THIRUVALLUVAR UNIVERSITY

Serkkadu

Vellore – 632115

Degree of Bachelor of Science

CHOICE BASED CREDIT SYSTEM

Syllabus for

B.Sc., STATISTICS
(SEMESTER PATTERN)

(For Candidates admitted in the Colleges affiliated to Thiruvalluvar University from 2023-2024 onwards)

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(From 2023 – 2024 Onwards)

(Semester-wise)

THIRUVALLUVAR UNIVERSITY.

BACHELOR OF SCIENCE BRANCH - STATISTICS

(The Revised Syllabus shall be Effective from the Academic Year 2023-2024 Onwards)

Introduction:

Programme Outcome, Programme Specific Outcome and Course Outcome

Statistics is the study of Data and extracting knowledge in the data using various methods and techniques, analyze and interpret data, taking data driven predictions and decisions. It also helps data collection through sampling techniques, that is to collect data focusing on problem solving, and presenting it with wider scope of application in science, social sciences, medical science, life sciences, country‘s official statistics etc. Statistical methods are used as research methodology in all most all domains. The key core areas of study in Statistics include Descriptive Statistics, Probability Theory, Sampling techniques, Matrix and Linear Algebra, Distribution Theory, Estimation Theory, Testing of Statistical hypotheses, Stochastic processes, Regression analysis, Design of Experiments, Demography and Official Statistics. The Bachelor‘s Degree B.Sc. Statistics is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements expected to be acquired by learners at the end of the Programme. Learning outcomes of Statistics are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for gaining knowledge of Statistics.

Bachelor‘s degree in Statistics is the culmination of in-depth knowledge in both theoretical and practical methods and techniques of Statistics. This also leads to study of related areas like Computer science, Industrial Statistics, Mathematical Statistics, Business Statistics and many more. Thus, this programme helps learners in building a solid foundation for higher

studies in Statistics. The skills and knowledge gained have intrinsic aesthetics leading to proficiency in analytical reasoning. This can be utilized in Statistical modeling and solving real life problems.

Students completing this programme will be able to present Statistics clearly and precisely, make abstract ideas precise by formulating them in the language of Statistics, describe Statistical ideas from multiple perspectives and explain fundamental concepts of Statistics to those non-Statistics users.

This syllabus 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. Along with this, students are equipped with skill enhancement courses like Research methodology, Statistical packages and R language.

❖ CARRIER IN STATISTICS

After the completion of undergraduate course, students can pursue higher education in the field of statistics, professional courses and research level studies.

Postgraduates	Professional Courses	Statistical Software	Competitive Exams
M. Sc Statistics	M. B. A	STATA	UPSC
M. Stat	M. C. A	SPSS	SSC
M. Sc Data Science/Data Analytics	C.A	Minitab	IAS
M. Sc Operations Research	I.C.W. A	R	IFS
M. Sc Actuarial Science	F. R. M	SAS	ISS
M. Sc in Library and Information Science	C. F. A	SAP	SSS
M. Sc in Quantitative Economics	C. C. A	ERP	CSO
M.A Economics		Python	NSSO
M. Pharm		MATLAB	IAMR
P.G Diploma in Statistical Methods with Applications		MaxStat.	ICMR

❖ JOB OPPURTUNITIES

Jobs opportunities in Statistics Field	Job opportunities in other fields
Statistician	Business Analyst
Statistics Investigator (TNPSC)	Chartered Accountant
Actuarial Analyst	Economist
Block Health Statistician (TNPSC)	Financial Manager
Data Scientist	Financial Trader
Data Analyst	Insurance Underwriter
Market Researcher	Machine Learning Engineer
Operational Researcher	Research Scientist (Maths)
Bio-Statistician	Python Developers
Meteorologist	Assistant Director (DPES)
Statistics Subject Matter Expert	Senior Manager – Research
Statistics at Up think Expert (Tutor)	Civil Service Fast Streamer
Young professional (Statistics) in MOSPI	Project Technical Officer
Agriculture Statistical Officer	Banking Sectors
Field Officer (Statistics)	Trainee Data Analyst

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**U.G.**
Duration:	**3 years [UG]**
Programme Outcomes:	**PO1: Disciplinary Knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical Thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the

	basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team **PO8: Scientific reasoning**: Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10: Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO11: Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

	PO12: Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO13: Moral and ethical awareness/reasoning**: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demon starting the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO15: Lifelong learning:** Ability to acquire knowledge and skills, including learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes:	**PSO1**: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making. **PSO2**: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment. **PSO3**: To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing. **PSO4**: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens. **PSO5:** Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PSO 1	Y	Y	Y	Y	Y	Y	Y	Y
PSO 2	Y	Y	Y	Y	Y	Y	Y	Y
PSO3	Y	Y	Y	Y	Y	Y	Y	Y
PSO 4	Y	Y	Y	Y	Y	Y	Y	Y
PSO 5	Y	Y	Y	Y	Y	Y	Y	Y

3 – Strong, 2- Medium, 1- Low

❖ **Highlights of the Revamped Curriculum**:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Mathematics based problem solving skills are included as mandatory components in the _Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in

conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.

- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome / Benefits
I	**Foundation Course** To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning Literature and analysing the world through the literary lens gives rise to a new perspective.	➢ Instill confidence among students ➢ Create interest for the subject
I, II, III, IV	**Skill Enhancement papers** (Discipline centric / Generic / Entrepreneurial)	➢ Industry ready graduates ➢ Skilled human resource ➢ Students are equipped with essential skills to make them employable
		➢ Training on language and communication skills enable the students gain knowledge and exposure in the competitive world.
		➢ Discipline centric skill will improve the Technical knowhow of solving real life problems.
III, IV, V & VI	**Elective papers**	➢ Strengthening the domain knowledge ➢ Introducing the stakeholders to the State-ofArt techniques from the streams of multi- disciplinary, cross disciplinary and inter disciplinary nature ➢ Emerging topics in higher education/ industry/ communication network / health sector etc. are introduced with hands-on-training.
IV	Elective Papers	➢ Exposure to industry moulds students intosolution providers ➢ Generates Industry ready graduates ➢ Employment opportunities enhanced

V	Elective papers	➢ Self-learning is enhanced ➢ Application of the concept to real situation is conceived resulting in tangible outcome
VI	Elective papers	➢ Enriches the study beyond the course. ➢ Developing a research frame work andpresenting their independent and intellectual ideas effectively.
Extra Credits: **For Advanced Learners / Honors degree**		➢ To cater to the needs of peer learners /research aspirants
Skills acquired from the Courses		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Credit Distribution for UG Programmes

Sem I	Credit	H	Sem II	Credit	H	Sem III	Credit	H	Sem IV	Credit	H	Sem V	Credit	H	Sem VI	Credit	H
Part 1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	5.1 Core Course –\CC IX	4	5	6.1 Core Course – CC XIII	4	6
Part.2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	5.2 Core Course – CC X	4	5	6.2 Core Course – CC XIV	4	6
1.3 Core Course – CC I	5	5	2..3 Core Course –CC III	5	5	3.3 Core Course – CC V	5	5	4.3 Core Course – CC VII Core Industry Module	5	5	5. 3.Core Course CC -XI	4	5	6.3 Core Course – CC XV	4	6
1.4 Core Course – CC II	5	5	2.4 Core Course –CC IV	5	5	3.4 Core Course – CC VI	5	5	4.4 Core Course – CC VIII	5	5	5. 4.Core Course –/ Project with viva-voce CC - XII	4	5	6.4 Elective - VII Generic/ Discipline Specific	3	5
1.5 Elective I Generic/ Discipline Specific	3	4	2.5 Elective II Generic/ DisciplineSpecific	3	4	3.5 Elective III Generic/ Discipline Specific	3	4	4.5 Elective IV Generic/ Discipline Specific	3	3	5.5 Elective V Generic / Discipline Specific	3	4	6.5 Elective VIII Generic/ Discipline Specific	3	5
1.6 Skill Enhancement Course SEC-1	2	2	2.6 Skill Enhancement Course SEC-2	2	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	1	4.6 Skill Enhancement Course SEC-6	2	2	5.6 Elective VI Generic / Discipline Specific	3	4	6.6 Extension Activity	1	-
1.7 Skill Enhancement - (Foundation Course)	2	2	2.7 Skill Enhancement Course – SEC-3	2	2	3.7 Skill Enhancement Course SEC-5	2	2	4.7 Skill Enhancement Course SEC-7	2	2	5.7 Value Education	2	2	6.7 Professional Competency Skill	2	2
						3.8 E.V.S.	-	1	4.8 E.V.S	2	1	5.8 Summer Internship /Industrial Training	2				
	23	**30**		**23**	**30**		**22**	**30**		**25**	**30**		**26**	**30**		**21**	**30**
Total – 140 Credits																	

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF Guideline Based Credit and Hours Distribution System for all UG courses including Lab Hours

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses [in Total]	13	14
Part-4	Skill Enhancement Course SEC-1	2	2
	Foundation Course	2	2
		23	**30**

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	92
Part IV	4	4	3	6	4	3	24
Part V	-	-	-	-	-	-	-
Total	23	23	22	25	26	21	**140**

***Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or Overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate	
	between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations	

❖ ELIGIBILITY CONDITION FOR ADMISSION

Candidates who seek admission to the Degree of Bachelor of Science in Statistics are required to have passed the Higher Secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an examination accepted as equivalent there to by the Thiruvalluvar University, with Statistics/ Mathematics/Business Mathematics as one of the subjects.

