# NATIONAL EDUCATION POLICY-2020

Syllabus for First Three Years of Higher Education



Sri Dev Suman Uttarakhand Universit Badshahi Thaul (Tehri Garwal)Uttarakhand

(State University of Uttarakhand)

**STATISTICS** 

2022

# Members of Board of Studies Faculty of Science Sri Dev Suman Uttarakhand University Badshahi Thaul (Tehri Garwal)Uttarakhand -249199

Sr. No.	Name & Designation	
1.	Prof. Gulshan Kumar Dhingra Principal and Dean, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand) -249201	Chairman
2.	Prof. M.S. Rawat Department of Zoology, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)-249201	Member
3.	Prof. Anita Tomar Head, Department of Mathematics, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)-249201	Member
4.	Prof. S.P. Sati Head, Department of Chemistry, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh, (Uttarakhand)-249201	Member
5.	Prof. Yogesh Kumar S \( \( \Darkarrow \) Darkarrow \( \Darkarrow \) Head, Department of Physics, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)-249201	Member
6.	Prof. Rakesh Kumar Head, Department of Zoology, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)-249201	Member (
7.	Prof. Sri Krishan Nautiyal Head, Department of Geology, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)-249201	Member
8.	Dr. Madhu Thapliyal Department of Zoology, Government P.G. College Uttarkashi (Uttarakhand)	Invited Member 1
9.	Prof. D.C. Nainwal, Principal Government P.G. College Doiwala(Uttarakhand)	P.G. Principa
10	Prof. Renu Negi, Principal Government P.G. College New Tehri(Uttarakhand)	P.G. Principal
11	Prof. Devesh Bhatt, Principal Government Degree College Bedikhal(Uttarakhand)	P.G. Principa
12	Prof. Durgesh Pant, Director General UCOST, Dehradun(Uttarakhand)	Director Research Institute
13	Prof. V. K. Khanduri, Dean VCSG UUHF Ranichauri Campus (University), Uttarakhand	Hon. V.C. Nominee
14	Prof. A.A. Baurai SRT Campus Badshahi Thaul, (Tehri Garwal) Uttarakhand	Hon. V.C. Nominee
15	Prof. J.P.Bhatt, Department of Zoology, H.N.B. Garhwal University, Srinagar Garhwal, Uttarakhand (Retired) Present address: Dehradun	Non. VC.

#### **DEPARTMENT COMMITTEE**

## Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)

S. No.	Name	Signature
1	Prof. Anita Tomar Head, Department of Mathematics, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)-249201	Ja
2	Dr. Deepa Sharma, Associate Professor, Department of Mathematics, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)-249201	Be
3	Dr. Gaurav Varshney, Assistant Professor, Department of Mathematics, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)-249201	Gans
4	Dr. Dhirendra Singh, Assistant Professor, Department of Mathematics, Pt. L. M. S. Campus, Sri Dev Suman Uttarakhand University, Rishikesh (Uttarakhand)-249201	

# Curriculum Design Committee, Uttarakhand

Sr. No.	Name & Designation	
1.	Prof. N.K. Joshi Vice-Chancellor, Kumaun University Nainital	Chairman
2.	Prof. O.P.S. Negi Vice-Chancellor, Uttarakhand Open University	Member
3.	Prof. P. P. Dhyani Vice-Chancellor ,Sri Dev Suman Uttarakhand University	Member
4.	Prof. N.S. Bhandari Vice-Chancellor, Soban Singh Jeena University Almora	Member
5.	Prof. Surekha Dangwal Vice-Chancellor, Doon University, Dehradun	Member
5.	Prof. M.S.M. Rawat Advisor, Rashtriya Uchchatar Shiksha Abhiyan, Uttarakhand	Member
	Prof. K. D. Purohit Advisor, Rashtriya Uchchatar Shiksha Abhiyan, Uttarakhand	Member

#### Subject Expert Committee

Name	Designation	Affiliation
Prof H.C Joshi	Professor	D. S. B. Campus, Kumaun University, Nainital
Dr. Spersh Bhatt	Assistant Professor(Contractual)	D. S. B. Campus, Kumaun University, Nainital

#### Syllabus Preparation Committee

Name	Designation	Affiliation
Dr Neeraj Tiwari	Professor & Head	S. S. J. Campus, S.S.J University, Almora
Dr. Spersh Bhatt	Assistant Professor(Contractual)	D. S. B. Campus, Kumaun University, Nainital

