21. Explain criteria of good index number.
22. Explain various components of life table.
23. Explain measures of mortality rate.
24. Explain measures of fertility rate.

P.R. Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations IV Semester (w.e.f 2021-22)
for 2021-22 Batch
Statistics Course V: Applied Statistics
(Model paper)

Time: 2 1/2 Hrs.

Max. Marks: 50

Section – A

4x5 = 20 M

Answer any **four** of the following questions. Each question carries **five** marks.

1. Explain the method of moving averages to measure trend.
2. Explain the mathematical models in time series.
3. Explain the method of link relatives.
4. Write a brief note on growth curves.
5. What is meant by base shifting.
6. Explain about Net Reproduction Rate.
7. Explain about the Criteria for Good Index Number

Section – B

3x10 = 30 M

Answer any **three** questions

8. Define Time series. Explain the components of time series.
9. Explain the least square method to measure Trend.
10. Explain the method of ratio to trend to measure seasonal variations.
11. What are the Problems or steps involved in the construction of Index Numbers?
12. Explain (i) General Fertility Rate. (ii) Specific Fertility Rate. (iii) Total Fertility Rate
13. State the meanings of various columns of a life table and mention the construction of a life table. Explain the relationship between different columns.

| | | | | | |
|------------------------|--|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Course Code | TITLE OF THE COURSE OPERATIONS RESEARCH – I | | | | |
| Theory | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | 4 | - | - | 4 |

Objectives:

The Objective of the paper is to introduce the basic concepts of Operational Research and linear programming to the students.

Course Outcomes:

| | |
|--|--|
| On Completion of the course, the students will be able to- | |
| CO1 | Students would be able to learn about basics of Operation research |
| CO2 | Students would be able to know concepts of optimization techniques |
| CO3 | Students would be able to know about Transportation problems |
| CO4 | Students must be able to know about different types of assignment problems |
| CO5 | Students would able to learn Sequencing methods. |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|-------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|-------------------|--|---------------|--|------------------|--|

UNIT-I

Introduction of OR – Origin and development of OR – Nature and features of OR –Scientific Method in OR – Modeling in OR – Advantages and limitations of Models-General Solution methods of OR models – Applications of Operation Research. Linear programming problem (LPP) - Mathematical formulation of the problem - illustrations on Mathematical formulation of Linear programming of problem. Graphical solution of linear programming problems. Some exceptional cases - Alternative solutions, Unbounded solutions, non-existing feasible solutions by Graphical method.

UNIT-II

General linear programming Problem (GLP) – Definition and Matrix form of GLP problem, Slack variable, Surplus variable, unrestricted Variable, Standard form of LPP and Canonical form of LPP. Definitions of Solution, Basic Solution, Degenerate Solution, Basic feasible Solution and Optimum Basic Feasible Solution. Introduction to Simplex method and Computational procedure of simplex algorithm. Solving LPP by Simplex method (Maximization case and Minimization case)

UNIT-III

Artificial variable technique - Big-M method and Two-phase simplex method, Degeneracy in LPP and method to resolve degeneracy. Alternative solution, Unbounded solution, Non existing feasible solution and Solution of simultaneous equations by Simplex method.

UNIT-IV

Duality in Linear Programming –Concept of duality - Definition of Primal and Dual Problems, General rules for converting any primal into its Dual, Economic interpretation of duality, Relation between the solution of Primal and Dual problem (statements only). Using duality to solve primal problem. Dual Simplex Method.

UNIT-V

Post Optimal Analysis - Changes in cost Vector C , Changes in the Requirement Vector b and changes in the Coefficient Matrix A . Structural Changes in a LPP.

Textbooks:

- 1) Operations Research by Kanthi Swaroop k.GUPTA AND ManMohan –Sultan Chand
- 2)Operation Research- S.D Sharma

Reference books:

- 3) Operation Research – Taha

Web Links:

1. <https://youtu.be/k3IUo0XYG3E>
2. <https://youtu.be/qSUjVDbKLWQ>

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High] '-':No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2 |
| CO3 | 1 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 |

| | | P.R.GOVERNMENT COLLEGE(A), KAKINADA | | | | | |
|------------------------|--|--|--|--|----------|----------|----------|
| Course Code | TITLE OF THE COURSE OPERATIONS RESEARCH – I | | | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Practical | Hours Allocated: 30 hrs | | | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | | | - | - | 2 | 1 |

I Practical/Lab to be performed on a computer using OR/Statistical packages

1. To solve Linear Programming Problem using Graphical Method with
 - (i) Unbounded solution
 - (ii) Infeasible solution
 - (iii) Alternative or multiple solutions.
2. Solution of LPP with simplex method.
3. Problem solving using Charnes-M method.
4. Problem solving using Two Phase method.
5. Illustration of following special cases in LPP using Simplex method
 - (i) Unrestricted variables
 - (ii) Unbounded solution
 - (iii) Infeasible solution
 - (iv) Alternative or multiple solutions.
6. Problems based on Principle of Duality.
7. Problems based on Dual simplex method.
8. Problems based on Post Optimal Analysis.

Reference books:

1) Operations Research by Kanthi Swaroop k.GUPTA AND ManMohan –Sultan Chand

2)Operation Research- S.D Sharma

Virtual Lab Links:

1. <https://youtu.be/k3IUo0XYG3E>
2. <https://youtu.be/qSUjVDbKLWQ>
3. <https://youtu.be/8DaOIjuF4BY>

Model blue print for the Question Paper setter

Course VI - OPERATIONS RESEARCH – I

Max. Marks: 60

Time : 2 ½ Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|------------------------|-----------------|------------------------------------|
| I | 2 | 2 | 30 |
| II | 1 | 2 | 25 |
| III | 1 | 1 | 15 |
| IV | 1 | 2 | 25 |
| V | 1 | 1 | 15 |
| Total including choice | 6 | 8 | 110 |

Question Bank

SHORT QUESTIONS

1. Nature and meaning of O.R.
2. Applications of O.R.
3. Mathematical formation of LPP.
4. Write a procedure on Graphical method.
5. Define slack, surplus and A.V.
6. What is degeneracy and how to resolve Degeneracy using LPP.
7. What is the difference between primal and it's dual.
8. The dual of the dual of a given primal is the primal or duality theorem.
9. Explain the concept of duality.
10. State and prove that fundamental theorem of duality.
11. Structure changes in LPP.

ESSAY QUESTIONS

12. Explain the nature and scope of O.R.
13. Explain about models in O.R.
14. Write a procedure on simplex method.
15. Solve the following LPP using Graphical method.

$$\text{Max } Z = 3X_1 + 5X_2$$

Subject to constraints;

$$X_1 + 2X_2 \leq 2000$$

$$X_1 + X_2 \leq 1500$$

$$X_2 \leq 600 \text{ and } X_1 \geq 0, X_2 \geq 0$$

16. Write a procedure on Big -M and two phase methods.
17. Use penalty method to solve the following LPP.

$$\text{Min } Z = 5X_1 + 10X_2 + 8X_3$$

Subject to constraints;

$$6X_1 + 8X_2 > 100$$

$$7X_1 + 12X_2 > 120 \text{ and } X_1, X_2 > 0$$

18. Explain the concept of degeneracy and how do you solve it.
19. State and prove fundamental theorem of duality.
20. Solve the following using LPP using two phase method.

$$\text{Min } Z = X_1 - 2X_2 - 3X_3$$

Subject to constraints;

$$-2X_1 + X_2 + 3X_3 = 2$$

$$2X_1 + 3X_2 + 4X_3 = 1 \text{ and } X_1, X_2, X_3 > 0$$

21. Explain a bout post optimal analysis.
22. Explain about the requirement vectors b, c using post optimal analysis.

P.R. Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations IV Semester (w.e.f 2022-23)
for 2021-22 Batch
Statistics Course 6A: OPERATIONS RESEARCH
(Model paper)

Time: 2 1/2 Hrs.

Max. Marks: 60

Section – A

4x5 = 20 M

Answer any four of the following questions. Each question carries five marks.

1. Define Nature and meaning of O.R.
2. Explain about Mathematical formation of LPP.
3. Define slack, surplus and A.V.
4. What is degeneracy and how to resolve Degeneracy using LPP.
5. Explain the concept of duality
6. Explain about Structure changes in LPP

Section – B

Answer any two of the following questions

2X10 = 20 M

7. Explain about models in O.R
8. Explain the nature and scope of O.R.
9. Solve the following LPP using Graphical method.
$$\text{Max } Z = 3X_1 + 5X_2$$

Subject to constraints $X_1 + 2X_2 \leq 2000$
 $X_1 + X_2 \leq 1500$, $X_2 \leq 600$ and $X_1 \geq 0, X_2 \geq 0$
10. Write a procedure on simplex method

Section – C

Answer any two of the following questions

2X10 = 20 M

11. State and prove fundamental theorem of duality.
12. Solve the following using LPP using two phase method.
$$\text{Min } Z = X_1 - 2X_2 - 3X_3$$

Subject to constraints;
$$-2X_1 + X_2 + 3X_3 = 2$$
$$2X_1 + 3X_2 + 4X_3 = 1$$
 and $X_1, X_2, X_3 > 0$
13. Explain about post optimal analysis.
14. Explain about the requirement vectors b, c using post optimal analysis

| | | | | | |
|------------------------|---|---|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VII | | | |
| Course Code | TITLE OF THE COURSE OPERATIONS RESEARCH – II | | | | |
| Theory | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | 4 | - | - | 4 |

Objectives:

After completion of this paper the students would be able to learn the applied part of statistics in various disciplines and also learn the opportunities of statistician in different fields.