❖ DURATION OF THE COURSE

a) Each academic year will be divided into two semesters. The first academic year will comprise the first and second semester, the second academic year - the third and fourth semester and the third academic year – the fifth and sixth semester.

b) The odd semesters consist of the duration from June to November of each year and the even semesters consist of the duration from December to April of each year. There won‘t be less than 90 working days for each semester.

❖ COURSE OF STUDY

In the following subjects, the course of study will comprise instruction according to the syllabus and books, prescribed from time to time.

❖ EXAMINATIONS

During semester examination for each theory examination three hours is allotted. For practical examination also three hours is allotted. It will be conducted at the end of each the year. The candidate who has failed in any subject will be permitted to attend the arrear subject(s) along with the subsequent examination.

❖ PROJECT

The aim of the course is to initiate students to write and present a statistical report, under the supervision of a faculty, on some area of social interest. The project work will provide hands on training to the students to deal with data emanating from some real – life situation and propel them to do well on so theory or relate it to some theoretical concepts. The project should be prepared based on the own idea and interpretation of the student. It should not be copied from anywhere. A student must consult his/her supervisor for the preparation of the project.

While writing a project, a student must present two seminars before the faculties/ supervisor from the department.

Internal – 25 Marks

Project Viva – Voce – 75 marks

Total – 100 Marks

❖ INTERNSHIP

Students should undergo the internship for a duration of fifteen days at the end of the fourth semester. The eligible agencies to undergo internship shall be reputed multinational companies, Banking organizations, State/ Central government governing agencies. A faculty in- charge from the department will be allotted to such students. The internship result will be declared in the fifth semester mark sheet. The internship programme does not carry any marks. The mark sheet will be showing the report of the guide after the viva-voce examination as Commended or Highly Commended.

❖ SCHEME OF EXAMINATIONS

The scheme of examination for different semesters shall be as follows:

Course structure under OBE (Semester-wise Details)

Branch II STATISTICS

(For the students admitted from the Academic year 2023-2024 onwards)

PART	PAPER CODE	COURSE	TITLE OF THE PAPER	HOURS	CREDIT	MARKS		TOTAL
						CIA	UE	
SEMESTER – I								
I		Part – 1 Language	Tamil – I	6	3	25	75	100
II		Part – 2 Language	English – I	6	3	25	75	100
III		Core Theory – I	Descriptive Statistics	5	5	25	75	100
		Core Theory – II	Probability Theory	5	5	25	75	100
		Elective – I	Mathematics for Statistics	4	3	25	75	100
IV		**SEC – I	NME – I(Bio Statistics)	2	2	25	75	100
		Foundation Course	Elementary Statistics	2	2	25	75	100
NO. OF COURSES – 7			**TOTAL**	**30**	**23**	**175**	**525**	**700**

*Practical examinations should be conducted at the end of the semester.

Course Structure

BRANCH: STATISTICS

TABLE SHOWING THE COURSES OFFERED WITH CREDITS UNDER VARIOUS PARTS

OBE Pattern With effect from the Academic Year 2023-24 onwards

Sem I	Credit	Sem II	Credit	Sem III	Credit	Sem IV	Credit	Sem V	Credit	Sem VI	Credit
1.1. Language	3	2.1. Language	3	3.1. Language	3	4.1. Language	3	5.1 Core Course – \CC IX	4	6.1 Core Course – CC XIII	4
1.2 English	3	2.2 English	3	3.2 English	3	4.2 English	3	5.2 Core Course – CC X	4	6.2 Core Course – CC XIV	4
1.3 Core Course – CC I	5	2.3 Core Course – CC III	5	3.3 Core Course – CC V	5	4.3 Core Course – CC VII Core Industry Module	5	5. 3.Core Course CC -XI	4	6.3 Core Course – CC XV	4
1.4 Core Course – CC II	5	2.4 Core Course – CC IV	5	3.4 Core Course – CC VI	5	4.4 Core Course – CC VIII	5	5. 3.Core Course –/ Project with viva-voce CC -XII	4	6.4 Elective -VII Generic/ Discipline Specific	3
1.5 Elective I Generic/ Discipline Specific	3	2.5 Elective II Generic/ Discipline Specific	3	3.5 Elective III Generic/ Discipline Specific	3	4.5 Elective IV Generic/ Discipline Specific	3	5.4 Elective V Generic/ Discipline Specific	3	6.5 Elective VIII Generic/ Discipline Specific	3

1.6 Skill Enhancement Course SEC-1 (NME)	2	2.6 Skill Enhancement Course SEC-2 (NME)	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	4.6 Skill Enhancement Course SEC-6	2	5.5 Elective VI Generic/ Discipline Specific	3	6.6 Extension Activity	1
1.7 Skill Enhancement - (Foundation Course)	2	2.7 Skill Enhancement Course – SEC-3	2	3.7 Skill Enhancement Course SEC-5	2	4.7 Skill Enhancement Course SEC-7	2	5.6 Value Education	2	6.7 Professional Competency Skill	2
				3.8 E.V.S	-	4.8 E.V.S	2	5.8 Summer Internship /Industrial Training	2		
	23		**23**		**22**		**25**		**26**		**21**
	Total Credit Points										**140**

DIFFERENT TYPES OF COURSES

Core Courses CC

S. No.	Course No.	Title of the course
1	I	Descriptive Statistics
2	II	Probability Theory
3	III	Matrix and Linear Algebra
4	IV	Distribution Theory
5	V	Estimation Theory
6	VI	Sampling Techniques
7	VII	Testing of Statistical Hypothesis
8	VIII	Actuarial Statistics
9	IX	Stochastic Processes
10	X	Regression Analysis
11	XI	Practical - IV
12	XII	Project (Core with Viva Voce)
13	XIII	Design of Experiments
14	XIV	Demography
15	XV	Practical - V

<table>
<tr><td colspan="8">(For the candidates admitted from the academic year 2023 -2024 onwards)</td></tr>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Descriptive Statistics</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">1</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basic arithmetic</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">The main objectives of this course are:
1. It explains the important concepts of statistics and statistical data.
2. It provides to formulate the visualization of frequency distribution.
3. Also they measure the averages, dispersions, lack of symmetry, moments, relationship among variables.
4. Estimate and predict the unknown and future values.
5. Study of non-linear and consistency of the data.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">Unit-I Statistics
Introduction - Definition –Collection of Data: Primary and secondary data - Methods of collecting primary data - Sources of secondary data. Sampling: Census and Sample methods. Classification-Types - Formation of frequency distribution-Tabulation - parts of a Table - Types. Diagrammatic representation – Types. Graphical representation - Graphs of frequency distributions. Merits and Limitations of diagrams and graphs.</td></tr>
<tr><td colspan="6">Unit-II Measures of Central tendency
Introduction-Definitions- Types - Mean-Median-Mode-Geometric mean-Harmonic Mean-Weighted mean - Merits and Demerits-Measures of Dispersion: Introduction – Definition – Types – Range - Quartile deviation - Mean deviation - Standard deviation - Co-efficient of variation.</td></tr>
<tr><td colspan="6">Unit-III Skewness
Introduction-Definition-Types-Karl Pearson‘s – Bowley‘s - Kelly‘s methods – Their merits and demerits. Kurtosis: Introduction-Definition-Types-Its merits and demerits. Moments: Introduction - Definition-Types - Raw, Central moments and their relations.</td></tr>
<tr><td colspan="6">Unit-IV Correlation analysis
Introduction - Definition - Types – Ungrouped and Grouped data – Probable error – properties - Rank correlation –Regression analysis: Introduction - Definition – Regression Equations -Multiple regression.</td></tr>
<tr><td colspan="6">Unit-V Theory of Attributes
Introduction – Definition-Classes and Class frequencies-Consistency of data-Independence of attributes- Association of attributes-Yule‘s coefficient and -Coefficient of Colligation.</td></tr>
</table>

Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Gupta, S.P. (2017): Statistical Methods, Sultan Chand & Sons Pvt Ltd, New Delhi, 35th Revised Edition. 2. Gupta S. C and Kapoor, V. K. (2002). Fundamentals of Mathematical Statistics, Sultan Chand & Sons Pvt. Ltd., New Delhi
Reference Books	**1.** Goon A. M. Gupta. A. K. and Das Gupta, B (1987). Fundamental ofStatistics, vol.2 World Press Pvt. Ltd., Kolkatta **2.** G. U. Yule and M.G. Kendall (1956). An introduction to the theoryof Statistics, Charles Griffin. **3.** M.R. Spiegel (1961). Theory and problems of Statistics, Schaum's outline series. **4.** Anderson, T.W. and Sclove SL. (1978). An introduction to statistical analysis of data, Houghton Miffin &co. **5.** Pillai, R.S., and Bagavathi (2003): Statistics, S. Chand and Company Ltd., New Delhi.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject https://en.wikipedia.org/wiki/Statistics https://en.wikipedia.org/wiki/Descriptive_statistics https://socialresearchmethods.net/kb/statdesc.php http://onlinestatbook.com/2/introduction/descriptive.html

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1: Describe the scope, functions, applications and limitations of Statistics.

CLO-2: Also to explain the statistical survey, collection of data, sampling and presentation of data.

CLO-3: Discuss the importance and uses of central values and dispersions for the various types of data.

CLO-4: Also to measure the various measures of averages and scatteredness of the mass of data in a series.

CLO-5: Explain about the lack of symmetry, r^{th} moments and peakedness of the frequency distributions.

CLO-6: Ability to apply in data

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	M	S	S	S	S	S	S	S	M
CLO5	S	S	S	S	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">Probability Theory</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">1</td><td>--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basic Knowledge on events and set theory</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">The main objectives of this course are:
1. To describe the importance and scope of probability theory and to predict the chance of an experimental outcomes.
2. It provides the study of random variable, distribution function, mathematical expectation,
3. Two-dimensional variables and its distributions</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">Unit-I Theory of Probability
Introduction-Basic terminology- Definition - Axiomatic approach – Types of Events - Conditional Probability – Addition and Multiplication theorems of Probability for ‗two' events (Statement and Proof) – Bayes theorem of Probability (Statement and Proof)- Simple problems.</td></tr>
<tr><td colspan="6">Unit-II Random variables and Distribution functions
Introduction - Discrete random variable: Probability mass function- Discrete distribution function, Properties. Continuous random variable: Probability density function and properties.</td></tr>
<tr><td colspan="6">Unit-III Two dimensional random variables
Joint probability mass function- Marginal probability function, Conditional probability function. Two dimensional distribution functions- Marginal distribution functions - Joint density function-Marginal density function - Conditional distribution function - Conditional probability density function only.</td></tr>
<tr><td colspan="6">Unit-IV Mathematical Expectations
Introduction- Expected value of a random variable (Discrete and Continuous)-Expected value of function of a random variable - Properties of Expectation-Properties of variance- Covariance. Inequalities involving expectation.</td></tr>
<tr><td colspan="6">Unit-V Generating functions
M.G.F-Properties-Uniqueness theorem - C.G.F-Properties- P.G.F-Properties. Characteristic Function: Properties– Inversion theorems (Statement only)- Uniqueness theorem (Statement only). Chebychev's Inequality (Statement and Proof).</td></tr>
</table>

Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Gupta S.C. and Kapoor V.K (2015): Fundamentals ofMathematical Statistics, Sultan Chand & Sons.
Reference Books	1. Rohatgi, V.K. (1984): An introduction to probability theory and mathematical statistics. 2. Hogg. R.V. and Craig. A.T. (1978) : Introduction to Mathematical Statistics, McGraw Hill Publishing Co. Inc. New York. 3. Mood A.M. Graybill, F.A. and Bose. D.C. (1974): Introduction to the theory of Statistics, McGraw Hill Publishing Co. Inc. New York. 4. Sanjay Arora and Bansilal (1989): New Mathematical Statistics, Satyaprakashan, New Delhi
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject www.khanacademy.org/math/statistics-probability/random-variables-stats-library https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1: Understand concepts of probability and identify the different approaches of probability theory

CLO-2: Define the random variable and its respective probability values and to compare a discrete and continuous random variable.

CLO-3: Calculate the expected value of a random variable variance, covariance, moments and find the conditional expectation and variance of bi-variate random variable.

CLO-4: Estimate the measures of central values, Dispersions, Skewness and Kurtosis through the generating function

CLO-5: Understand bivariate random variables and its distributions

CLO-6: Application of probability theory in real life

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	S	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO'

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">Mathematics for Statistics</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">Elective I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">3</td><td colspan="2">1</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">Calculus – Basic arithmetic</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">The main objectives of this course are:
1. The overall objective of the study is to create deep interest in learning mathematics which develop broad and balance knowledgeand understanding definitions, concepts, principles and theorems.
2. It helps the students to enhance the ability of learners to apply the knowledge and skill acquired by them to solve specific theoretical and applied problems in mathematics.
3. It also encourages the students to develop a range of generic skill helpful in employment, internships in social activities.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">Unit-I Rational fractions: Proper and improper rational fractions. Partial fractions: Forms of partial fractions.</td></tr>
<tr><td colspan="8">Unit-II Series: Summation and approximations related to Binomial, Exponential and Logarithmic series -Taylor‘s series.</td></tr>
<tr><td colspan="8">Unit-III Theory of equations: Polynomial equations with rea coefficients- imaginary and irrational roots-solving equations with related roots-equation with given numbers as roots.</td></tr>
<tr><td colspan="8">Unit-IV Differential calculus: Functions – Different types – simple valued and many valued – Implicit and Explicit functions, Odd and even functions, periodic functions, algebraic and transcendental functions.</td></tr>
<tr><td colspan="8">Unit-V Successive differentiation: Leibnitz‘s theorem, nth derivatives of standard functions – simple problems. Partial differentiation: Successive partial differentiation.</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	**1.** Duraipandian, P. and Udaya Baskaran, S. (2014): Allied Mathematics, Vol. – I&II,S.Chand & Company Pvt. Ltd. **2.** Vittal, P.R(2012). Allied Mathematics, Margham Publications. **3.** Narayanan,SManickavachagamPillai(1993): Ancillary Mathematics, Book II : (Containing Differential Calculus) S. Viswanathan Pvt, Ltd .
Reference Books	**1.** Narayanan,S and ManickavachagamPillai (1993): Ancillary Mathematics (Vol. II,Part I) : (Containing Trignometry) S. ViswanathanPvt. Ltd . **2.** Narayanan, S and ManickavachagamPillai (1993): Ancillary Mathematics, Book I : (Containing Algebra). S. Viswanathan Pvt.Ltd . **3.** S.J.Venkatesan (2019), Algebra,Sri Krishna Publications ,Chennai-77 , skhengg1999@gmail.com
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Distinguish between proper and improper fractions. Express an algebraic fraction as the sum of its partial fractions.

CLO-2 Demonstrate the knowledge to determine the sums, expansion and approximation of series including binomial, exponential, logarithmic.

CLO-3 Solve problems about polynomials with real coefficients, imaginary and irrational roots.

CLO-4 Calculate limits of a function.

CLO-5 Obtain the nth derivative in successive differentiation.

CLO-6 Obtain the mathematical knowledge and skills for the better understanding of statisticsas a mathematical science

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Title of the Course		**SEC - Biostatistics**					
Paper Number							
Category	Core	**Year**	I	**Credits**	2	**Course Code**	
		Semester	I				
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**		
		2	-	--	2		
Pre-requisite		Basics of distribution theory and Regression analysis					
Objectives of the Course		The main objectives of this course are to: 1. Initiate the awareness of Biostatistics and its need. 2. Make the students have a clear understanding of special kinds of various statistical tools used in biostatistics. 3. Be knowledgeable about the potential applications of these tools.					
		Unit I - Introduction to Bio statistics – Various types of studies – Ethics – Measures of disease frequency and disease burden. Clinical trials – Goals of Clinical trials – Phases of clinical trials – Classification of clinical trials					
		Unit II -Randomization : Fixed Allocation, Simple , Blocked, Stratified, Baseline Adaptive and Response Adaptive – Blinding: Single, Double and triple- Designs for clinical Trials : Parallel Groups Design, Cluster Randomization Designs, Crossover Designs.					