# Semester-wise Titles of the Papers in B.Sc./B.A(Statistics)

Year	Sem.	Course	Paper Title	Theory/Practical	Credits
		C	ertificate in Elementary Sta	tistics	
1	I		Statistical Methods and Indian Official Statistics	Theory	4
	× .	2001-0-1	Statistical Methods Lab	Practical-1	2
	11		Probability Theory and Theoretical Distributions	Theory	4
			Theoretical Distributions Lab	Practical-1	2
			Diploma in Basic Statisti	CS	
2	III		Statistical Inference and Sampling Distributions and their related tests of Significance	Theory	4
			Sampling Distributions and their related tests of Significance Lab	Practical-2	2
	IV		Sampling Techniques and Analysis of Variance (ANOVA)	Theory	4
			Sampling Survey and ANOVA Lab	Practical-2	2
Farmer I			Degree in Bachelor of Scie	nce	4
3	V		Numerical Analysis and Design of Experiment ( DOE)	Theory	
			Multivariate Analysis and Non-parametric Methods	Theory	2
			Non-parametric Methods and DOE Lab	Practical-3	. 4
	1016	1-11/2019/1919	Research Project	Project	Qualifying
	VII		Statistical Quality Control & Computer Programming	Theory	4

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Applied Statistics & Educational Statistics	Theory	2
Statistical Quality Control & Computer Programming Lab	Practical-3	4
Research Project	Project	Qualifying
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on Spain	From O	

#### **Subject Prerequisites**

To study this subject a student must had the subject(s) Mathematics in class 12th.

Program outcomes (Pos)

Students having Degree in B.Sc. (with Statistics) should have knowledge of different concepts and fundamentals of Statistics and ability to apply this knowledge in various fields of industry. They may pursue their future career in the field of Statistics and Research.

### Program Specific Outcomes (PSOs)

After completing B.Sc. (with Statistics) the student should have:

- Knowledge of different concepts, principles, methodologies and tools(skills) of Statistics.
- Ability to collect tabulate, represent graphically, analyze and interpret data/information by using appropriate statistical tools.
- Ability to identify and solve a wide range of problems in real life/industryrelated to Statistics.
- Familiarity with computational techniques and statistical software including programming language (e.g. R) for mathematical and statistical computation.
- Capability to use appropriate statistical skills in interdisciplinary areas such as finance, health, agriculture, government, business, industry, telecommunication and bio-statistics.
- Ability to compete with industrial/private sector demand in the field of data analysis, marketing survey, etc. in professional manner and pursue their future career in the field of Statistics.

Ability to develop original thinking for formulating new problems and providing their solutions. As a result, they will be able to pursue higher studies or research in the field of Statistics.

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First	PROGRAM SPECIFIC OUTCOMES (PSOS)
Year	CERTIFICATE COURSE IN ELEMENTARY STATISTICS
	After completing this course a student will have:
	✓ Knowledge of Statistics its seems and immediate the seems are seen and immediate the seems are seen and immediate the seems and immediate the seems and immediate the seems and immediate the seems are seems and immediate
	Knowledge of Statistics, its scope and importance in various fields.
	Ability to understand concepts of sample vs. population and
	difference between different types of data.
	✓ Knowledge of methods for summarizing data sets, including common
	graphical tools (such as box plots, histograms and stem plots).
	Interpret histograms and boxplots.
	✓ Ability to describe data with measures of central tendency and
	measures of dispersion.
	✓ Ability to understand measures of elements and the state of the sta
	✓ Ability to understand measures of skewness and kurtosis and
	their utility and significance.
	✓ Gain knowledge about Indian Official Statistics
	✓ Ability to understand the concept of probability along with basic
	laws and axioms of probability.
	✓ Ability to understand the terms mutually exclusive and independence
- 1	and their relevance.
	✓ Ability to identify the appropriate method (i.e. union, intersection,
1	conditional, etc.) for solving a problem.
	✓ Abilitytoapplybasicprobabilityprinciplestosolvereallifeproblems.
	✓ Ability to understand the concept of random variable (discrete and
	continuous), concept of probability distribution.
	Coin knowledge shout verieue discrete and annihum 1 1 111
	✓ Gain knowledge about various discrete and continuous probability distributions.
	그 그는 3 대한 경우를 하지만 하면 하지만 하는 것이 되었다. 그는 사람들은 전에 가장 무슨 이 전에 되었다면 하는 것이 되었다는 것이 되었다. 그 사람들은 사람들이 되었다는 것이 없는 것이 없다.
	✓ It will enable students to join the diploma course(semester III and
	IV) in any University or College of Higher education in Uttarakhand
ond	DIPLOMA IN BASIC STATISTICS
ear	10 14 45 45
	After completing this course a student will have
140	✓ Knowledge of the terms like null and alternative hypotheses, two-tailed
	and one-tailed alternative hypotheses, significant and insignificant,
	level of significance and confidence, p value etc.
14	✓ Ability to understand the concept of MP, UMP and UMPU tests
	✓ Ability to understand under what situations one would conduct the
	small sample and large sample tests (in case of one sample and two
	sample tests).
	✓ Ability to understand the difference between parameter &
	statistic and standard error & standard deviation.
	✓ Knowledge of the concept of Point and Interval
	Estimation and discuss characteristics of a good
	estimator.
	✓ Ability to understand and practice various methods of
	estimations of parameters.
	✓ Knowledge of the concept of Sampling distributions.
	✓ Knowledge of the concept of Sampling distributions.  ✓ Knowledge of the sampling distribution of the sumand mean.
1000	A hilling and agreed the A T and the agree distribution and
	Ability to understand the t, F and chi-square distribution and
	toidentify the main characteristics of these distributions.
176	✓ Ability to understand the concept of sampling and how it is different
	from complete enumeration.
	✓ Knowledge of various probability and non-probability sampling