To enrich the knowledge of students with advanced techniques of linear programming problem along with real life applications.

Course Outcomes:

| | |
|--|---|
| On Completion of the course, the students will be able to- | |
| CO1 | Students would be able to learn about game theory and its problems |
| CO2 | Students would be able to know concepts of Inventories |
| CO3 | Students would be able to know about Networking |
| CO4 | Students must be able to know about different networking models |
| CO5 | Students would able to learn queuing models |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|-------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|-------------------|--|---------------|--|------------------|--|

UNIT-I

Transportation Problem - Introduction, Mathematical formulation of Transportation problem. Initial Basic feasible solution of Transportation problem - North-West corner rule, Lowest cost entry method, Vogel's approximation method. Method of finding optimal solution-**MODI**

method(U-V method). Degeneracy in transportation problem, Resolution of degeneracy, Unbalanced transportation problem. Maximization TP. Transshipment Problem.

UNIT-II

Assignment Problem - Introduction, Mathematical formulation of Assignment problem, Reduction theorem (statement only), Hungarian Method for solving Assignment problem, Unbalanced Assignment problem. The Traveling salesman problem, Formulation of Traveling salesman problem as an Assignment problem and Solution procedure.

UNIT-III

Sequencing problem: Introduction and assumptions of sequencing problem, Sequencing of n jobs and one machine problem. Johnson's algorithm for n jobs and two machines problem-problems with n-jobs on two machines, algorithm for n jobs on three machines problem-problems with n-jobs on three machines, algorithm for n jobs on m machines problem, problems with n-jobs on m-machines.

UNIT-IV

Network Scheduling: Basic Components of a network, nodes and arcs, events and activities– Rules of Network construction – Time calculations in networks - Critical Path Method (CPM) and PERT.

UNIT-V

Game Theory: Two- person zero-sum games. Pure and Mixed strategies. Maxmin and Minimax Principles - Saddle point and its existence. Games without Saddle point-Mixed strategies. Solution of 2 x 2 rectangular games. Graphical method of solving 2 x n and m x 2 games. Dominance Property.

Textbooks:

1. Kanti Swaroop, P.K.Gupta and Man Mohan: Operations Research. Sultan Chand.
2. Taha: Operations Research: An Introduction: Mac Millan.

Reference books:

- 3) Operation Research – Taha

Web Links:

1. <https://youtu.be/k3IUo0XYG3E>
2. <https://youtu.be/qSUjVDbKLWQ>

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High] '-' :No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2 |
| CO3 | 1 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 |

| | | | | | |
|------------------------|---|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Course Code | TITLE OF THE COURSE OPERATION RESEARCH-II | | | | |
| Practical | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | - | - | 2 | 1 |

I Practical/Lab to be performed on a computer using OR/Statistical packages

1. IBFS of transportation problem by using North- West corner rule, Matrix minimum method and VAM
2. Optimum solution to balanced and unbalanced transportation problems by MODI method (both maximization and minimization cases)
3. Solution of Assignment problem using Hungarian method (both maximization and minimization cases),
4. Solution of sequencing problem—processing of n jobs through two machines
5. Solution of sequencing problem - processing of n jobs through three machines
6. To perform Project scheduling of a given project (Deterministic case-CPM).
7. To perform Project scheduling of a given project (Probabilistic case-PERT).
8. Graphical method of solving for $m \times 2$ and $2 \times n$ games.
9. Solution of $m \times n$ games by dominance rule.
10. Linear programming method for solving $m \times n$ games.

Reference books:

- 1) Operations Research by Kanthi Swaroop k.GUPTA AND ManMohan –Sultan Chand
- 2)Operation Research- S.D Sharma

Virtual Lab Links:

1. <https://youtu.be/k3IUo0XYG3E>
2. <https://youtu.be/qSUjVDbKLWQ>
3. <https://youtu.be/8DaOIjuF4BY>

Model blue print for the Question Paper setter

Course VI - OPERATIONS RESEARCH – II

Max. Marks: 60

Time : 2 ½ Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|------------------------|-----------------|------------------------------------|
| I | 2 | 2 | 30 |
| II | 1 | 2 | 15 |
| III | 1 | 1 | 15 |
| IV | 1 | 1 | 15 |
| V | 1 | 2 | 25 |
| Total including choice | 6 | 8 | 110 |

QUESTION BANK

SHORT QUESTIONS

1. Write a short notes on un- balanced Transportation problems.
2. Explain the degeneracy in Transportation problems. How can you resolve it.
3. Explain NWCR method.
4. General Mathematical form of Transportation problems.
5. Write a procedure on optimal solution.
6. Assignment problem as a particular case of LPP.
7. Explain travelling sales man problem.
8. Explain the types of Assignment Problems.
9. Explain the Assumptions on sequencing problems.
10. Write a procedure for n- jobs through k- machines.
11. Explain the rules of constructing a networking diagram.
12. Explain PERT and CPM.
13. Explain the components of a networking.
14. Two persons zero sum game.
15. Explain the concept of Max-min and Min-max criterion principal.

ESSAY QUESTIONS

16. Explain procedure on LCEM and obtain IBFS for T.P by using LCEM.

| | W_1 | W_2 | W_3 | W_4 | SUPPLY |
|--------|-------|-------|-------|-------|--------|
| F_1 | 5 | 3 | 6 | 7 | 19 |
| F_2 | 4 | 7 | 9 | 1 | 37 |
| F_3 | 3 | 4 | 7 | 5 | 34 |
| DEMAND | 16 | 18 | 31 | 25 | |

17. Obtain IBFS for T.P by using VAM.

| | D_1 | D_2 | D_3 | D_4 | Availability |
|--------------|-------|-------|-------|-------|--------------|
| O_1 | 11 | 20 | 7 | 8 | 50 |
| O_2 | 21 | 16 | 10 | 12 | 40 |
| O_3 | 8 | 12 | 18 | 9 | 70 |
| Requirements | 30 | 25 | 35 | 40 | |

18. Explain the procedure for modi method.

19. Write the procedure for Hungarian method.
 20. Solve the following A.P

| | I | II | III | IV |
|---|----|----|-----|----|
| A | 30 | 25 | 26 | 28 |
| B | 26 | 32 | 24 | 20 |
| C | 20 | 22 | 18 | 27 |
| D | 23 | 20 | 21 | 19 |

21. Explain the sequencing algorithm for n jobs on two machines.
 22. Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information processing time on machines given in hours and passing is not followed.

| JOB | A | B | C | D | E | F | G |
|----------------|---|---|---|----|---|---|----|
| M ₁ | 3 | 8 | 7 | 4 | 9 | 8 | 7 |
| M ₂ | 4 | 3 | 2 | 5 | 1 | 4 | 3 |
| M ₃ | 6 | 7 | 5 | 11 | 5 | 6 | 12 |

23. Explain forward & backward time computations.
 24. Explain the critical path method?
 25. Explain the PERT algorithm.
 26. Find the optimum time of completion of projects, when the time of completion of each task is as follows

$$A < D, E \quad B, D < F; \quad C < G; \quad B, G < H; \quad F, G < I.$$

| TASK | A | B | C | D | E | F | G | H | I |
|------|----|---|----|----|----|----|----|---|----|
| TIME | 23 | 8 | 20 | 16 | 24 | 18 | 19 | 4 | 10 |

27. Write a procedure on graphical method $2 \times n$, $m \times 2$ games.
 28. Write a procedure on Domains properly and solve the following problem using dominance property.

| | A | B | C |
|---|----|---|---|
| A | 10 | 5 | 7 |
| B | 6 | 7 | 5 |
| C | 7 | 6 | 7 |

P.R. Government College (Autonomous), Kakinada
II year B.Sc., Degree Examinations IV Semester (w.e.f 2022-23)
for 2021-22 Batch
Statistics Course 7A: OPERATIONS RESEARCH-II
(Model paper)

Time: 2 1/2 Hrs.

Max. Marks: 50

Section – A

4x5 = 20 M

Answer any four of the following questions. Each question carries five marks.

1. Explain the degeneracy in Transportation problems. How can you resolve it.
2. Explain NWCR method.
3. General Mathematical form of Transportation problems.
4. Explain travelling sales man problem.
5. Explain PERT and CPM.
6. Two persons zero sum game.