Course Outline	**Unit III -**Multiple Regression – Assumptions – Uses – Estimation and interpretation of regression coefficients – Testing the regression coefficients – Coefficient of determination – Testing model Adequacy.
	Unit IV -Logistic Regression : Introduction – Logistic regression model – Relative risk – Logistic – odds Ratio – Properties of odds ratio – the relationship between the odds ratio and relative risk
	Unit V -Maximum likelihood estimates and interpretation of coefficients – Test for coefficients – Test for overall regression and goodness of fit using Maximum Likelihood technique – Deviance Statistics , Wald Test, LR Test and score test.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Books	1. Chow, S. C., and Liu, J. P. (2013). Design and Analysis of Clinical Trials: Concepts and Methodologies, Third Edition, Wiley – Interscience, John Wiley & Sons, NJ. 2. Friedman, l. M., Furberg, C. D., and DeMets, D. L. (2015), Fundamentals of Clinical Trials, Fifth edition, Springer – Verlag, NY.

	3. Van Belle, G., Fisher, L. D., Heagerty, P. J., and Lumley, T. (2004). Bio-Statistics - A Methodology for the Health Science, Second Edition, Wiley, NY. 4. Daniel, W. W. and Chad L. Cross(2018). Bio-Statistics: A foundation for analysis in the Health Sciences, Eleventh Edition, John Wiley & Sons, NY. 5. Kleinbaum, D. G., and Klein, M. (2012): Logistic regression: A Self-Learning Text, Third Edition, Springer – Verlag, NY.
Reference Books	1. Hosmer, Jr. D. W., Lemeshow, S., and Sturdivant, R. X. (2013). Applied Logistic Regression, Third Edition, John Wiley & Sons, Inc., NY. 2. Rossi, R. J. (2010). Applied Biostatistics for Health Sciences, John Wiley & Sons, Inc., NY
Website and e-Learning Source	1. Prof.Shamik Sen, Department of Bioscience and Bioengineering, IIT Bombay, ―Introduction to Biostatistics‖, NPTEL. [https://swayam.gov.in/nd1_noc20_bt28/preview] 2. Dr.Felix Bast, Central University of Punjab, Bathinda, 2020, ―Biostatistics and Mathematical Biology‖, (NPTEL). [https://swayam.gov.in/nd2_cec20_ma05/preview]

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the concepts and statistical tools used in Biostatistics

CLO-2 Effectively apply these tools on solving the biological problems occurring in real life

CLO-3 Analyze the given Bio-statistical data as per the objectives of the problem

CLO-4 Interpret the outcomes of the analyses meaningfully

CLO-5 Create research problems of his own and able to proceed with them

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Title of the Course	**Foundation Course – Elementary Statistics**							
Paper Number	**Foundation Course**							
Category	Core	**Year**	I	**Credits**	2	**Course Code**		
		Semester	I					
Instructional Hours per week	**Lecture**		**Tutorial**		**Lab Practice**		**Total**	
	2		-		--		2	
Pre-requisite	Uses and its basics							
Objectives of the Course	1. To enable the students to understand the basic concepts of set theory. 2. Appreciate the basics of functions and relations. 3. Understand the types of functions and relations. 4. To acquire knowledge the Sequence and series of Arithmetic and Geometric. Find useful applications in commercial problems among others. 5. To know the difference between permutation and combination for the purpose of arranging different objects.							
Course Outline	**Unit – I** Set Theory – Subset, Types of Sets, Relations, Functions – Simple problems.							
	Unit – II Sequence and Series of Arithmetic and Geometric Progressions – Introduction to Sequence, Series, Arithmetic Progression, Geometric Progression – Simple Problems.							
	Unit – III Basic Concepts of Permutations & Combination – Fundamental Principles of Counting, Factorial, Permutations, Circular Permutations, Permutation with Restrictions, Combinations – Simple Problems.							
	Unit – IV Logical Reasoning – Number Series, Coding and decoding and odd man out.							

	Unit – V Statistics – Importance of statistics, concept of statistical population and a sample – quantitative and qualitative data. Collection of primary and secondary data, Measurement scales – nominal, ordinal interval and ratio.
Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved.
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

reference Books	1. V.K. Kapoor and S.C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi. 2. Charles C.Pinter : A Book of Set Theory –Dover Publications, Inc, Mineola, New York. 3. Dr. R.S. Aggarwal : A Modern Approach to Logical Reasoning, Sultan & Chand - 2018.
Website and e-Learning Source	https://www.icai.org/post.html?post_id=17790

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 : Describe the rule that definition, relations and functions of set theory.

CLO-2 : To develop the skill of computation with real sequences and series.

CLO-3 : Students should be able to determine the number of outcomes in a problem.

CLO-4 : Students should be able to apply the fundamental principle of counting to find out the total number of outcomes in problem.

CLO-5 : Understand of data and its relevance in business and develop an understanding of quantitative techniques.

CLO-6 : Ability to apply in data.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

ALLIED PAPERS FOR OTHER MAJORS

S. No.	Paper code	Title of the Course	Page No.
1.		Allied Statistical Methods I	
2.		Allied Statistical Methods II	
3.		Allied Statistics Practical	
4.		Allied Biostatistics	
5.		Allied Statistics Practical	
6.		Statistical methods & their applications I	
7.		Statistical methods & their applications II	
8.		Allied Statistics Practical	
9.		Statistical methods for economics	
10.		Applied Statistics for Economics	

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Allied - Statistical Methods - I
(For B.Sc ., Mathematics/ B.Sc., Mathematics (CA))</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basis of Statistics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1. To introduce the basic concepts of probability theory, random variables, probability distribution.
2. To introduce t the statistical concepts and develop analytical skills.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">Unit I Probability, Random Variable and Mathematical Expectation
Definitions – Addition and Multiplication Theorem of Probability – Conditional probability – Random variable (discrete and continuous) – Distribution functions – Marginal and Conditional Distributions – Mathematical Expectation – Moment generating function - Characteristic function (concept only) – Tchebychev‘s inequality - Simple Problems.</td></tr>
<tr><td colspan="6">UNIT II Discrete and Continuous Distributions
Binomial and Poisson Distributions – Derivations – Properties and Applications - Simple Problems – Normal distribution – Derivations – Properties and Applications - Simple Problems.</td></tr>
<tr><td colspan="6">Unit III Measures of Central Tendency, Measures of Dispersion and Skewness
Definitions – Mean , Median , Mode , Geometric mean , Harmonic mean – Merits and demerits – Range , Quartile deviation , Mean deviation and their coefficients - Standard deviation – Co-efficient of Variation - Merits and demerits – Measure of Skewness – Karl Pearson‘s and Bowley‘s Coefficient of Skewness.</td></tr>
<tr><td colspan="6">Unit IV Curve Fitting
Method of least square – Fitting of a straight line and second degree Parabola, Fitting of Power Curve and Exponential Curves – Simple Problems.</td></tr>
<tr><td colspan="6">Unit V Correlation and Regression
Definition – Types and methods of measuring correlation – Scatter diagram , Karl Pearson‘s correlation coefficient and Spearman‘s rank correlation coefficient - Regression lines - Regression coefficients – Properties – Regression equations .</td></tr>
<tr><td colspan="2">Skills acquired from this Course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">References Books</td><td colspan="6">1. Gupta S. C and Kapoor V. K (2004), Fundamentals of Mathematical Statistics, (11th edition), Sultan Chand & Sons, New Delhi.
2. Gupta. S. P. (2001), Statistical Methods, Sultan Chand & Sons, New Delhi.</td></tr>
</table>

	3. Sancheti D. C and Kapoor V. K (2005), Statistics (7th Edition), Sultan Chand & Sons, New Delhi. 4. Robert V. Hogg, Allen T. Craig, Joseph W. McKean , Introduction to mathematical statistics, Pearson Education. 5. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 6. Marek Fisz, Probability theory and Mathematical Statistics, John Wiley and Sons. 7. Rohatgi V. K, An Introduction to Probability theory and Mathematical Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 8. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi. 9. Vittal P. R, Mathematical Statistics, Margham Publications, Chennai. 10. Hoel P. G, Introduction to Mathematical Statistics, Asia Publishing House, New Delhi.
Weblinks	https://seeing-theory.brown.edu/probability-distributions/index.html https://www.kullabs.com/classes/subjects/units/lessons/notes/note-detail/9557 https://www.stat.berkeley.edu/~stark/SticiGui/Text/location.html https://www.originlab.com/index.aspx?go=Products/Origin/DataAnalysis/CurveFitting https://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one/11-correlation-and-regression

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the random experiments in real life situations

CLO-2 Understand the axioms of probability in real life situations.