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Î.	methods along with estimates of population parameters	
1 '	✓ Ability to identify the situations where the various sampling techniques	
	shall be used.	
	✓ Knowledge of sampling and non-sampling errors.	
100	✓ Knowledge of the concept of Analysis of Variance(ANOVA).	
	✓ Ability to carry out the ANOVA for One way and Two way	
٠.	Classification.	
	✓ Ability to carry out the post-hoc analysis.	
	✓ It will enable students to join the diploma course (semester V	
	and VI) in any University or College of Higher education in	
	Uttarakhand	
Third	DEGREE IN BACHELOR OF SCIENCE	
Year		
	After completing this course a student will have	
	✓ Knowledge of the concept of Design of experiment and its basic	
100	principles.	
	✓ Ability to perform the basic symmetric designs CRD, RBD and LSD	
	with and without missing observations.	
100	✓ Ability of understand finite Differences	
7	✓ Ability of understand Relationship between ∆ and E	
	✓ Ability of understand Stirling &Bessel's formula	
	✓ Ability of understand Stirling & Besser's formula  ✓ Ability of understand Trapezoidal rule, Simpson's rule and Weddle's rule	
157	Addity of understand Trapezoidar rule, Simpson's rule and wedness rules	
	and numerical problems based on these rules	a balance
1809	✓ Ability to conduct test of significance based non-para metric tests.	
	✓ Ability to deal with multivariate data.	
	✓ Ability to understand the basic concepts of matrices in order to study	in the state of
	multivariate distribution.	
. 1 .	✓ Abilitytounderstandbivariatenormaldistributionanditsapplications	
	✓ Knowledge of the applications of multivariate normal distribution and	
- 1	Maximum Likelihood estimates of mean vector and dispersion	
	matrix.	1.00
1- 11 6	Ability to apply distribution free tests(Non-parametric methods) for one	
1	Ability to apply distribution nee tests (100 parameter and 100 parameter)	
	and two sample cases.  Ability to understand the Control Charts for variables and attributes	
-	Ability to understand the Control Charts for variables and attributes	ade year of the
-	Ability to understand the Single and double sampling plans	
1	Ability to understand the Basics of computer, C and R language	
1.1	Familiarity with different aspects of Applied Statistics and their use in	
	-nol life cituations	
1/	Ability to understand the concept of Time series along with its different	
	components.	
	Knowledge of Index numbers and their applications along with different	
	Knowledge of index numbers and area approximately	
	types of Index numbers.	
1.	Familiarity with various demographic methods and different measures of	
	mortality and fertility.	
11	Ability to understand the concept of life table and its construction.	
11	Ability to understand the Scaling individual test item in terms of	( sun
	difficulty.	
1	Ability to understand the Z score and Z-scaling.	
\ \ \	At the transferred the T george uses of T-scores	
1	Ability to understand the T-scores, uses of T-scores	/
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# Theory and Practical Examination Pattern

Theory (External) each theory paper carrying maximum marks 75 and shall consist of two sections A and B. Examination duration shall be 02 hours.

 Section A: Multiple choice questions (MCQ)/true and false/very very short answer type questions.

Section A will consist of 10 questions, each of one mark)

Total: 10X1= 10 Marks

b. Section B: (Short answers type)

Section B will consist of 08 questions, each of 7 marks in which 5 has to be answered.

Total: 7X5=35 Marks

c. Section C: (Long answers type)

Section C will consist of 3 long answered questions, in which has to be answered, each of

15 marks.

Total: 2X15=30 marks

For each theory paper internal assessment shall be conducted periodically (in the form of class tests and/or assignments/ group discussion/ oral presentation/ overall performance) during the semester period. Total marks allotted to internal assessment shall be 25 (Assignments 10 marks, written test/viva 10 marks and regularity 5 marks). The evaluated answer sheets/assignments have to be retained by the Professor In-Charge for the period of six months and can be shown to the students if students want to see the evaluated answer sheets. The marks obtained by the students shall be submitted to the Head of concerned department/ the Principal of the College for uploading onto the University examination portal.

Practical The laboratory work of the students has to be evaluated periodically.

The internal assessment (in the form of lab test, lab record, internal evaluation, assignment/home assignment and attendance) of total 10 marks for each semester shall be conducted during the semester. All kinds of exercises have to be conducted during a semester. Maximum 5 marks of attendance can be given to the students.