Section – B

Answer any two of the following questions

2X10 = 20 M

7. Obtain IBFS for T.P by using VAM.

| | D ₁ | D ₂ | D ₃ | D ₄ | Availability |
|----------------|----------------|----------------|----------------|----------------|--------------|
| O ₁ | 11 | 20 | 7 | 8 | 50 |
| O ₂ | 21 | 16 | 10 | 12 | 40 |
| O ₃ | 8 | 12 | 18 | 9 | 70 |
| Requirements | 30 | 25 | 35 | 40 | |

8. Explain the procedure for modi method.
9. Write the procedure for Hungarian method.
10. Solve the following A.P

| | I | II | III | IV |
|---|----|----|-----|----|
| A | 30 | 25 | 26 | 28 |
| B | 26 | 32 | 24 | 20 |
| C | 20 | 22 | 18 | 27 |
| D | 23 | 20 | 21 | 19 |

. Section – C

Answer any two of the following questions

2X10 = 20 M

- 11. Explain the sequencing algorithm for n jobs on two machines
- 12. Find the optimum time of completion of projects, when the time of completion of each task is as follows

$A < D, E \ B, D < F; \ C < G; \ B, G < H; \ F, G < I.$

| | | | | | | | | | |
|------|----|---|----|----|----|----|----|---|----|
| TASK | A | B | C | D | E | F | G | H | I |
| TIME | 23 | 8 | 20 | 16 | 24 | 18 | 19 | 4 | 10 |

- 13. Write a procedure on graphical method $2 \times n, m \times 2$ games
- 14. Explain the concept of Max-min and Min-max criterion principal

| | | | | | |
|------------------------|--|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Course Code | TITLE OF THE COURSE Statistical Process and Quality Control | | | | |
| Theory | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | 4 | - | - | 4 |

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 standardizations for quality.

Course Outcomes:

| | |
|--|---|
| On Completion of the course, the students will be able to- | |
| CO1 | Students would be able to learn about basics |
| CO2 | Students would be able to know concepts |
| CO3 | Students would be able to know about |
| CO4 | Students must be able to know about |
| CO5 | Students would able |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|-------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|-------------------|--|---------------|--|------------------|--|

Unit I

Meaning of quality, concept of total quality management (TQM) and six-sigma, ISO, comparison between TQM and Six Sigma, Meaning and purpose of Statistical Quality Control (SQC), Seven Process Control Tools of Statistical Quality Control (SQC) (i) Histogram (ii) Check Sheet, (iii) Pareto Diagram (iv) Cause and effect diagram(CED), (v) Defect concentration diagram (vi) Scatter Diagram (vii) Control chart. (Only introduction of 7 tools is expected).

Unit II

Statistical basis of Shewhart control charts, use of control charts. Interpretation of control charts, Control limits, Natural tolerance limits and specification limits. Chance causes and assignable causes of variation, justification for the use of 3-sigma limits for normal distribution, Criteria for detecting lack of control situations:

- (i) At least one point outside the control limits
- (ii) A run of seven or more points above or below central line.

Unit III

Control charts for Variables: Introduction and Construction of \bar{x} and R chart and Standard Deviation Chart when standards are specified and unspecified, corrective action if the process is out of statistical control.

Control charts for Attributes: Introduction and Construction of p chart, np chart, C Chart and U charts when standards are specified and unspecified, corrective action if the process is out of statistical control.

Unit IV

Acceptance Sampling for Attributes: Introduction, Concept of sampling inspection plan, Comparison between 100% inspection and sampling inspection. Procedures of acceptance sampling with rectification, Single sampling plan and double sampling plan.

Producer's risk and Consumer's risk, Operating characteristic (OC) curve, Acceptable Quality Level (AQL), Lot Tolerance Fraction Defective (LTFD) and Lot Tolerance Percent Defective (LTPD), Average Outgoing Quality (AOQ) and Average Outgoing Quality Limit (AOQL), AOQ curve, Average Sample Number (ASN), Average Total Inspection (ATI).

Unit V

Single Sampling Plan: Computation of probability of acceptance using Binomial and Poisson approximation, of AOQ and ATI. Graphical determination of AOQL, Determination of a single sampling plan by: a) lot quality approach b) average quality approach.

Double Sampling Plan: Evaluation of probability of acceptance using Poisson distribution, Structure of OC Curve, Derivation of AOQ, ASN and ATI (with complete inspection of second sample), Graphical determination of AOQL, Comparison of single sampling plan and double sample plan.

Textbooks:

1. Montgomery, D. C. (2008): Statistical Quality Control, 6thEdn., John Wiley, New York.
2. Parimal Mukhopadhyay: Applied Statistics, New Central Book Agency.
3. Goon A.M., Gupta M.K. and Das Gupta B. (1986): Fundamentals of Statistics, Vol. II, World Press, Calcutta.
4. S.C. Gupta and V.K. Kapoor: Fundamentals of Applied Statistics – Chand publications.

Reference books:

1. R.C. Gupta: Statistical Quality Control.
2. Duncan A.J. (1974): Quality Control and Industrial Statistics, fourth edition D.B. Taraporewala Sons and Co. Pvt. Ltd., Mumbai.

- Grant, E. L. and Leavenworth (1980): Statistical Quality Control, fifth edition, Mc- Graw Hill, New Delhi.

Web Links:

- <https://youtu.be/k3IUo0XYG3E>
- <https://youtu.be/qSUjVDbKLWQ>

CO-PO Mapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High] '-' :No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2 |
| CO3 | 1 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 |

| | | P.R.GOVERNMENT COLLEGE(A), KAKINADA | | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
|------------------------|--|--|--|--|----------|----------|----------|
| Course Code | TITLE OF THE COURSE Statistical Process and Quality Control | | | | | | |
| Practical | Hours Allocated: 30 hrs | | | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | | | - | - | 2 | 1 |

I Practical/Lab to be performed on a computer using Statistical packages

- Construction of \bar{x} and R Charts.
- Construction of \bar{x} and σ Charts.
- Construction of p Charts for fixed sample size.
- Construction of p Charts for variable sample size.
- Construction of np Charts.
- Construction of C charts.
- Construction of U charts.
- Single sampling plan for attributes (OC Curve, Producer's and Consumer's risks, AOQ, AOQL, ATI).
- Determination of single sampling plan by: a) lot quality approach b) average quality approach.
- Double sampling plan for attributes (OC curve, AOQ, AOQL, ATI, ASN using Poisson distribution).

Model blue print for the Question Paper setter

Course VI - Statistical Process and Quality Control

Max. Marks: 60

Time : 2 ½ Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|------------------------|-----------------|------------------------------------|
| I | 1 | 1 | 15 |
| II | 1 | 1 | 15 |
| III | 1 | 2 | 25 |
| IV | 2 | 2 | 30 |
| V | 1 | 2 | 25 |
| Total including choice | 6 | 8 | 110 |

QUESTION BANK

SHORT QUESTIONS

1. Meaning of Quality. And SQC.
2. Purpose of Statistical quality control.
3. Define control charts & control limits.
4. Components of control charts.
5. Causes of Statistical quality control.
6. Applications on C-chart.
7. Construction of R chart.
8. Using control chart for variables on σ -chart.
9. Define 100% inspection of the sampling inspection.
10. Write merits and demerits on Accepted sampling plan.
11. Define OC curve.
12. Define AQL, ASN, and ATI Functions.
13. Define single sampling plan .
14. Define Double sampling plan.

ESSAY QUESTIONS

15. Write a process of control tools on SQC.
16. Explain shewhart control charts and six sigma charts.
17. Criteria for detecting lack of controlling situations.
18. Construction of control charts using mean and R charts.
19. Construction of control charts using p, np charts.
20. Define producers and consumers risk.
21. Define AOQ, AOQL, LTFD, LTPD, and AOQ Curve
22. Write ASN and ATI functions on single and double sampling plans.
23. Write producers and consumers risk on single sampling plans.
24. Producers and consumers risk on double sampling plans.
25. Difference between single and double sampling plans.
26. Define OC curve using double sampling plans.
27. Write the probability of acceptance using binomial approximation.
28. Write the probability of acceptance using Poisson approximation.

| | | | | | |
|------------------------|---|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Course Code | TITLE OF THE COURSE Computational Techniques and R Programming | | | | |
| Theory | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | 4 | - | - | 4 |

Objectives:

To learn the statistical analysis with the help of the statistical software R

Course Outcomes:

| | |
|--|--|
| On Completion of the course, the students will be able to- | |
| CO1 | Students would be able to learn about basics |
| CO2 | Students would be able to know concepts of computer |
| CO3 | Students would be able to know about programming |
| CO4 | Students must be able to know about R-language |
| CO5 | Students would be able to know about statistics with R |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|----------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|----------------------|--|---------------|--|------------------|--|

Unit I

Computer basics: Introduction and brief history of evolution of computers, Classification of computers: special purpose and general purpose; analog, digital and hybrid; Super, main-frame etc.

Unit II

Organization of general purpose digital computers: CPU, main memory and peripherals. Mass storage devices and other I/O devices. Computer languages: Machine code language (machine language), assembly language and high level languages. Software: Operating systems, linker, loader, compiler, interpreter and assembler.

Unit III

Computer programming: Algorithm and flow-chart. Storage of information: concepts of records and files. File organization: sequential, relative and indexed.

Unit IV

Programming with R: Introduction to R, Data types in R (numeric, logical, character, complex etc.), R objects: vector, matrix, array, list, data frame, factor, and time series. Arithmetic, logical and relational operators, explicit and implicit looping, functions and functional programming in R, Lexical scoping rules in R, benefits of Lexical scoping, other scoping rules, debugging facility in R. Few important mathematical, statistical and graphical functions in R.

Unit V

Descriptive Statistics with R software: : Calculations with R software such as descriptive statistics, frequency distribution, Graphics and plots, statistical functions of central tendency, variation, skewness and kurtosis and illustration with examples.