CLO-3 Compute Bernoulli trials and understand the rare case population

CLO-4 Learn the usage of central tendencies, dispersion and skewness.

CLO-5 Obtain the relationship between two random variables.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">Allied – Statistical Methods - II
(For B.Sc ., Mathematics/ B.Sc., Mathematics (CA))</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">Basis of Statistics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">1. To equip students with theoretical knowledge for estimating unknown parameters.
2. To introduce the concepts of testing the hypothesis, significance and chi-square test..</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">UNIT – I Point Estimation
Population and Sample – Parameter and Statistic – Point Estimation – Consistency – Unbiasedness – Efficiency (Cramer – Rao inequality) and Sufficiency (Rao – Blackwell Theorem).</td></tr>
<tr><td colspan="7">UNIT – II Methods of Estimation and Interval Estimation
Maximum likelihood Estimator (MLE) and Methods of Moments – Properties of these estimators – Interval estimation (concept only).</td></tr>
<tr><td colspan="7">UNIT – III Test of Significance
Concept of Statistical Hypothesis – Simple and Composite Hypothesis – Null and Alternative Hypothesis – Critical region – Type I and Type II Errors – Power of a test – Neyman-Pearson Lemma.</td></tr>
<tr><td colspan="7">UNIT – IV Test of Significance (Large Sample Tests)
Sampling distribution – Standard error – Large sample tests with regard to Mean, Difference of Means, Proportions and Difference of Proportions – Simple Problems.</td></tr>
<tr><td colspan="7">UNIT – V Test of Significance (Small Sample Tests)
Exact sample test based on ‗t‘ and F Distributions with regard to Means, Variance and Correlation coefficient – Chi-square test , Goodness of fit and independence of attributes.</td></tr>
<tr><td colspan="2">Skills acquired from this Course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">References Books</td><td colspan="7">1. Gupta. S. C. and Kapoor. V. K. (2004) – Fundamentals of Mathematical Statistics – (11th Edition), Sultan Chand & Sons, New Delhi.
2. Saxena H.C, Statistical Inference, S. Chand & Company Private Ltd, New Delhi.
3. Goon A M, Gupta M K, Das Gupta B: Fundamentals of Statistics (Vol-I), The World Press Pvt. Ltd., Kolkata.
4. Mood A. M, Graybill F. A and Boes D. C (1983), Introduction to the theory of Statistics, McGraw Hill, New Delhi.</td></tr>
</table>

	5. Sancheti. D. C. and Kapoor. V. K. Statistics (7th Edition), Sultan Chand & Sons, New Delhi. 6. Snedecor G.W and Cochran W.G., Statistical Methods, Oxford Press and IBH. 7. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 8. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi. 9. Vittal P. R, Mathematical Statistics, Margham Publications, Chennai. 10. Robert V. Hogg, Elliot A. Tanis, Probability and statistical inference, Macmillan.
Weblinks	http://www.sjsu.edu/faculty/gerstman/StatPrimer/estimation.pdf https://www.tutorialspoint.com/statistics/ https://www.statisticshowto.datasciencecentral.com/ https://www.investopedia.com/terms/c/chi-square-statistic.asp http://onlinestatbook.com/2/introduction/inferential.html

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Know the importance of good estimators.

CLO-2 understand the importance of maximum likelihood estimator

CLO-3 know the difference types of estimators Cramer Rao inequality.

CLO-4 Learn the importance of statistical hypothesis for large samples.

CLO-5 Learn the importance of statistical hypothesis for small samples.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">Allied – Statistics Practical
(For B.Sc ., Mathematics/ B.Sc., Mathematics (CA))</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">To impart knowledge about the basis of data analysis related to various activities like production, consumption, distribution, bank transactions, insurance and transportation.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">UNIT – I Measures of Central Tendency and Dispersion
Computation of Measures of Central Tendency – Measures of Dispersion (absolute and relative measures) -Coefficient of Skewness.</td></tr>
<tr><td colspan="7">UNIT – II Theoretical Distributions
Distributions – Fitting of Binomial distribution, Poisson distributions and Normal distribution – Testing the Goodness of fit.</td></tr>
<tr><td colspan="7">UNIT – III Method of Least Square
Curve fitting - Method of least square – Fitting of a straight line (y=a+bx), Second degree parabola($y=a+bx+cx^2$), Fitting of Power Curve and ($y=ax^b$), Exponential Curve ($y=ae^{bx}$ and $y = ab^x$)– Simple Problems.</td></tr>
<tr><td colspan="7">UNIT – IV Correlation and Regression
Computation of Karl Pearson‘s co-efficient of correlation – Spearman‘s rank correlation coefficient – Regression equations.</td></tr>
<tr><td colspan="7">UNIT – V Large and Small Sample Tests
Large sample tests with regard to Mean, Difference between Means, Proportions and Difference of Proportions.
Small sample tests with regard to Mean, Difference between Means and Paired_t‘ test , F –test, Chi-square test for independence of attributes.</td></tr>
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Note:

Question Paper Setting:

5 questions are to be set without omitting any unit. All questions carry equal marks.

Any 3 questions are to be answered in 3 hours duration.

Examinations Distribution of Marks

University Examinations (Written Practical)	60 Marks
CIA (Including Practical Record)	40 Marks
Total	100 Marks

<table>
<tr><td>Title of the Course</td><td colspan="6">Allied – Bio – Statistics
(For B.Sc ., Biotechnology and Bio – Chemistry)</td></tr>
<tr><td>Paper Number</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category Allied</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td>--</td><td colspan="2">4</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">Basis of Statistics</td></tr>
<tr><td>Objectives of theCourse</td><td colspan="6">1. The students will be able to understand and apply the statistical methods like measures of location, dispersion and the relationship between two variables in bio-statistics.
2. To understand large and small samples in laboratory study to apply it in real life problems.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">Unit I Collection and Presentation of Statistical Data
Biostatistics Definition – Types of data – Primary and secondary data – Methods of Collection of data – Sources of data in life science – Limitations and Uses of Statistics – Classification and Tabulation of data – Diagrammatic and Graphical representation of data.</td></tr>
<tr><td colspan="6">UNIT II Measures of Central Tendency
Definitions – Mean – Median – Mode – Geometric mean – Harmonic mean – Characteristics of a good average – Merits and demerits.</td></tr>
<tr><td colspan="6">Unit III Measures of Dispersion Range
Quartile deviation – Mean deviation and their co-efficients – Standard deviation – Co-efficient of variation – Merits and demerits.</td></tr>
<tr><td colspan="6">Unit IV Correlation and Regression
Definitions – Types and Methods of Correlation –Karl Pearson‘s coefficient of correlation – Spearman‘s Rank correlation coefficient
Regression: Simple regression equations (two variables) – Simple Problems.</td></tr>
<tr><td colspan="6">Unit V Test of Significance Sampling distribution
Standard error – Test of Hypothesis: Simple hypothesis, Null hypothesis and Alternative Hypothesis – Test of significance: Large sample tests based on Mean, Differences of Means, Proportion and Difference of Proportions - Small sample test based on Mean, Difference of Means, Paired _t‘ test - F-test - Chi-square test.</td></tr>
<tr><td>Skills acquired from this Course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
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3. P.S.S. Sundar Rao, J. Richard (2012). Introduction to Bio-Statistics and Research methods, Prentice Hall of India Pvt Ltd, New Delhi.
4. Gurumani. N (2005), An introduction to Bio-Statistics, 2nd Revised Edition, MJP Publishers.</td></tr>
</table>