In each semester practical examination of 40 marks has to be conducted by two examiners (External and internal) having duration of 4 hours. The total number of students to be examined per batch should not be more than sixty. Marks obtained in the practical examination have to be submitted to the Head of the department/ Principal of the College. The Head of the Department/Principal of the College will make necessary arrangement for uploading the marks onto the University exam portal. The hard copy of the award list from portal has to be submitted to the Controller of Examination, Sri Dev Suman Uttarakhand University, Badshahithaul, New Tehri.

The breakup of marks for practical examination for each semester would be as follows:

Practical exam:

30 Marks (exercises)

Viva voce:

05 Marks

Lab Record and collection:

05 Marks

Sessional (Internal):

10 Marks

Total:

50 marks (each semester

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		2. Problems based on t- test.	significance Lab	4. Interval Estimation	Distributions		
4+2=6	NIL	1. Problems based on Z tests	Sampling Distributions and	2. Methods of Estimation 3. Testing of Hymothesis	Inference & Sampling		
		hyper geometric distribution.		Distributions-II	Children		S
		order distribution.  4. Problems based on		8. Continuous			
		3. Problems based on		7. Continuous			
		probabilities based on		6. Discrete Distributions-			
		distribution.		5. Discrete Distributions-	2501001010		
		Normal		•	Theoretical Distributions		
4+2=6	NE	and Poisson and	Analysis-II	2. Probability Theory-II	Theory and	:	
		1~		1 Bookshilliturakana. I	Drohability	-	
		Co relation					
		4. Problems based on					
		Dispersion					
		based		Statistics			
		Tendency.		5. Indian Official			
		Measures of Central					
		calculation		4. Tri Variate			
		2. Problems based on				2	
		representation of		3. Bi Variate	Statistics		
		graphical	Methods Lab	2. Descriptive Statistics-	Methods and		
4+2=6	NIL	1. Problems based on	Statistical	<ol> <li>Descriptive Statistics-I</li> </ol>	Statistical	. 1	1
the Year subject			1000				
Credits of	Project				Paper		
Total	Research	Units	Practical Paner	Units	Theory	Semester	Year
			Subject Statistics				

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	<b>A</b>		
Numerical Analysis and Design of Experiment (DOE)	Sampling Techniques and Analysis of Variance (ANOVA)	and related tests of significance	
<ol> <li>Finite Differences</li> <li>Interpolation-I</li> <li>Interpolation-II</li> <li>Numerical Integration</li> <li>Basics of Design of Experiment</li> <li>Basic symmetric designs</li> </ol>	1. Basics of Sample Survey 2. Simple Random Sampling 3. Stratified and Systematic Sampling 4. Ratio and Regression Methods 5. Analysis of Variance	<ol> <li>Sampling         Distribution-I         </li> <li>Sampling         Distribution-II     </li> <li>Large Sample tests</li> <li>Small sample tests</li> </ol>	
Numerical Analysis, DOE and Non Parametric Methods Lab	Sampling Techniques and Analysis of Variance Lab		
<ol> <li>Problems based on Non-parametric tests for one sample.</li> <li>Problems based on Non-parametric tests</li> </ol>	1. Problems based on drawing a simple random sample with the help of table of random numbers.  2. Problems based on estimation of population means and variance in simple random sampling.  3. Problems based on Stratified random sampling for population means (proportional and optimum allocation).  4. Problems based on Systematic random sampling 5. Problems based on Analysis of variance in one- way and two-way classification.	<ol> <li>Problems based on Ftest.</li> <li>Problems based on Chi-square test.</li> <li>Problems based on calculation of power function.</li> </ol>	
Research Project (Qualifying)	AIN NIT		
4+4+2=10	4+2=6	N. C.	
D.	10/08/2020 Gang Jan 10/0/2022	Operator Continued	Dev

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	9	Sausucs	Educational	Applied Statistics and	,					Programming	and Computer	Control(SQC)	Statistical											Menions	Parametric	Non	Multivariate Analysis and
		4.0	· w i	٠:	.00	7.	6	is	4.	_	'n	!	٠:	1									÷	٠, ٠	,	5	
		Vital Statistics Educational Statistics	Index Numbers-II	Time Series Analysis	Basics of R	Basics of C	Flowcharts and	Basics of Computers	Sampling Inspection	Attributes	Control harts for	Variables	Control harts for										Methods	Linear Estimation	Distribution	Multivariate Normal	Bivariate Normal Distribution
											Lab	Applied Statistics	SQC, Computer														
Ī									,		N		_		7					6.		5		4.			ω
	K in simple data  8. analysis Problem	7. Problem based on application of	Calculator.	6. Problem based on	Vital Statistics	Index Numbers 5. Problem based on	4. Problem based on	Time Series	attributes		2. Problem based on	variables	1. Problem based on	1		based on these rules	wedgie s rule and	Simpson's rule and	Trapezoidal rule,		formula		A and F				for two samples.  Problems based on
												(Qualifying)	Research														
													4+4+2=10														