Textbooks:

1. Chambers, J. (2008). Software for Data Analysis: Programming with R, Springer.
2. Crawley, M.J. (2017). The R Book, John Wiley & Sons.
3. Eckhouse, R.H. and Morris, L.R. (1975). Minicomputer Systems Organization, Programming and Applications, Prentice-Hall.
4. Matloff, N. (2011). The Art of R Programming, No Starch Press, Inc.
5. Peter N. (1986). Inside the IBM PC, Prentice-Hall Press.

Reference books:

1. Dr. Mark Gardener(2012): Beginning R The statistical Programming Languages, John Wiley & Sons.
2. Sudha G. Purohit, SharadD.Gore, and ShailajaR.Deshmukh (2008), Statistics Using R, Narosa Publishing House, India.
3. Crawley, M.J. (2006). Statistics – An introduction using R. John Wiley London.
4. Purohit, S.G., Deshmukh, S.R. and Gore, S.D., (2015): Statistics using R, Alpha Science International.
5. Verzani, J., (2018): Using R for introductory statistics. CRC press.
6. Schumacker, R.E., (2014): Learning statistics using R. Sage Publications.
7. Michale J. Crawley (2009), THE R BOOK, John Wiley & Sons.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High] ' ':No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2 |
| CO3 | 1 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 |

| | | | | | |
|------------------------|---|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Course Code | TITLE OF THE COURSE Computational Techniques and R Programming | | | | |
| Practical | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | - | - | 2 | 1 |

Practical/Lab to be performed on a computer using R Software

1. Data visualization using R - frequency polygon, Ogives, Histogram.
2. Data visualization using R - simple and multiple bar diagram, pie chart.
3. Computation of Descriptive Statistics using R - Central Tendencies, Dispersions, Moments, Skewness and Kurtosis.
4. Computation of Karl Pearson's Coefficient of Correlation and Rank Correlation using R.
5. Construction of Control Charts for variables (\bar{X} , R and σ) charts using R.
6. Construction of Control Charts for attributes (p, np charts with fixed and varying sample sizes) using R.
7. Construction of Control Charts using R - C and U charts.

Model blue print for the Question Paper setter

Course VI - Computational Techniques and R Programming

Max. Marks: 60

Time : 2 ½ Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|------------------------|-----------------|------------------------------------|
| I | 1 | 1 | 15 |
| II | 1 | 2 | 25 |
| III | 1 | 1 | 15 |
| IV | 2 | 2 | 30 |
| V | 1 | 2 | 25 |
| Total including choice | 6 | 8 | 110 |

QUESTION BANK

SHORT ANSWERS

1. Describe analog and digital computers
2. Describe about evolution of computers
3. Describe about cpu
4. Write about interpreter and assembler
5. Write about concept of files
6. Write about benfites of lexical scoping
7. Write about functional progromming in r
8. Write about frequency distributio
9. Explain about graphics and plots.
10. Explain about r-objects.
11. Write about debugging facility in r.
12. Write about explicit and implicit.

ESSAY QUESTIONS :

- 1.explain about classification of computers.
- 2.define computers basis and explain about brief history of computers.
- 3.explain about computers languages.
- 4.explain briefly about mass storage devices and other i/o devices.
- 5.explain about algorithm and flow-chart.
- 6.discuss briefly about file organization.
- 7.explain about data types in r.
- 8.explain about operators in r.
- 9.explain about mathematical ,statistical and graphical functions in r.
- 10.dicuss briefly about descriptive statistical with r software.
- 11.explain about statistical function of central tendency.
- 12.explain about skewness with examples.

| | | | | | |
|------------------------|---|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Course Code | TITLE OF THE COURSE ECONOMETRICS | | | | |
| Theory | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | 4 | - | - | 4 |

Objectives:

Course Outcomes:

| | |
|--|---|
| On Completion of the course, the students will be able to- | |
| CO1 | Students would be able to learn about basics |
| CO2 | Students would be able to know concepts |
| CO3 | Students would be able to know about |
| CO4 | Students must be able to know about |
| CO5 | Students would able |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|-------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|-------------------|--|---------------|--|------------------|--|

UNIT-I

Basic Econometrics: Nature of econometrics and economic data, concept of econometrics, steps in empirical economic analysis, econometric model, importance of measurement in economics, the structure of econometric data, cross section, pooled cross section, time series and paired data, simple regression models, two variable linear regression model, assumptions estimations of parameters.

UNIT-II

Models and Estimations: Gauss marcoff theorem, OLS estimations, partial and multiple correlations coefficients. The general linear model assumptions, estimation and properties of estimators, BLUEs, and tests of significance of estimators, R square and ANOVA

UNIT-III

Problems in OLS Estimators: Multicollinearity: Introduction and concepts, detection of multicollinearity, consequences, tests and solutions of multicollinearity.

Unit IV

Autocorrelation: concept, consequences of autocorrelated disturbances, detection and solution of autocorrelation.

Unit V

Heteroscedastic disturbances: Concepts, Consequences of heteroscedasticity. Tests and solutions of heteroscedasticity. specification error, Errors of measurement.

Textbooks:

1. Gujarati, D. and Sangeetha, S. (2007). Basic Econometrics, 4th Edition, McGraw Hill Companies.
2. Johnston, J. (1972). Econometric Methods, 2nd Edition, McGraw Hill International.

Reference books:

1. Koutsoyiannis, A. (2004). Theory of Econometrics, 2nd Edition, Palgrave Macmillan Limited.
2. Maddala, G.S. and Lahiri, K. (2009): Introduction to Econometrics, 4th Edition, John Wiley & Sons.

CO-PO Mapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High] '-' :No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2 |
| CO3 | 1 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 |

| | | | | | |
|------------------------|--|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Course Code | TITLE OF THE COURSE ECONOMETRICS | | | | |
| Practical | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | - | - | 2 | 1 |

I Practical/Lab to be performed on a computer using Statistical packages

1. Problems based on estimation of General linear model.
2. Testing of parameters of General linear model.
3. Forecasting of General linear model.
4. Problems concerning specification errors.
5. Problems related to consequences of Multicollinearity.
6. Diagnostics of Multicollinearity.
7. Problems related to consequences of Autocorrelation (AR(I)).
8. Diagnostics of Autocorrelation.
9. Estimation of problems of General linear model under Autocorrelation.
10. Problems related to consequences Heteroscedasticity.
11. Diagnostics of Heteroscedasticity.
12. Estimation of problems of General linear model under Heteroscedastic distance terms.

Model blue print for the Question Paper setter

Course VI - ECONOMETRICS

Max. Marks: 60

Time : 2 ½ Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|------------------------|-----------------|------------------------------------|
| I | 2 | 2 | 30 |
| II | 1 | 2 | 25 |
| III | 1 | 1 | 15 |
| IV | 1 | 2 | 25 |
| V | 1 | 1 | 15 |
| Total including choice | 6 | 8 | 110 |

QUESTION BANK

Short answer questions

1. Define econometrics
2. Write uses of econometrics
3. Write about simple linear regression model
4. Write about multiple correlation coefficients
5. Explain properties of estimators
6. Define multicollinearity
7. Write concept about autocorrelation
8. Write about consequences of heteroscedasticity
9. Write about detection of auto-correlation
10. Tests of heteroscedasticity
11. Define **ols** estimators
12. Define **r** square and **anova**

Essay questions

1. Write nature and scope of econometrics
2. Explain limitations and assumptions econometrics
3. Explain about structures of econometric data
4. Explain about two variable linear regression model
5. State and prove Gauss Markov theorem
6. Explain about BLUE estimators
7. Explain causes & effects of multicollinearity
8. Explain deductions of multicollinearity
9. Write sources of autocorrelation
10. Explain consequences of autocorrelated disturbances
11. Explain about tests of heteroscedasticity
12. Explain about specification error
13. Explain about errors of measurement

| | | | | | |
|------------------------|--|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Course Code | TITLE OF THE COURSE REGRESSION ANALYSIS | | | | |
| Theory | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | 4 | - | - | 4 |

Objectives:

1. After completion of this paper the students would be able to learn the applied part of statistics in various disciplines and also learn the opportunities of statistician in different fields.

Course Outcomes:

| | |
|--|---|
| On Completion of the course, the students will be able to- | |
| CO1 | Students would be able to learn about Regression analysis |
| CO2 | Students would be able to know concepts of Types of regression |
| CO3 | Students would be able to know about |
| CO4 | Students must be able to know about |
| CO5 | Students would able to learn |

Course with focus on employability / entrepreneurship / Skill Development modules

| | | | | | |
|----------------------|--|---------------|--|------------------|--|
| Skill Development | | Employability | | Entrepreneurship | |
|----------------------|--|---------------|--|------------------|--|

Unit I

Correlation: Bivariate data, Scatter diagram and interpretation. Karl Pearson's correlation coefficient, Properties. Spearman's rank correlation coefficient, with ties and without ties, limits. Regression, difference between correlation and regression.

Unit II

Steps in Regression Analysis: Assumptions of regression models. Simple linear regression model, Estimation of regression parameters by least squares method (fitting of regression model), Interpretation of parameters. Concept of residual, Residual plots. Multiple linear regression: Estimation of regression parameters by least square method, Interpretation of parameters. Concept of coefficient of determination.