	5. Daniel. W. W, (1987), Bio-Statistics, John Wiley and Sons, New York. 6. Beth Dawson, Robert G Trapp (2004), Basic and Clinical Biostatistics, McGraw Hill, New Delhi. 7. Zar J, Bio Statistical Analysis, Prentice Hall, India. 8. Bernard Rosner, Fundamentals of Biostatistics, (8th edition), Cengage Learning, USA. 9. Rossi R. J (2010), Applied Biostatistics for Health Science, John Wiley, New York. 10. Rao C. R, Advanced Statistical Methods in Biometric Research, John Wiley, New York.
Weblinks	https://faculty.franklin.uga.edu/dhall/sites/faculty.franklin.uga.edu.dhall/files/lec1.pdf https://www.tutorialspoint.com/statistics/ http://www.stat.yale.edu/Courses/1997-98/101/sigtest.htm http://biostat.jhsph.edu/~jleek/teaching/2011/754/lecture1.pdf http://homepage.divms.uiowa.edu/~dzimmer/applied-multivariate/lecturenotesold.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the statistical methods measures of location

CLO-2 Understand the statistical methods measures of dispersion

CLO-3 Apply the statistical methods of dispersion and location

CLO-4 understand the relationship between two variables in bio statistics

CLO-5 Understand large and small samples in laboratory study to apply it in real life problems.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Allied – Statistics Practical
(For B.Sc ., Biotechnology/ B.Sc., Biochemistry)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
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<tr><td colspan="2">Objectives of the Course</td><td colspan="6">➢ To impart knowledge about the basis of data analysis related to various activities like production, consumption, distribution, bank transactions, insurance and transportation.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT – I Collection and Presentation of Statistical Data
Diagrammatic and Graphical Representation of Statistical Data (Histogram, Frequency Polygon, Frequency curves and Ogive).</td></tr>
<tr><td colspan="6">UNIT – II Measures of Central Tendency and Dispersion
Computation of Measures of Central Tendency (Mean, Median, Mode, Geometric Mean & Harmonic Mean)</td></tr>
<tr><td colspan="6">UNIT – III Measures of Dispersion
Computation of Measures of Dispersion (absolute and relative measures) - Coefficient of Variation.</td></tr>
<tr><td colspan="6">UNIT – IV Correlation and Regression
Computation of Karl Pearson‘s Coefficient of Correlation and Spearman‘s Rank Correlation Coefficient – Regression equations (two variables only).</td></tr>
<tr><td colspan="6">UNIT – V Large and Small Sample Tests
Large sample tests with regard to Mean(s) and Proportion(s) – Small sample tests with regard to Mean(s)
Variance - Chi-square test for independence of attributes.</td></tr>
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Note:

Question Paper Setting:

5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are answered in 3 hours duration.

Examinations Distribution of Marks

University Examinations (Written Practical)	60 Marks
CIA (Including Practical Record)	40 Marks
Total	100 Marks

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Allied – For B.Sc. Computer Science
Common for B.Sc. (Information Science) and B.C.A
STATISTICAL METHODS AND THEIR APPLICATIONS – I</td></tr>
<tr><td colspan="2"></td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>I/II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>I/ III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basis of Statistics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1. Analyse the sample data and its usage in different ways such as locations, dispersion.
2. Understand the relationship between variables and forecasting the future values.
3. Understand the concept of sampling, sampling errors, and types of sampling.</td></tr>
<tr><td colspan="2" rowspan="5"></td><td colspan="6">Unit I
Collection and Presentation of Statistical Data
Nature and Scope of Statistics – Limitations – Types of data – Classification and Tabulation of Data – Construction of Frequency Distribution – Diagrammatic and Graphical Representation of Data.</td></tr>
<tr><td colspan="6">UNIT II Measures of Central Tendency
Mean, Median, Mode, Geometric mean, Harmonic mean – Characteristics of a good average – Merits and demerits.</td></tr>
<tr><td colspan="6">Unit III Measures of Dispersion
Range – Quartile deviation – Mean deviation and their coefficients – Standard deviation – Coefficient of variation – Merits and demerits.</td></tr>
<tr><td colspan="6">Unit IV Correlation and Regression
Types and Methods for Measuring Correlation - Scatter diagram – Karl Pearson‘s co-efficient of correlation – Spearman‘s rank correlation coefficient – Regression equations of two variables – Simple Problems.</td></tr>
<tr><td colspan="6">Unit V Probability
Definition of Probability – Addition and Multiplication Theorems – Conditional probability – Simple Problems.</td></tr>
<tr><td colspan="2">Skills acquired from this Course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
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	Society, Kolkata. 7. Pillai R. S. N. And Bagavathi. V. (1987), Practical Statistics, S. Chand & Company Ltd., New Delhi. 8. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 9. Gupta C. B (1978), An Introduction to Statistical Methods, Vikas Publishing House, New Delhi. 10. Snedecor G.W and Cochran W.G., Statistical Methods, Oxford Press and IBH.
Weblinks	➢ https://www.tutorialspoint.com/statistics/data_collection.htm ➢ https://www.surveysystem.com/correlation.htm ➢ https://www.investopedia.com/terms/r/regression.asp ➢ https://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one/11-correlation-and-regression ➢ https://course-notes.org/statistics/sampling_theory

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the statistical methods measures of location

CLO-2 Understand the statistical methods measures of dispersion

CLO-3 Apply the statistical methods of dispersion and location

CLO-4 Understand the relationship between variables and forecasting the future values.

CLO-5 Understand the concept of sampling, sampling errors and types of sampling.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Allied – For B.Sc. Computer Science
Common for B.Sc. (Information Science) and B.C.A</td></tr>
<tr><td colspan="2"></td><td colspan="6">STATISTICAL METHODS AND THEIR APPLICATIONS – II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>I/II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>II/IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">-</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basis of Statistics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1. To impart statistical concepts with rigorous mathematical treatment.
2. To introduce concepts of statistical hypothesis.</td></tr>
<tr><td colspan="2" rowspan="5"></td><td colspan="6">Unit I Random Variable and Mathematical Expectation
Definitions – Random variable – Discrete and Continuous Random variable – Distribution functions and Density function – Mathematical Expectation and its Properties - Simple Problems.</td></tr>
<tr><td colspan="6">UNIT II Discrete Probability Distribution
Binomial and Poisson Distributions – Mean and Variance of Distributions – Recurrence formula – Fitting of Binomial and Poisson Distributions - Simple Problems.</td></tr>
<tr><td colspan="6">Unit III Continuous Probability Distribution and Curve Fitting
Definition of Normal distribution – Characteristics of Normal distribution (Simple Problems) – Curve fitting – Fitting of Straight line and Second degree Parabola - Simple Problems.</td></tr>
<tr><td colspan="6">Unit IV Test of Significance (Large Samples Tests)
Concept of Statistical Hypothesis – Simple and Composite Hypothesis – Null and Alternative Hypothesis – Critical region – Type I and Type II Errors – Sampling distribution and Standard Error – Test of Significance: Large Sample Tests for Proportion, Difference of Proportions, Mean and Difference of Means - Simple Problems.</td></tr>
<tr><td colspan="6">Unit V Test of Significance (Small Samples Tests)
Small sample tests with regard to Mean, Difference between Means and Paired _t‘ test , F-test - Definition of Chi-square test – Assumptions – Characteristics – Chi-square tests for Goodness of fit and Independence of attributes – Simple Problems.</td></tr>
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Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the concept of random variables and expected average

CLO-2 Compute Bernoulli trials and understand the rare case population.

CLO-3 Learn the usage of normal curve and curve fitting by using the method of least squares.

CLO-4 Learn about the large samples

CLO-5 Learn the basic concepts of theory of attributes.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

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Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Allied – Statistics Practical
For B.Sc. Computer Science (Common for B.Sc. (Information Science) and B.C.A</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>IV</td></tr>
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<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT – I Collection and Presentation of Statistical Data
Construction of Uni-variate frequency distribution – Diagrammatic and Graphical Representation of Statistical Data.</td></tr>
<tr><td colspan="6">UNIT – II Measures of Central Tendency and Dispersion
Computation of Measures of Central Tendency – Computation of Measures of Dispersion (absolute and relative measures) – Coefficient of Variation.</td></tr>
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Computation of Karl Pearson‘s Coefficient of Correlation and Spearman‘s Rank Correlation Coefficient – Regression equations (two variables only).</td></tr>
<tr><td colspan="6">UNIT – IV Theoretical Distributions and Methods of Least Squares
Fitting of Binomial and Poisson Distributions – Test for Goodness of fit – Fitting of a Straight line (y=a+bx) , Second degree Parabola (y=a+bx+cx^2) by the method of least square.</td></tr>
<tr><td colspan="6">UNIT – V Large and Small Sample Tests
Large sample tests with regard to Mean(s) and Proportion(s) – Small sample tests with regard to Mean(s)
Variance - Chi-square test for independence of attributes.</td></tr>
</table>

Note:

Question Paper Setting:

5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are answered in 3 hours duration.