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			Diploma in Basic Statistics	·		Statistics	Certificate in Elementary	Соигзе	
	¥		E		11	,	-	Semester	
Practical-2	Theory-1	Practical-2	Theory-1	Practical-1	Theory-1	Practical-1	Theory-1		
Sampling Survey and ANOVA Lab	Sampling Techniques and Analysis of Variance (ANOVA)	Sampling Distributions and their related tests of Significance Lab	Statistical Inference and Sampling Distributions and their related tests of Significance	Theoretical Distributions Lab	Probability Theory and Theoretical Distributions	Statistical Methods Lab	Statistical Methods and Indian Official Statistics	Paper Title	
Opted Sem-IV Theory Paper-1	Passed Sem-III Theory Paper-	Opted Sem-III Theory Paper-1	Passed Certificate Course in Elementary Statistics.	Opted Sem-II Theory Paper-1	Passed Sem-I Theory paper-1	Mathematics in 12th Standard	Mathematics in 12th Standard	Prerequisite for Paper	applicati Excel in analysis
Zoo/Bot/Physics/Math/Comp Sci	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	Yes for the students with major Zoo/Bot./Physics/Math/Comp Sci	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	Elective for Major Subject	application of Excel in data analysis
8	8	60	6	6	60	60	66	Hours per Semester	
	s .		3			. 2		Creditsof the Year subject	ما م

		Numerical Analysis and Design of Experiment (DOE)	Theory papers	Zoo/Bot/Physics/Math/Comp Sci		•
	Theory-2	Multivariate Analysis and Non-parametric Methods	Passed Sem-III and Sem-IV Theory papers	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	09	4
	Practical-3	Non-parametric Methods and DOE Lab	Opted Sem-V Theory Paper-1 &2.	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	09	2
	Research Project			Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	09	Qualifying
N	Theory-1	Statistical Quality Control & Computer Programming	Passed Sem-V Theory papers	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	09	4
	Theory-2	Applied Statistics & Educational Statistics	Passed Sem-V Theory papers Theory papers	Yes for the students with major Zoo/Bot./Physics/Math/Comp Sci	09	4
	Practical-3	Statistical Quality Control & Computer Programming	Opted Sem-VI Theory Paper-1 &2	Yes for the students with major Zoo/Bot/Physics/Math/Comp Sci	09	2
	Research			7	09	Qualifying

# Pattern of examination theory papers

#### A. Theory

Each theory paper shall consist two sections A and B.
Section A: (Short answers type with reasoning); 45 marks, eight questions of nine markseach, any five have to be attempted).
Section B: (Long answers type);30 marks, two questions of fifteen marks each. Both thequestions are compulsory with internal choice.

B. Internal assessment

For each theory paper internal assessment shall be conducted periodically (in the form of class tests and/or assignments/ group discussion/ oral presentation/ overall performance) during the semester period. Total marks allotted to internal assessment shall be 25. The evaluated answer sheets/assignments have to be retained by the Professor In-Charge for the period of six months and can be shown to the students if students want to see the evaluated answer sheets. The marks obtained by the students shall be submitted to the Head of concerned department/ the Principal of the College for uploading onto the University examination portal.

C. Practical

The laboratory work of the students has to be evaluated periodically. The internal assessment (in the form of lab test, lab record, internal evaluation, assignment/home assignment and attendance) of total 10 marks for each semester shall be conducted during the semester. A minimum of 10 experiments covering all kinds of exercises have to be conducted during a semester. Maximum 5 marks of attendance can be given to the students. In each semester practical examination of 40 marks has to be conducted by two examiners (External and internal) having duration of 2 hours for I to IV Semester and 3 hours for V and VI Semester. The total number of students to be examined per batch should not be more than sixty. Marks obtained in the practical examination have to be submitted to the Head of the department/Principal of the College. The Head of the Department/Principal of the College will make necessary arrangement for uploading the marks onto the University exam portal. The hard copy of the award list from portal has to be submitted to the Controller of Examination, Sri Dev Suman Uttarakhand University, Nainital.

Certific	nme/Class:		Year: First		Semester: First
	Su	bject: STA	TISTICS (MA	JOR)	
Course Co	The state of the s	course Title	: Statistical Mo	thods &India	n Official
Ability betwee Knowl graphic histogr Ability of disp Ability and sig	edge of Statistics, is to understand concern different types of edge of methods for cal tools (such as became and boxplots.	its scope and cepts of sar f data. For summarized the control of t	d importance in apple vs. popular ting data sets, in stograms and states of central tendewness and kurden	tion and difference of the comment o	ence non rpret sures
	Credits:	04		Core:	Compulsory
	Max.Marks:7	5+25	Min. Passin	g Marks:	•••
	Total No. of Lectur	es-Tutorial	s-Practical(in h	ours per week)	:4-0-0.
Unit	arrad sanding the	Topic		back out the	No. of Lectures
	er I: STATISTIC	_		N OFFICIAL	
Ī	Definition and Qualitative & ON OPPORTUGE (Normally Ordinal data, Collection representation of data with special recommendation)	Quantitative I, Interval of data, I Data. Cons	e. Scales of and Ratio. Or Diagrammatic sistency and in	measurement ganization of and Graphica	08
				14	