Unit III

Regressions with Qualitative Independent Variables: Dummy variable technique — Testing structural stability of regression models comparing two regressions, interaction effects, seasonal analysis.

Unit-IV

Regressions with Qualitative Dependent Variables: Piecewise linear regression, use of dummy variables, regression with dummy dependent variables; The LPM, Logit, Probit and Tobit models — Applications

Unit - V

Best Model: Selecting 'Best' regression model. All possible regressions – R^2 , Adjusted R^2 , MS_{Res} , Mallows' statistic. Sequential selection – forward selection, backward elimination.

Textbooks:

Johnston J.(1984): Econometric Methods

S.Chatterjee and B.Price(1977):Regression Analysis by Example, John Wiley & Sons, New York. Chapter 1, 2, 3 and relevant portions in chapters 4, 5, 6, 7, 8, 9. N.R.Draper & H.Smith(1981), Applied Regression Analysis, Second Edition

Reference books:

Web Links:

1. Draper, N. R. and Smith, H. (1998). Applied Regression Analysis. 3rd Edition. John Wiley.
2. Hosmer, D. W., Lemeshow, S. and Sturdivant R.X. (2013). Applied Logistic Regression, Wiley Blackwell.
3. Montgomery, D. C., Peck, E. A. and Vining, G. G. (2013). Introduction to Linear Regression Analysis. 5th Edition. Wiley.
4. Neter, J., Kutner, M. H., Nachtsheim, C.J. and Wasserman, W. (1996). Applied Linear Statistical Models, 4th Edition, Irwin USA.
5. Gujarati, D. and Sangeetha, S. (2007). Basic Econometrics, 4th Edition

Web Links:

1. <https://youtu.be/k3IUo0XYG3E>
2. <https://youtu.be/qSUjVDbKLWQ>

CO-PO Mapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High] '-' :No Correlation)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2 |
| CO3 | 1 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 |

| | | | | | |
|------------------------|--|--|----------|----------|----------|
| | P.R.GOVERNMENT COLLEGE(A), KAKINADA | Program & Semester III B.Sc. (V Sem) Paper-VI | | | |
| Course Code | TITLE OF THE COURSE REGRESSION ANALYSIS | | | | |
| Practical | Hours Allocated: 30 hrs | L | T | P | C |
| Pre-requisites: | Basic knowledge in Statistical functions | - | - | 2 | 1 |

I Practical/Lab to be performed on a computer using Statistical packages

1. Correlation coefficient
2. Rank correlation Coefficient
3. Regression Lines
4. Linear Models
5. Structural stability
6. Selecting best regression model by R^2
7. Selecting best regression model by Adjusted R^2
8. Selecting best regression model by MS_{Res}
9. Selecting best regression model by Mallow's statistic
10. Selecting best regression model by forward selection
11. Selecting best regression model by backward elimination.

Virtual Lab Links:

1. <https://youtu.be/k3IUo0XYG3E>
2. <https://youtu.be/qSUjVDbKLWQ>
3. <https://youtu.be/8DaOIjuF4BY>

Model blue print for the Question Paper setter

Course VI - REGRESSION ANALYSIS

Max. Marks: 60

Time : 2 ½ Hrs.

| Module | Short Answer Questions | Essay Questions | Marks allotted to the Unit/Chapter |
|-------------------------------|------------------------|-----------------|------------------------------------|
| I | 1 | 1 | 15 |
| II | 1 | 2 | 25 |
| III | 1 | 2 | 25 |
| IV | 2 | 2 | 30 |
| V | 1 | 1 | 15 |
| Total including choice | 6 | 8 | 110 |

QUESTION PAPER

SHORT ANSWERS

1. Write about bi-variable data
2. Write spear's man rank correlation co-efficient
3. Write about interpretation of parameters
4. Write assumptions of regression models
5. Write about estimation of regression parameters by least square method
6. Write about seasonal analysis
7. Write about piecewise linear regression
8. Write about tobit model
9. Write about adjusted r^2
10. Write about forward selection

ESSAY QUESTIONS

1. Explain measures of correlation
2. Explain differences between correlation and regression
3. State and prove properties of correlation coefficient
4. Explain about concept of residual plots
5. Explain fitting of regression model
6. Explain about multiple linear regression model
7. Explain about dummy variable technique
8. Explain about comparing two regressions
9. Explain about interaction effects
10. Explain uses of dummy variables
11. Explain about logit and probit models
12. Explain sequential selection
13. Explain about backward elimination

P.R. Government College(A), Kakinada

DEPARTMENT OF STATISTICS

MOOCS

Guidelines:

- Extra credits will be given to the student who will be completed an online course (total credits achieved in the course will be considered)
- The student should submit the course completion certificate with credits to claim the extra credits
- The maximum no. of extra credits is as per guidelines of the college.
- The students may choose online course(s) in the domain of Statistics/Actuarial Science or inter-disciplinary subjects related to these subjects
- The students may register and complete a course from the following online platforms
 - <https://swayam.gov.in/>
 - <https://swayam.gov.in/CEC>
 - <https://swayam.gov.in/NPTEL>
 - <https://nptel.ac.in/noc/>
 - <https://swayam.gov.in/UGC>
 - <https://spoken-tutorial.org/>
 - <https://www.coursera.org/>
 - <https://www.coursera.org/programs/iit-madras-48km0>
 - Any other
- The students may get extra credits from other sources also. For details contact Academic Cell/Website/Notice Board
- Some suggested courses:

| Name of the Course | Web Link |
|---|---|
| Applied Multivariate Analysis | https://swayam.gov.in/nd2_cec20_ma17/preview |
| Bio Statistics and Mathematical Biology | https://swayam.gov.in/nd2_cec20_bt23/preview |
| Big Data Computing | https://swayam.gov.in/nd1_noc20_cs92/preview |
| Business Statistics | https://swayam.gov.in/nd2_cec20_mg13/preview |
| Operations Research | https://swayam.gov.in/nd2_cec20_ma19/preview |
| Research Methodology | https://swayam.gov.in/nd2_cec20_ge37/preview |
| Quantitative Techniques for Management | https://swayam.gov.in/nd2_cec20_mg18/preview |
| Communication Research | https://swayam.gov.in/nd2_cec20_ge30/preview |
| Fundamental of Insurance | https://swayam.gov.in/nd2_cec20_mg24/preview |
| Introduction to Bio-Statistics | https://swayam.gov.in/nd1_noc20_bt28/preview |
| Introduction to R Software | https://swayam.gov.in/nd1_noc20_ma53/preview |
| Non Parametric Statistical Inference | https://swayam.gov.in/nd1_noc20_ma55/preview |
| Operations Research | https://swayam.gov.in/nd1_noc20_ma45/preview |
| Regression Analysis | https://swayam.gov.in/nd1_noc20_ma30/preview |
| Methods and Statistics in Social Sciences Specialization | https://www.coursera.org/specializations/social-science |
| Statistics with R Specialization | https://www.coursera.org/specializations/statistics |
| R-Programming | https://www.coursera.org/programs/iit-madras-48km0/browse?productId=RMFRum1BEeWXRa6ju0fvnQ&productType=course&query=r+programming&showMiniModal=true |
| Hypothesis Testing in Public health | https://www.coursera.org/learn/hypothesis-testing-pub |
| Business Statistics and Analysis Specialization | https://www.coursera.org/programs/iit-madras-48km0/browse?collectionId=&productId=gZBrS7vSEeWQ9xLvZ6r9Zw&productType=s12n&query=r+programming&showMiniModal=true |
| Probability and Statistics : To p or not to p | https://www.coursera.org/learn/probability-statistics |
| Data Analysis and Interpretation Specialization | https://www.coursera.org/specializations/data-analysis |
| Introduction to Statistics and Data Analysis in Public health | https://www.coursera.org/programs/iit-madras-48km0/browse?productId=wYVFrFUOEeiXDgqeSsw0yA&productType=course&query=data+analysis+public+health&showMiniModal=true |
| Basic Statistics | https://www.coursera.org/programs/iit-madras-48km0/browse?productId=ZNeGqEC2EeWC4g7VhG4bTQ&productType=course&query=statistics&showMiniModal=true |

P.R. Government College(A), Kakinada

DEPARTMENT OF STATISTICS

Work Load for Statistics and Actuarial Science

2022-23 (Odd Sem)

| S.No | Name of the Class | Strength | No. of Theory Hours | No. of Practical Hours | No. of Batches | Total Practical Hours | Total hrs. (Theory + Practical) |
|-------------|---|-----------------|----------------------------|-------------------------------|-----------------------|------------------------------|--|
| 1 | I MSCS-stat | 30 | 4 | 2 | 2 | 4 | 6 |
| 2 | I MSAs Stat | - | - | - | - | - | - |
| 3 | II MSCS-Stat | 34 | 4 | 2 | 2 | 4 | 8 |
| 4 | II MAS-Stat | 30 | | 2 | 2 | 2 | 8 |
| 5 | III MSCs-stat Paper 6A &7A | 31 | 4+4 | 2+2 | 2 | 8 | 16 |
| 6 | III MSAs-stat Paper 6A &7A | 31 | | 2+2 | 2 | 8 | 16 |
| 7 | III MSAs Actuarial Science paper 6B & 7B | 31 | 3+6 | 3 | 2 | 6 | 12 |
| | | | Total | | | | 66 |