Examinations Distribution of Marks

University Examinations (Written Practical)	60 Marks
CIA (Including Practical Record)	40 Marks
Total	100 Marks

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">For B.A. (Economics)</td></tr>
<tr><td colspan="2"></td><td colspan="6">STATISTICAL METHODS FOR ECONOMICS</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>I/II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23USTA06</td></tr>
<tr><td>Semester</td><td>I/ III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basis of Statistics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To introduce statistical concepts and develop analytical skills through economic barometers.</td></tr>
<tr><td colspan="2" rowspan="5"></td><td colspan="6">UNIT – I Collection, Classification and Tabulation of Data
Nature and scope of statistics - Limitations – Types of data – Primary data and secondary data – Methods of collection of data – Classification and tabulation of data.</td></tr>
<tr><td colspan="6">UNIT – II Diagrammatic Representation of Data
Formation of frequency distribution – Diagrammatic representation – Simple bar diagram – Multiple bar diagram – Subdivided bar diagram – Percentage bar diagram – Pie diagram.</td></tr>
<tr><td colspan="6">UNIT – III Graphical representation of Data
Graphical representation – Histogram – Frequency polygon – Frequency curve – Ogives curve and Lorenz curve.</td></tr>
<tr><td colspan="6">UNIT – IV Measures of Central Tendency
Definitions – Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean, weighted arithmetic mean and their uses in Economics – Simple Problems.</td></tr>
<tr><td colspan="6">UNIT – V Measures of Dispersion
Definitions - Absolute and Relative Measures of Dispersion – Range , Quartile deviation , Mean deviation and their coefficients – Standard deviation and co-efficient of variation.</td></tr>
<tr><td colspan="2">Skills acquired from this Course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">References Books</td><td colspan="6">1. Gupta S. P. (2001), Statistical Methods, Sultan Chand & Sons, New Delhi.
2. Gupta. S. C. and Kapoor. V. K. Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi
3. Pillai R. S. N. And Bagavathi. V. (2005), Statistics, S. Chand & Company Ltd., New Delhi.
4. Sancheti D. C. And Kapoor. V. K (2005), Statistics (7th Edition), Sultan Chand & Sons, New Delhi.
5. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi.
6. Murthy M. N (1978), Sampling Theory and Methods, Statistical Publishing Society, Kolkata.
7. Pillai R. S. N. And Bagavathi. V. (1987), Practical Statistics, S. Chand &</td></tr>
</table>

	Company Ltd., New Delhi. 8. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 9. Gupta C. B (1978), An Introduction to Statistical Methods, Vikas Publishing House, New Delhi. 10. P.A. Navanithan (2007), Business Statistics, Jai Publishers, Trichy.
Weblinks	➢ https://www.tutorialspoint.com/statistics/ ➢ http://pages.intnet.mu/cueboy/education/notes/statistics/presentationofdata.pdf ➢ https://www3.nd.edu/~dgalvin1/10120/10120_S17/Topic15_8p2_Galvin_2017_short.pdf ➢ https://www3.nd.edu/~dgalvin1/10120/10120_S16/Topic16_8p3_Galvin.pdf ➢ https://www.toppr.com/guides/economics/statistics-for-economics/statistics-in-economics/

Note: The question paper 20% theory and 80% problems to be considered.

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the scope and functions of statistics

CLO-2 Emphasis the necessity of data collection

CLO-3 Understand the various types of diagrams and graphs.

CLO-4 Understand the relationship between variables and forecasting the future values.

CLO-5 Compute mathematical averages, positional averages and dispersion.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td>Title of the Course</td><td colspan="6">For B.A. (Economics)</td></tr>
<tr><td></td><td colspan="6">APPLIED STATISTICS FOR ECONOMICS</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>I/II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23USTA07</td></tr>
<tr><td>Semester</td><td>I/ III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basis of Statistics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To enable the students to understand the elementary concepts in statistical analysis</td></tr>
<tr><td colspan="2" rowspan="5"></td><td colspan="6">UNIT – I Correlation
Definition of Correlation – Types of Correlation – Measures of Correlation – Scatter diagram – Karl Pearson‘s correlation coefficient – Spearman‘s rank correlation coefficient and their interpretation.</td></tr>
<tr><td colspan="6">UNIT – II Regression
Meaning of Regression – Fitting of Regression lines – Regression Equations – Uses in Economics.</td></tr>
<tr><td colspan="6">UNIT – III Time Series
Time series analysis – Definition – Uses – Components of Time series – Measures of Trend – Graphic method – Semi-average method – Moving average method – Least square method – Measure of Seasonal variation - Simple average method.</td></tr>
<tr><td colspan="6">UNIT – IV Index Number
Definition – Uses of Index Number – Types of Index Number – Methods of construction – Simple index number - Weighted index number –Time Reversal and Factor Reversal Test – Cost of living index number.</td></tr>
<tr><td colspan="6">UNIT – V Sampling Methods
Basic sampling methods – Probability sampling - Simple Random Sampling – Systematic Sampling – Stratified Random Sampling – Non Probability sampling - Quota Sampling – Purposive Sampling - Errors – Difference between probability and non- probability sampling.</td></tr>
<tr><td colspan="2">Skills acquired from this Course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">References Books</td><td colspan="6">1. Gupta S. P. (2001), Statistical Methods, Sultan Chand & Sons, New Delhi.
2. Gupta. S. C. and Kapoor. V. K. Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi
3. Pillai R. S. N. And Bagavathi. V. (2005), Statistics, S. Chand & Company Ltd., New Delhi.
4. Sancheti D. C. And Kapoor. V. K (2005), Statistics (7th Edition), Sultan Chand & Sons, New Delhi.
5. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi.
6. Murthy M. N (1978), Sampling Theory and Methods, Statistical Publishing</td></tr>
</table>

	Society, Kolkata. 7. Pillai R. S. N. And Bagavathi. V. (1987), Practical Statistics, S. Chand & Company Ltd., New Delhi. 8. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 9. Gupta C. B (1978), An Introduction to Statistical Methods, Vikas Publishing House, New Delhi. 10. P.A. Navanithan (2007), Business Statistics, Jai Publishers, Trichy.
Weblinks	➢ https://www.surveysystem.com/correlation.htm ➢ https://www.investopedia.com/terms/r/regression.asp ➢ https://www.academia.edu/2191454/Chapter5_Index_number ➢ https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc4.htm

Note: The question paper 20% theory and 80% problems to be considered.

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the correlation coefficient from different methods of measurements.

CLO-2 Concept of regression lines

CLO-3 Understand the concept of time series and estimate the trend values using various methods.

CLO-4 Understand the concept, purpose and its types of index numbers.

CLO-5 Understand the concept of sampling, sampling errors and types of sampling.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

NME FOR OTHER MAJOR

S. No.	Title of the Course	Page No.
1	Basics for Statistics I	
2	Basics for Statistics II	
3	Genetical Statistics	
4	Indian Official Statistics	

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">(NME) Basic of Statistics – I</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">NME - I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">NME</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">Uses and its basics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">1. To enable the students to understand the basic concepts of statistics, collection of data, presentation of data and analysis of data.
2. To acquire knowledge of statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc.,</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">Unit I Introduction Meaning and Scope
Statistics – Definition – Scope – Limitations – Population and Sample – Concepts of Random sampling and Non-random sampling – Basic concepts only.</td></tr>
<tr><td colspan="7">Unit II Collection of Data
Primary and Secondary data – Methods of collecting primary and secondary data - sources of data – Preparation of Questionnaire and Schedule.</td></tr>
<tr><td colspan="7">Unit III Presentation of Data
Classification of data – Types – Frequency distributions for discrete and continuous data – Construction of tables with one, two factors of classification.</td></tr>
<tr><td colspan="7">Unit IV Diagrammatic Representation of Data
Bar Diagrams: Types of one dimensional and two dimensional bar diagrams - Pie-diagrams – Uses.</td></tr>
<tr><td colspan="7">Unit –V Graphical Representation of Statistical Data
Histogram – Frequency Polygon – Frequency curve and Cumulative frequency curve – Ogive curves – Lorenz curve – Uses.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="7">Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this Course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="7">1. Gupta. S. P. (2001), Statistical methods, Sultan Chand & Company Ltd., New Delhi.
2. Pillai. R. S. N. And Bagavathi. V. (2005), Statistics, S. Chand & Company Ltd., New Delhi.
3. Sancheti. D. C. and Kapoor. V. K, Statistics (7th Edition), Sultan Chand & Sons, New Delhi.</td></tr>
</table>

	4. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi. 5. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 6. Vittal P. R, Business Statistics, Margham Publications, Chennai. 7. Shukla M. C and Gulshan S. S, Statistics, Sultan Chand & Sons, New Delhi. 8. Simpson G and Kafka F, Basic Statistics, Oxford and IBH, Calcutta. 9. Freud J. E, Modern Elementary Statistics, Prentice Hall of India, New Delhi. 10. Saxena H. C (1983), Elementary Statistics, Sultan Chand & Sons, New Delhi.
Website and e-Learning Source	❖ https://www.tutorialspoint.com/statistics/ ❖ https://www.emathzone.com/tutorials/basic-statistics/collection-of-statistical-data.html ❖ https://byjus.com/commerce/meaning-and-objectives-of-classification-of-data/ ❖ https://byjus.com/commerce/diagrammatic-presentation-of-data/ ❖ https://byjus.com/maths/graphical-representation/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO -1 Distinguish between population and sample.