ш	Meaning of Correlation, Scatter diagram, Karl Pearson's Coefficient of Correlation. Assumptions Underlying Karl Pearson's Correlation Coefficient. Correlation coefficien for a Bivariate Frequency Distribution. Probable Error of Correlation Coefficient. Rank Correlation. Linear regression, Properties of Regression Coefficients Standard Error of Estimate and Residual variance Correlation Coefficient between Observed and Estimated Values, R <sup>2</sup> Principle of least squares and curve fitting.	16
IV	Correlation Ratio, Intra-class Correlation, Multiple and Partial Correlation— Yule's Notation, Plane of Regression, Properties of Residuals- Variance of the Residual, Coefficient of Multiple Correlation- Properties of Multiple Correlation Coefficient, Coefficient of Partial Correlation (Tri-Variate).	12
v	Indian Statistical System: Present official Statistical System in India, Methods of collection of official Statistics, their reliability and limitation and the principal publications containing such statistics on the topics-population, agriculture, industry, trade, price, labour and employment, transport and communication, banking and finance.	08

Suggested Readings:

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

2. Fundamentals of Statistics Vol- I: A. M. Goon, M. K. Gupta and B. Das Gupta.

3. New Mathematical Statistics: Bansi Lal and S. Arora.

4. Basic Statistics: B. L. Aggarwal.

5. Programmed Statistics: B. L. Aggarwal.

6. An Introduction to Theory of Statistics: G. Udny, M. G, Kendal.

7. Guide to current Indian Official Statistics, Central Statistical Office, GOI, New Delhi.

8. http://mospi.nic.in

Suggested Online Links/Readings:

http://heecontent.upsdc.gov.in/SearchContent.aspx

https://swayam.gov.in/explorer?searchText=statistics

https://nptel.ac.in/course.html

# https://www.edx.org/search?q=statistics https://www.coursera.org/search?query=statistics&

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:

Quiz/Assignment		(05marks)
Class Test-I		(10marks)
Class Test-II	No. of the Control of	(10marks)

This course can be opted as a minor elective by the students. Open to all(O t h e r Faculty).

Programme/Class:	Year: First	Semester: First
Certificate	Fire and the special dis-	The for the Council of
	Subject: STATISTIC	S
Course Code:-	Course Title: Statist	ical Methods Lab
Graphical methods incl histograms and stem plot Acquire the knowledge of central tendency as meaningful conclusions	ummarize the data/informate uding common graphical to ts) and also to draw inference to identify the situation to apper the nature and need regarding behavior of the data to identify the situation to appear to identify the situation to appear to the data to identify the situation to appear to the data to identify the situation to appear to the data to identify the situation to appear to the data to identify the situation to appear to the data to identify the situation to appear to the data to identify the situation to appear to the data to identify the situation to appear to the data to identify the situation to appear to the data to identify the situation to appear to the data to identify the situation to appear the data to identify the situation to appear	es from these graphs of the data and draw a.
of dispersion as per the	nature and need of the da	ta and draw meaningful
of dispersion as per the	e nature and need of the data. eterogeneity of the data. ness and kurtosis of data and	ta and draw meaningful
of dispersion as per the conclusions regarding he Ability to measure skewn Credi	e nature and need of the data. eterogeneity of the data. ness and kurtosis of data and ts:02 s:50 Min. Pass	define their significance.  Core: Compulsory sing Marks:
of dispersion as per the conclusions regarding he Ability to measure skews  Credi	e nature and need of the data.  eterogeneity of the data.  ness and kurtosis of data and  ts:02	define their significance.  Core: Compulsory sing Marks:

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1,	Problems based on graphical representation of data by	
	Histogram, Frequency polygons, frequency curvesand Ogives, Stem and Leaf Plot, Box	
	Plot.	30
2.	Problems based on calculation of Measures of Central Tendency.	30
3.	Problems based on calculation of Measures of Dispersion.	

Suggested Readings: As suggested for paper I

# Suggested Continuous Evaluation Methods: (10Marks)

Continuous Internal Evaluation shall be based on Practical File/Record, Class Activities and Overall performance. The marks shall be as follows:

337-137-137-137-137-137-137-137-137-137-		
Practical File/I	Record	(05marks)
Class Interacti	on	(03marks)
Report Prepar	ation/Presentation	(02marks)

Suggested Practical Examination Evaluation Methods: (40 Marks)

Practical Examination Evaluation shall be based on Viva-voce and Practical Exercises. The marks shall be as follows:

Practical Exercise(Major) 01x15Marks	15Marks
Practical Exercise(Minor) 01x10Marks	10Marks
Viva-voce	15 Marks

There shall be 04-05 Practical Exercises in Examination comprising 01 as Major(Compulsory) and 03-04 as Minor(Students have to attend any 01).