P.R. Government College(A), Kakinada

DEPARTMENT OF STATISTICS

Work Load for Statistics and Actuarial Science

2022-23 (Even Sem)

| S.No | Name of the Class | Strength | No. of Theory Hours | No. of Practical Hours | No. of Batches | Total Practical Hours | Total hrs. (Theory + Practical) |
|--|---------------------------|----------|---------------------|------------------------|----------------|-----------------------|---------------------------------|
| 1 | I MSCS-stat | 30 | 4 | 2 | 2 | 4 | 8 |
| 2 | I MSAs Stat | 30 | | - | - | - | - |
| 3 | I MSAs Act. Sc. paper II | 30 | - | -- | -- | -- | - |
| 4 | II MSCS-Stat IV | 33 | 4 | 2 | 2 | 4 | 8 |
| 5 | II MSAS- Stat IV | 31 | | 2 | 2 | 4 | 4 |
| 6 | II MSCS-Stat V | 33 | 4 | 2 | 2 | 4 | 8 |
| 7 | II MAS- Stat V | 31 | | 2 | 2 | 4 | 4 |
| 8 | II Actuarial Sc. Paper IV | 31 | 6 | | | | 6 |
| 9 | II Actuarial Sc. Paper V | 31 | 6 | | | | 6 |
| Total Work Load for Statistics and Actuarial Sciences | | | | | | | 44 |

P.R. Government College (Autonomous), Kakinada
Department of Statistics
Certificate Course 01: Statistical Package for Social Sciences (SPSS)

Duration: 40 Hours

No. of Credits(Extra): 01

Period of the course: During Even Semester

Course Overview:

Introduction to Statistical Analysis Using IBM SPSS Statistics (v24) provides an application-oriented introduction to the statistical component of IBM® SPSS® Statistics. Students will review several statistical techniques and discuss situations in which they would use each technique, the assumptions made by each method, how to set up the analysis, as well as how to interpret the results. This includes a broad range of techniques for exploring and summarizing data, as well as investigating and testing underlying relationships. Students will gain an understanding of when and why to use these various techniques as well as how to apply them with confidence, interpret their output, and graphically display the results.

Objectives:

A good knowledge of quantitative data analysis is a sine qua none for progress in academic and corporate world. Keeping this in mind this course has been designed in such way that students, researchers, teachers and corporate professionals who want to equip themselves with sound skills of data analysis and wish to progress with this skill can learn it in in-depth and interesting manner using IBM SPSS Statistics-one of the earliest and most popular statistical data analysis software package till date.

Learning Outcomes:

On completion of this course the participants will develop an ability to independently analyze and treat data, plan and carry out new research work based on their research interest. The course encompasses most of the major type of research techniques employed in academic and professional research which can be seen in syllabus.

Course Layout:

Unit 1:

Developing the familiarity with SPSS Processor: (10h)

Entering data in SPSS editor. Solving the compatibility issues with different types of file. Inserting and defining variables and cases. Managing fonts and labels. Data screening and cleaning. Missing Value Analysis. Sorting, Transposing, Restructuring, Splitting, and Merging. Compute & Recode functions. Visual Binning & Optimal Binning. Research with SPSS (random number generation).

Unit 2:

Working with descriptive statistics: (8h)

Frequency tables, Using frequency tables for analyzing qualitative data, Explore, Graphical representation of statistical data: histogram (simple vs. clustered), boxplot, line charts, scatter plot (simple, grouped, matrix, drop-line), P-P plots, Q-Q plots, Addressing conditionalities and errors, computing standard scores using SPSS, reporting the descriptive output in APA format.

Unit 3:

Testing the differences between group means: (6h)

t – test (one sample, independent- sample, paired sample), ANOVA- 1 (one way), Reporting the output in APA format.

Unit 4:

Correlation Analysis: (8h)

Data entry for correlational analysis, Choice of a suitable correlational coefficient: non-parametric correlation (Kendall's tau), Parametric correlation (Pearson's, Spearman's), Special correlation (Biserial, Point-biserial), Partial and Distance Correlation

Unit 5:

Regression (Linear & Multiple): (8h)

The method of Least Squares, Linear modeling, Assessing the goodness of fit, Simple regression, Multiple regression (sum of squares, R and R² , hierarchical, step-wise), Choosing a method based on your research objectives, checking the accuracy of regression model.

- **SPSS Statistics – New User:**

Key topics

1. Introduction to statistical analysis
2. Examine individual variables
3. Test hypotheses-theory
4. Test hypotheses about individual variables
5. Test the relationship between categorical variables
6. Test the difference between two group means
7. Test the differences between more than two group means
8. Test the relationship between scale variables
9. Predict a scale variable
10. Explore nonparametric tests

P.R GOVERNMENT (A) COLLEGE, KAKINADA

DEPARTMENT OF STATISTICS

CERTIFICATE COURSE 01: SPSS

Model Paper

Time:2hrs

maxmarks:50

SECTION-A

Answer all questions. Each question carries 1 mark

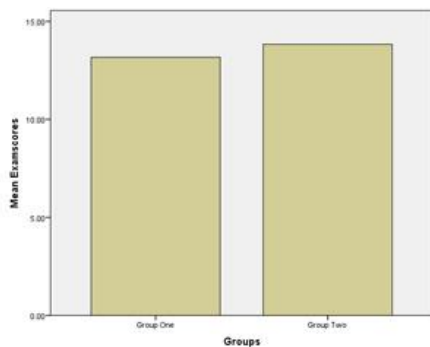
1. What are the two main windows in SPSS
 - a. Data view and variable view
 - b. Data editor and output viewer
 - c. Variable view and output viewer
 - d. Data view and output viewer
2. Which menu item contains the split file and select cases command
 - a. Analyze menu
 - b. Graph menu
 - c. Transform menu
 - d. Data menu
3. Select the window where the results of your analysis appear
 - a. Output viewer
 - b. Data view
 - c. Data editor
 - d. Variable view
4. In which sub-dialog box can the Chi Square test be found?
 - a. Frequencies : percentages
 - b. cross tabs :statistics
 - c. bivariate: pearson
 - d. Gender:female
5. To generate a Spearman's *rho* test, which set of instructions should you give SPSS?
 - a. Analyze; Crosstabs; Descriptive Statistics; Spearman; OK
 - b. Analyze; Crosstabs; Descriptive Statistics; Spearman; OK
 - c. Analyze; Compare Means; Anova table; First layer; Spearman; OK
 - d. Analyze; Correlate; Bivariate; [select variables]; Spearman; OK
6. Which of the following is used for creating and defining various characteristics of variables?
 - a. Output viewer
 - b. Data view
 - c. Data editor
 - d. Variable view
7. Rating a group of variables on how much you like them is an example of
 - a. Nominal data
 - b. Ordinal data
 - c. Interval data
 - d. ratio data
8. Ordinal level data are characterized by
 - a. Equal intervals between each adjacent score.
 - b. A fixed zero
 - c. Data that can be meaningfully arranged by order of magnitude
 - d. None of the above.
9. In this tab, rows represent individual cases and columns represent variables in your data.
 - a. Output viewer
 - b. Data view
 - c. Data editor
 - d. Variable view
10. Which drop down menu do you need to select in order to recode your data.
 - a. Transform
 - b. Data
 - c. Analyze
 - d. Graph
11. Which menu item contains the split file and select cases command?
 - a. Data Menu
 - b. Transform Menu
 - c. Analyze Menu
 - d. Graph Menu
12. You want to produce a graph that will show the distribution of scores in your data. An appropriate way to display the information would be to use a
 - a. Histogram
 - b. Pie chart
 - c. Line chart
 - d. Scatter plot
13. You want to produce a graph that will show the percentages of participants that belonged to different groups

- a. Histogram b. Pie chart c. Line chart d. Scatter plot
14. You have collected some demographic data on age groups and would like to produce a pie chart to accompany the descriptive statistics .which of the following commands could produce this pie chart
 a. Frequencies b. Descriptive c. Explore d. Cross tabs
15. Which of these commands enables you to produce a Bar chart of your data
 a. Legacy dialogues b. Chart Builder c. Frequencies command d. All the above
16. What is a research hypothesis?
 a. A predicted relationship between variables b. A theory
 c. A way to describe a sample d. A statement about the normality of the data
17. SPSS stands for which of the following?
 a. Statistical Package for the Social Sciences b. Statistics Problems Solved smart
 c. Simple Package for Science Statistics d. Simple Program for Statistics and Science
18. Boot strapping is a technique that
 a. Can provide an estimation of population parameter
 b. Provides a method of purchasing a sampling distribution
 c. Provides a way of estimating bias of a statistic d. All of these
19. What is the probability of getting head if throwing a coin .
 a. P=0.2 b. P=0.5 c. P=0.05 d. P=0.1
20. Rating a group of vegetables on how much you like them is an example of:
 a. Nominal data b. Ordinal data c. Interval data d. Ratio data

SECTION-B

Answer all questions. Each question carries 3 marks

21. A researcher conducted a study exploring the impact of scary films on individuals' heart rates. The researcher measured individuals' heart rate as they watched a scary film. Measuring heart rate is an example of which level of data (as defined by SPSS)?
 a. Nominal data b. Ordinal data c. Interval data d. Ratio data
22. You have produced a output of a table through the custom tables command. which type of graph you you not create from this table
 a. Bar b. Line c. Histogram d. Area
23. Which of these commands enables you to produce a bar chart of your data
 a. Legacy dialogues b. hart builder c. Frequencies command d. All of the above
24. How would you change the increments on the following graph?