CLO-2 Know the concepts of random sampling and non – sampling

CLO-3 Frame a questionnaire and collect primary and secondary data.

CLO-4 Easy to understand the basic concepts.

CLO-5 Analyze statistical data and draw graphs, histograms, frequency polygons and Ogives.

CLO-6 Obtain the mathematical knowledge and skills for the better understanding of statistics.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">(NME) Basic of Statistics – II</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">NME - II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">NME</td><td>Year</td><td>I</td><td>Credits</td><td>2</td><td>Course Code</td><td>23USTSE02</td></tr>
<tr><td>Semester</td><td>II</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">2</td><td colspan="2">-</td><td>--</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Statistics and its basics</td></tr>
<tr><td colspan="2" rowspan="6">Objectives of the Course
Course Outline</td><td colspan="6">1. To enable the students understand and compute the measures of central tendency and dispersion.
2. To learn the concepts of time series, evaluation of trend and measurement of seasonal variations by using various methods.
3. Acquire knowledge about index numbers, cost of living index numbers and calculate an indices from real life problems.</td></tr>
<tr><td colspan="6">Unit I Measures of Central Tendency
Definitions and concepts of Arithmetic mean Median and Mode – Merits and Demerits – Uses - Simple Problems.</td></tr>
<tr><td colspan="6">UNIT II Measures of Dispersion
Range, Quartile deviation and their relative measures - Standard deviation and Coefficient of variation - Simple Problems.</td></tr>
<tr><td colspan="6">Unit III Correlation
Karl Pearson‘s coefficient of correlation and Spearman‘s rank correlation coefficient – Simple Problems.</td></tr>
<tr><td colspan="6">Unit IV Time series
Measures of trend – Graphic method – Semi average method and Moving average method - Simple Problems.</td></tr>
<tr><td colspan="6">Unit V Index Numbers
Unweighted and Weighted Index Numbers: Laspeyre‘s, Paasche‘s and Fisher‘s method – Cost of living index numbers – Simple Problems.</td></tr>
<tr><td colspan="2">Skills acquired from this Course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2"></td><td colspan="6">❖ https://byjus.com/maths/central-tendency/
❖ https://byjus.com/maths/dispersion/
❖ https://www.bmj.com/about-bmj/resources-readers/publications/statistics-square- one/11-correlation-and-regression
❖ http://www.stat.columbia.edu/~rdavis/lectures/Session6.pdf
❖ https://www.civilserviceindia.com/subject/Management/notes/index-numbers.html</td></tr>
</table>

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Analyze statistical data using measures of central tendency.
CLO- 2 Analyze statistical data using measures of central dispersion.
CLO-3 Understand and compute various statistical measures of correlation.
CLO-4 Gain knowledge about the sources of time series
CLO-5 Gain knowledge about the sources of measure secular trend.
CLO-6 understand the concepts of index numbers, optimum tests and its construction.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	S	S	M
CLO2	S	S	S	S	M	S	S	S	M
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weight age	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Genetical Statistics</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">NME</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td>--</td><td colspan="2">2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basic level on mathematical computation</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">The main objectives of this course are to:
1. Know the Elements of Genetics
2. Understand Mandel‘s Law of inheritance and Use of χ2 (chi-square) tests in testing the Mendel‘s segregation law
3. Know the Method of maximum likelihood and other methods of estimation</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT – I
Elements of Genetics: Physical basis of heredity-cell structure chromosomes and genes – Interaction of genes concept of genotypes and phenotypes –Linkage and crossing over-Genetic maps.</td></tr>
<tr><td colspan="6">UNIT – II
Mandel‘s Law of inheritance –Laws of segregation and independent assortment –concept over generation.</td></tr>
<tr><td colspan="6">UNIT - III
Use of χ2 (chi-square) tests in testing the Mendel‘s segregation law-Sex linked genes –Concept of gene frequency –concept of random mating detection and estimation of linkage from back cross, F2,& F3 Data.</td></tr>
<tr><td colspan="6">Unit – IV
Method of maximum likelihood and other methods of estimation-Planning of experiments.</td></tr>
<tr><td colspan="6">Unit – V
Multiple allelic systems-Elementary aspects of the study of human blood group.</td></tr>
<tr><td colspan="2">Skills acquired from this Course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">References Books</td><td colspan="6">2. Kempthorne, O. (1957). An Introduction to Genetic Statistics, John Wiley & Sons, New York, US.
3. Mackay, T. F. C., and Falconer, D. S. (1995). Introduction to Quantitative Genetics, Longman (Publisher)</td></tr>
<tr><td colspan="2">Website Links</td><td colspan="6">1 https://en.wikipedia.org/wiki/Mobile_genetic_elements
2 https://byjus.com/biology/mendel-laws-finheritance/#:~:text=Mendel%27s%20Laws%20of%20Inheritance%20Inheritance%20can%20be%20defined,that%20the%20offsprings%20are%20similar%20to%20the%20parents
3 https://www.encyclopedia.com/science-and-</td></tr>
</table>

	technology/biology-and-genetics/genetics-andgenetic-engineering/multiplealleles#:~:text=multiple%20alleles%20Three%20or%20more%20alternative%20forms%20of,present%20in%20an%20individual.%20A%20Dictionary%20of%20Biology

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the correlation coefficient from different methods of measurements.

CLO-2 Concept of regression lines

CLO-3 Understand the concept of time series and estimate the trend values using various methods.

CLO-4 Understand the concept, purpose and its types of index numbers.

CLO-5 Understand the concept of sampling, sampling errors and types of sampling.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Indian Official Statistics</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">NME</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td>--</td><td colspan="2">2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basic level on statistical computation</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">The main objectives of this course are to:
1. know the population and agricultural statistics
2. understand industrial statistics and price statistics
3. know the National sample survey</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT – I Population Statistics: Statistical organization – Population Statistics – Agricultural Statistics – Indices of Agricultural production – Miscellaneous Agricultural Statistics.</td></tr>
<tr><td colspan="6">UNIT – II
Industrial statistics – ASI – Indices of Industrial Production and profits.</td></tr>
<tr><td colspan="6">UNIT - III
Price statistics – Price index numbers – Labour Bureau; Index number of Retail prices – Indices of security price</td></tr>
<tr><td colspan="6">Unit – IV
Wage statistics – trade statistics – Financial statistics – National income statistics.</td></tr>
<tr><td colspan="6">Unit – V
National sample surveys – Activities and publications of CSO and the Department of Statistics, Government of Tamil Nadu. National Income compilation.</td></tr>
<tr><td colspan="2">Skills acquired from this Course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">References Books</td><td colspan="6">1. Central Statistical Organisation, Guide to Official Statistics 1979 Ed
Department of Statistics, Ministry of Planning, India</td></tr>
<tr><td colspan="2">Website Links</td><td colspan="6">1 https://agriculture.uk.gov.in/pages/show/221-agriculture-statistics-Data
2 http://labourbureau.gov.in/CPIW05%20Methodolgy.html
3 https://byjus.com/free-ias-prep/nsso</td></tr>
</table>

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the correlation coefficient from different methods of measurements.

CLO-2 Concept of regression lines

CLO-3 Understand the concept of time series and estimate the trend values using various methods.

CLO-4 Understand the concept, purpose and its types of index numbers.

CLO-5 Understand the concept of sampling, sampling errors and types of sampling.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's