Course prerequisites: To study this course, a student must have opted/passed the

paper code.

10/8/2022

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Programme/Class:	Year: First	Semester: Second
Certificate	Subject: STATISTIC	CS pory and Theoretical
Course Code:-	Distributions	iory and

# Course outcomes:

After completing this course a student will have:

- ✓ Knowledge of discrete distributions. Discuss appropriate distribution negative binomial, Poisson, etc. with their properties and application of discrete distribution models to solve problems.
- ✓ Knowledge of continuous distributions. Discuss the appropriate distribution (i.e. uniform, exponential, normal, etc.) with their properties and application of continuous distribution models to solve problems.
- ✓ Knowledge of the formal definition of order statistics.
- ✓ Ability to identify the application of theory of order statistics in real life problems.
- ✓ Ability to understand the concept of probability along with basic laws and axioms of probability.
- ✓ Ability to understand the terms mutually exclusive and independence and their relevance.
- ✓ Ability to identify the appropriate method (i.e. union, intersection, conditional, etc.) for solving a problem.
- ✓ Ability to apply basic probability principles to solve real life problems.
- ✓ Ability to understand the concept of random variable (discrete and) continuous), concept of probability distribution.

7.1	Credits:04	Core: Compulsory	
	3.6 3.6 mlcg:75+25	Min. Passing Marks:	
	Total No. of Lectures-Tutoria Total Top	ls-Practical (in hours per week):4-0-0.	
Unit Pap	er I: PROBABILITY T	HEORY & THEORETICAL IBUTIONS	

Part A: PROBABILITY THEORY

1	Introduction: Brief History, Basic Terminology, and Mathematical (or Classical or 'a Priori') Probability-limitation of Mathematical Probability. Statistical (or Empirical) Probability, Limitation of Empirical Probability. Subjective Probability. Mathematical tools: Preliminary Notations of sets. Elements of sets. Operation on sets, Algebra of sets. Axiomatic approach to probability- Random experiment, Sample Space and Elementary events, Acceptable assignment of probabilities, Natural assignment of probabilities. Axiomatic Probability, Algebra of Events.	10
Π	Some Theorems on Probability-Addition theorem of Probability, Extension of Addition theorem of Probability to n Events, Boole's Inequality, Conditional Probability, Multiplication Theory of Probability, Independent Events, Multiplication Theory of Probability for Independent Events- Extension of Multiplication theorem of Probability to n Events, Pair Wise Independent Events, Mutually Independent events, Probability of Occurrence of at least one of the events. Bayes' Theorem, Geometrical Probability.	06
Ш	Random variables: Discrete and Continuous. Distribution functions, probability mass function, and probability density function. Joint distribution of two random variables- marginal and conditional distribution, Independence of two random variables. Transformation of random variables. Expectation-theorem on expectation of sum of random variables and product of independent random variables, Conditional Expectation.	08
IV	Moments and Moment Generating function, Cumulan Generating function, Characteristic function, Uniqueness and Inversion Theorems (without proof) Chebyshev's inequality, Weak Law of Large numbers (without proof) and Central Limit Theorem (without proof).  Part B: THEORETICAL DISTRIBUTIONS: DISC	06

Good July 2012

	Bernoulli distribution and its moments, Binomina distribution: Moments, recurrence relation for the moments, moment generating function (m.g.f.) additive property, characteristics function (c.f.) cumulants, probability generating function (p.g.f.) and recurrence relation for the probabilities of Binomina distribution, Poisson Distribution: Poisson distribution as a limiting case of Binominal distribution, moments mode, recurrence relation for moments, m.g.f., c.f. cumulants and p.g.f. of poison distribution, additive property of independent poisson variates. Negative Binominal distribution: m.g.f. and p.g.f., deduction of moments of negative binominal distribution.	08
VI	Discrete uniform distribution; Geometric distribution: Lack of memory, moments and m.g.f Hypergeometric distribution: Mean and variance. Continuous uniform distribution: Moments, m.g.f. characteristic function and mean deviation.	08
VII	Normal distribution as a limiting form of binominal distribution, chief characteristic of Normal distribution: mode, median, m.g.f., c.g.f. and moments of Normal distribution, a linear combination of independent normal variates, points of inflexion, mean deviation about mean, area property of Normal distribution, importance and fitting of normal distribution.	08
VIII	Gamma distribution; m.g.f., c.g.f., additive property.  Beta distribution of first and second kind.  Moments( Mean and Variance). Exponential  Distribution: m.g.f., moments, lack of memory.  Log Normal and Cauchy distribution. Order  statistics: Introduction, Distribution of the rth  order statistic, smallest and largest order statistics.	06