- a. Double click on the graph, and then select Edit and click on Select Y Axis

- b. Double click on the graph and then select Edit and click on Select X Axis
- c. Double click on the graph and click on the X icon on the toolbar
- d. Double click on the graph and then select Options and click on Y Axis Reference Line

25. Which of the following is used for creating and defining various characteristics of variables?
- a. Output viewer b. Variable view c. Data editor d. Data view
26. How is a variable name different from a variable label?
- a. It is shorter and less detailed b. It is longer and more detailed.
 - c. It is abstract and unspecific. d. It refers to codes rather than variables.
27. in this tab rows represent variables & columns represent characteristics of variables.
- a. Output viewer b. Variable view c. Data editor d. Data view
28. after selecting the analyse and descriptive statistics dropdown menus, which of the following commands could you use to generate the median and mode for your data .
- a. the frequencies or the explore command b. the descriptives or the frequencies command
 - c. the descriptives or the explore command d. the descriptives or the crosstabs command
29. a parameter statistical test with allows you to examine whether there is a difference in the scores between two groups (or) conditions is known as
- a. A Pearson's test b. A chi-square c. A linear regression d. A t-test
30. You have collected some demographic data on age groups and would like to produce a pie chart to accompany the descriptive statistics which of the following commands could produce this pie chart
- a. Frequencies b. Descriptive c. Explore d. Cross tabs

P.R. Government College (Autonomous), Kakinada

Department of Statistics

Certificate Course 02: Descriptive Statistics with 'R' Software

Duration:40 Hours

No. of Credits(Extra): 01

Period of the course: During Odd Semester

ABOUT THE COURSE:

Any data analysis is incomplete without statistics. After getting the data, any statistical analysis starts with descriptive statistics which aims to extract the information hidden inside the data. The tools of descriptive statistics are based on mathematical and statistical functions which are to be evaluated using the software. The statistical software are paid as well as free. Most of the statistical software are paid software. Popular free statistical software is R.

Objective of the Course: What are the basic tools of descriptive statistics and how to use the R software for descriptive statistical analysis is the objective of the course to be taught.

Learning Outcomes: After completion of the course, the learners are able apply various tools of 'R' software to analyze descriptive statistics and to derive insights of the data.

INTENDED AUDIENCE:

Any UG student of Science, commerce and Humanities with very basic mathematical and statistical background.

COURSE LAYOUT:

Unit 1: Calculations with R Software: (8 Hrs)

Introduction, Basics, Data Vectors, Matrices, Handling missing data

Unit 2: Introduction to Descriptive Statistics, frequency distribution, Central Tendency of Data: (10 Hrs)

Absolute frequencies, Relative frequencies, Cumulative frequency distribution, Mean, Median, Mode, GM and HM

Unit 3: Variation in Data and Bi-variate data and correlation analysis: (12 Hrs)
Range, Quartile deviation, Absolute Deviation, Standard deviation and variance
Correlation analysis of bi-variate data

Unit 4: Graphics and Plots: (10 Hrs)

Bar diagrams, Pie diagrams, kernel density, stem-leaf plots, Box plots, scatter plots.

References:

1. Software for Data Analysis: Programming with R (Statistics and Computing) by John M. Chambers(Springer)
2. [R reference card](#)(PDF)by Tom Short (more can be found under Short Documents and Reference Cards [here](#))
3. [Quick-R](#): quick online reference for data input, basic statistics and plots
- 4.[R programming](#) class on Coursera, taught by Roger Peng, Jeff Leek and Brian Caffo

P.R GOVERNMENT (A) COLLEGE, KAKINADA
DEPARTMENT OF STATISTICS
CERTIFICATE COURSE 02: Descriptive Statistics with R
Model Paper

Time:2hrs
maxmarks:50

SECTION-A

Answer all questions. Each question carries 2 marks

1. The output of the command `C(1,2,3,4)*C(1,2)` is
 a. 1, 4, 3, 8 b. 1, 4 c. 1, 4, 3, 4 d. Error
2. If `x=matrix(nrow = 2, ncol = 2, data = c(1,0,0,1))`, then which one of the following relations hold true ?
 a. `x%*%x-x=x` b. `x%*%x=x` c. `x*2=2+x` d. `x/x=1`
3. The outcome of the R command `c(3,4,5,6)^c(2,3,1)` is
 a. 9 64 5 36 b. 9 64 5 36 with a warning message
 c. 6 12 5 12 d. 6 12 5 12 with a warning message
4. Five cars run between two given points which are at a distance of 10 kilometres. The average of the time taken by these five cars is found and the experiment is repeated 100 times. The nature of variables defined by the “average time” is
 a. discrete b. continuous. c. sometimes discrete and sometimes continuous
 d. not clear as the information is inadequate
5. Which of the following command is to find out the cumulative frequency of a discrete data
 a. `cumsum(table(var, seq(a,b, by=c), right=FALSE))`
 b. `cumsum(table(cut(var, seq(a,b, by=c), right=FALSE)))`
 c. `cumsum(table(cut(var, right=FALSE)))`
 d. `cumfreq(table(cut.var, seq(a,b, by=c), right=FALSE))`
6. Suppose the number of graduate students in 15 localities are recorded and three such numbers get missed. The collected observations are as follows: 104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253.
 Which one of the following is the correct command to obtain the arithmetic mean of this data in R?
 a. `mean(c(104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253), na.rm=TRUE)`
 b. `mean(104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253, na.rm=TRUE)`
 c. `mean((104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253), na.rm=TRUE)`
 d. `sum((104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253), na.rm=TRUE)/length((104,215,215,251,167,NA,308,NA,342,215,346,315,NA,364,253), na.rm=TRUE)`
7. The arithmetic means and variances of two data sets on volume of medicine on different bottles are obtained as follows. Based on the information provided by the coefficient of variations, which of the data set has more variability?

| Data Set | A.M | Variance |
|----------|-----|----------|
| I | 200 | 36 |
| II | 180 | 81 |

 a. Both data sets have the same variability b. Second data set has more variability.

- c. First data set has more variability d. Inadequate data to compute the coefficient of variation.
8. The command in R to find absolute mean deviation around median of a data on X is
- a. `mean(abs(X-median(X)))` b. `abs(X-median(X))`
 c. `Median(abs(X-median(X)))` d. `mean deviation(X-median(X))`
9. The command in R to get bar diagram with relative frequency data is
- a. `barplot(table(X))` b. `barplot(table(X)/length(X))`
 c. `bardiagram(table(X))` d. `bardiagram(table(X)/length(X))`
10. The command in R to get a scatter plot for two data vectors X and Y
- a. `plot(X,Y)` b. `scatterplot(X,Y)` c. `lineplot(X,Y)` d. `barplot(X,Y)`

SECTION-B

Answer all questions. Each question carries 3 mark

11. If x is a matrix given by the R command
`x = matrix(nrow=3, ncol=3, data=c(1,8,8,10, 12, 4, 12, 18, 16))`, the output
 of `t(x)+2*t(x)+t(x)%t(x)` is

- a. `[,1] [,2] [,3]`
`[1,] 36 54 48`
`[2,] 30 36 12`
`[3,] 3 24 24`
- b. `[,1] [,2] [,3]`
`[1,] 3 24 24`
`[2,] 30 36 12`
`[3,] 36 54 48`
- c. `[,1] [,2] [,3]`
`[1,] 36 54 48`
`[2,] 3 24 24`
`[3,] 30 36 12`
- d. `[,1] [,2] [,3]`
`[1,] 3 30 36`
`[2,] 24 36 54`
`[3,] 24 12 48`

Questions 12 to 14 are based on the following data set.

Following marks out of 100 were given to 200 students in an examination.

marks:

12.1, 80.0, 49.6, 83.5, 76.1, 90.3, 28.6, 45.1, 27.9, 33.7, 86.5, 11.9, 40.8, 41.2, 44.2, 18.5, 27.3, 66.3, 81.8, 42.7, 16.8, 29.6, 80.4, 17.3, 79.2, 52.9, 32.7, 28.2, 80.4, 11.3, 84.0, 8.8, 72.0, 86.6, 97.9, 25.7, 3.5, 23.1, 13.1, 39.1, 9.3, 29.0, 57.1, 33.5, 94.4, 38.4, 95.4, 28.1, 69.0, 14.6, 81.2, 76.5, 44.8, 46.2, 68.4, 8.4, 65.0, 79.2, 23.1, 5.1, 39.1, 35.1, 45.2, 39.3, 91.9, 18.2, 15.8, 61.7, 2.7, 7.5, 78.1, 93.6, 21.5, 64.7, 33.8, 95.6, 81.9, 74.3, 23.0, 5.5, 37.3, 74.4, 93.4, 67.6, 70.4, 84.9, 70.9, 86.0, 45.1, 68.0, 13.7, 73.9, 7.7, 28.8, 41.8, 94.4, 97.8, 4.8, 59.2, 4.0, 57.0, 10.7, 63.4, 82.0, 35.7, 14.3, 9.0, 35.7, 99.6, 53.8, 34.3, 32.1, 38.9, 2.8, 4.6, 88.0, 40.8, 47.5, 40.8, 70.5, 40.5, 50.7, 4.7, 30.5, 96.3, 93.6, 96.1, 79.5, 75.7, 7.5, 14.4, 13.2, 76.5, 90.4, 40.9, 19.1, 38.1, 51.1, 91.4, 8.6, 11.9, 75.7, 31.2, 72.7, 24.0, 40.0, 51.3, 94.1, 6.7, 31.2, 24.9, 39.1, 76.5, 86.6, 68.2, 68.0, 17.3, 80.5, 71.5, 92.9, 1.7, 60.0, 37.3, 74.5, 76.4, 26.8, 26.2, 68.2, 49.1, 38.5, 6.5, 90.0, 80.4, 48.6, 4.2, 51.7, 37.9, 50.4, 40.5, 3.1, 52.9, 16.9, 21.3, 97.5, 96.7, 76.2, 8.6, 52.1, 60.4, 44.3, 1.2, 44.1, 50.6, 67.3, 69.8, 78.5, 14.8, 17.2, 76.2, 44.9

12. The arithmetic mean of the data on marks is

- a. 44.85 b. 48.49 c. 65.46 d. 68.34

13. The median of the data on marks is

- a. 44.85 b. 48.49 c. 65.46 d. 68.34

14. The 25% and 75% quartiles of the data on marks are

- a. 1.200 and 75.800 respectively b. 23.775 and 99.600 respectively
c. 23.775 and 75.800 respectively d. 1.200 and 99.600 respectively

Questions 15 to 17 are based on the following data set.

Following yield (in kilograms) are reported from 200 agricultural fields of same size where 10 values are missing and are expressed as NA. The data is stored in a data vector yieldna:

yieldna:

34.4, 47.0, 19.6, 20.9, NA, NA, 47.2, 28.5, NA, 22.5, 18.3, 46.8, 12.1, 26.4, 28.3, 26.6, 36.8, 40.3, NA, 42.8, 13.7, 17.1, 35.7, NA, 33.7, 20.5, 45.4, 17.5, 29.6, 10.4, 24.4, 27.7, 15.0, 35.0, 22.1, 19.6, 24.3, 45.7, NA, 39.3, 49.7, 31.6, 27.4, NA, 15.9, 12.7, 11.0, 34.5, 37.9, 42.0, 15.5, 16.4, NA, 25.9, 17.5, 29.1, 31.8, 23.1, NA, 31.1, 15.3, 27.5, 34.8, 18.1, 15.4, 41.1, 35.4, 21.3, 17.7, 20.6, 31.2, 37.4, 25.3, NA, 14.7, 11.6, 30.2, 33.1, 43.6, 36.2, 47.8, 30.5, 13.4, 49.8, 26.1, 45.8, 45.1, 21.9, 15.3, 20.6, 10.2, 42.8, 17.0, 43.7, 16.7, 40.6, 30.8, 20.9, 23.7, 38.2, 33.7, 28.8, 23.5, 48.7, 35.8, 17.9, 24.3, 30.5, 45.3, 16.1, 19.2, 16.5, 34.6, 30.1, 17.5, 26.3, 33.3, 22.4, 29.2, 47.6, 11.8, 31.4, 27.7, 46.3, 45.2, 16.5, 40.1, 26.1, 32.3, 13.2, 14.7, 47.0, 45.2, 16.5, 31.3, 47.2, 23.0, 16.4, 48.0, 28.5, 18.8, 10.1, 34.8, 26.1, 46.0, 30.2, 39.1, 11.1, 25.2, 25.5, 23.5, 24.6, 35.6, 11.3, 37.8, 42.6, 30.3, 14.5, 46.3, 26.5, 29.0, 38.5, 19.7, 22.0, 38.2, 40.9, 10.6, 32.1, 36.1, 47.3, 37.6, 20.2, 26.4, 14.9, 15.3, 35.6, 23.9, 26.9, 47.6, 25.4, 19.1, 37.6, 10.4, 37.4, 41.7, 30.3, 22.3, 39.5, 22.2, 41.0, 14.5, 41.9, 29.6, 43.3, 40.3, 46.1, 21.1, 27.8, 20.9, 23.2

15. The absolute mean deviation around median of the data on yieldna is

- a. 19.3984 b. 19.638 c. 9.81932 d. 9.398421

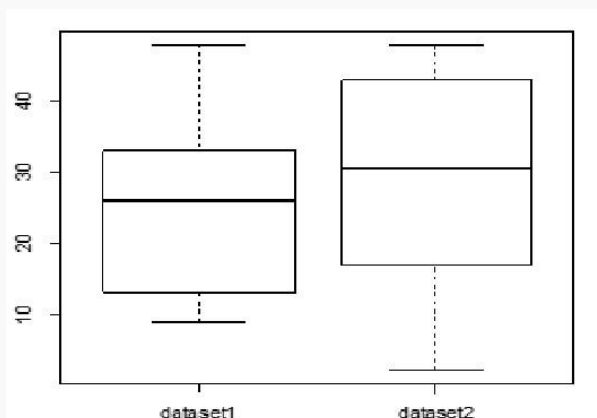
16. The value of variance of the data on yieldna is

- a. 131.3516 b. 130.6949 c. 122.6149 d. 120.4329

17. The value of coefficient of variation of the data on yieldna is

- a. 0.3833847 b. -0.3833847 c. 2.608346 d. -2.608346

18. Following are the boxplots of two datasets- dataset1 and dataset 2:



Which of the following statements are correct:

- (i) Quartile range of dataset 1 is more than the quartile range of dataset 2.
(ii) Quartile range of dataset 2 is more than the quartile range of dataset 1

(iii) Difference between minimum value of data and its median is smaller in dataset 1 than in dataset 2.

(iv) Difference between minimum value of data and its median is smaller in dataset 2 than in dataset 1.

- a. (i) and (iii) b. (i) and (iv) c. (ii) and (iii) d. (ii) and (iv)

19. For the following data weight on the weights of 20 children

2.25, 1.43, 1.31, 9.24, 8.56, 2.61, 5.46, 3.76, 3.47, 2.15, 4.86, 7.26, 4.02, 7.31, 8.56, 8.94, 7.90, 3.90, 1.38, 9.03 ,

the outcome of the R command `stem(weight, scale=1)` is

a. 1 | 344

2 | 136

3 | 589

4 | 229

7 | 339

8 | 669

9 | 552

b. 1 | 344

2 | 136

3 | 589

4 | 229

7 | 339

8 | 669

9 | 552

c. 1 | 344

2 | 136

3 | 589

4 | 91

5 | 590

6 | 452

7 | 339

8 | 669

9 | 1

d. 1 | 344

3 | 589

5 | 5

7 | 339

9 | 02

20. Which of the commands are used to find correlation and plotting smooth trend line respectively

a. `cor(X,Y)` and `smooth.scatter(X,Y)` b. `cor(X,Y)` and `scatter.smooth(X,Y)`

c. `cor(X,Y)` and `plot(X,Y)`

d. `correlation(X,Y)` and `plot(X,Y)`

List of Examiners

1. Dr.N.Madhavi - Govt. College (A), Rajahmundry
2. Dr.D.V. Ramana Murthy - SKVT College, Rajahmundry
3. Dr.T.C.Ravi Chandra kumar - Principal, Govt.Degree College, Tuni
4. Dr. Kousar Jaha Begum -GDC(M) SVA, Chittoor
5. Dr.S.Hariprasad - GDC, SG, Piler, Chittoor Dist
6. A. Kullaya Swamy - GDC, SG, Piler, Chittoor Dist
7. Dr. N. SrinivasaRao - Andhra Loyola college, Vijayawada
8. Dr.G.Vara Lakshmi - GDC,DKWC, Nellore
9. Dr. RVS Prasad - GDC PRR&VS, Nellore
- 10.Dr. B. Chandra Shekar Reddy -GDC SR, Chittoor
- 11.Dr. P. Maheswari - GDC(M) SVA, Chittoor
- 12.Dr. A Janaki Ram - GDC(M), Karnool
- 13.Anand - Gayatri Vidhya Parishad, Vizag
- 14.Gandhi - AVN college, Vizag
- 15.Dr. Hanumanth Rao - MR College, Vizayanagaram
- 16.Dr. Kalyani - MR College, Vizayanagaram
17. Gopala Rao - MR College, Vizayanagaram
- 18.M. Satyanarayana -Govt.Degree College, Kadapa
- 19.Dr.V.Munaiah -GDC, PVKN, Chittoor
- 20.Dr.GangaRam -PVKN GDC, Chittoor
- 21.Dr. P.Konda Babu - MR College, Vizayanagaram
- 22.Dr.V. Rohini Kumari -GDC, Ananthapur
- 23.G. S. Moses -GDC. Bhimavaram
- 24.S.V.Narasimha Raju -GDC, Bhimavaram