Suggested Reading

1. Fundamental of Mathematical Statistics : S.C. Gupta and V. K. Kapoor

2. Mathematical Statistics: Kapoor & Saxsena

3. Mathematical Statistics: O.P Gupta & B. D. Gupta

4. New Mathematical Statistics: Bunshi Lal & S. Arora

undamental of Applied Statistics: S.C. Gupta & V. K. Kapoor Fundamental of Statistics Vol - II: A.M. Goon, M.K. Gupta & B. Das Gupta

# Suggested Online Links/Readings:

- http://heecontent.upsdc.gov.in/SearchContent.aspx
- https://swayam.gov.in/explorer?searchText=statistics
- https://nptel.ac.in/course.html
- https://www.edx.org/search?q=statistics
- https://www.coursera.org/search?query=statistics&

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	hods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:

	(05marks)
Quiz/Assignment	(10marks)
Class Test-I	(10marks)

This course can be opted as a minor elective by the students. Open to all (Other Faculty)

Faculty)	2 1 44 5 44 5 44 6 44	Semester: Second
Programme/Class:	Year: First	Semester. Second
Certificate	Subject: STAT	ISTICS
Course Code:-	Course Title: T	heoretical Distributions Lab

# Course outcomes:

After completing this course a student will have:

- 1. Ability to fit Binomial and Poisson distribution for given data.
- 2. Acquire the knowledge to compute conditional probabilities based on Bayes Theorem.
- 3. Problems based on order distribution.
- 4. Problems based on hyper geometric distribution.

Credits: 02	Core: Compulsory
May Marks:50	Min. Passing Marks:
A STATE OF THE STA	orials-Practical (in hours per week):0-0-4.
Total No. of Lectures-Tute	No. of

Change (

1	<ol> <li>Fitting of Binomial and Poisson distribution.</li> <li>Computation of conditional probabilities based on Bayes theorem</li> <li>Problems based on order distribution.</li> <li>Problems based on hyper geometric distribution.</li> </ol>	30

# Suggested Continuous Evaluation Methods (10 marks):

Continuous Internal Evaluation shall be based on Practical File/Record, Class Activities and Overall performance. The marks shall be as follows:

Champion of the Control				(05 marks)	
Practical File/Reco	ord	·	7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	(03 marks)	
Class Interaction					SAN SAMORAS
Report Preparatio	To tatio			(02marks)	Burk from

# Suggested Practical Examination Evaluation Methods: (40Marks)

Practical Examination Evaluation shall be based on Viva-voce and Practical Exercises. The marks shall be as follows:

26 : -> 01=15Marks	15 Marks
actical Exercise (Major) 01x15Marks	10 Marks
Practical Exercise (Minor) 01x10Marks	15 Marks
va-voce	

There shall be 04-05 Practical Exercises in Examination comprising 01 as Major (Compulsory) and 03-04 as Minor (Students have to attend any 01).

Course prerequisites: To study this course, a student must have opted/passed the paper code.

# Further Suggestions:

In practical classes a series of lectures for any statistical software(e.g. Excel or R) maybe organized for students and they may be asked to use it to perform practical problems assigned to them.

Subject: STATISTICS  ourse Code:-  Course Title: Statistical Inference and Sampling Distributions and their related tests of Significance	Programme /Class Diploma	: Year	: Second	Semester: Third
Distributions and their related tests of Significance fiter completing this course a student will have:  Knowledge of the terms like null and alternative hypotheses, two-tailed and one-tailed alternative hypotheses, significant and insignificant, level of significance and confidence, p value etc.  Ability to understand the concept of MP, UMP and UMPU tests  Ability to understand under what situations one would conduct the small sample and large sample tests (in case of one sample and two sample tests).  Ability to understand the difference between parameter & statistic and standard error & standard deviation.  Knowledge of the concept of Point and Interval Estimation and discuss characteristics of a good estimator.  Ability to understand and practice various methods of estimations of parameters.  Knowledge of the concept of Sampling distributions.  Knowledge of the sampling distribution of the sum and mean.  Ability to understand the t, F and chi-square distribution and to identify themain characteristics of these distributions.  Credits:04  Core: Compulsory  Max.Marks:75+25  Min. Passing Marks:  Total No. of Lectures-Tutorials-Practical(in hours per week):4-0-0.  Unit  Topic  Part A: STATISTICAL INFERENCE  Point Estimation: Introduction, Estimators and Estimate. Characteristics/Properties of Estimators:  Unbiasedness, Consistency, Efficiency- Most Efficient Estimator, Minimum Variance Unbiased (MVU) Estimators, Sufficiency- Factorization Theorem (Neyman), Invariance property of Sufficient Estimator, Fisher-Neyman Criterion for Sufficient Estimator. Cramer-Rao inequality and MVB		Subject:	STATISTICS	
firer completing this course a student will have:  Knowledge of the terms like null and alternative hypotheses, two-tailed and one-tailed alternative hypotheses, significant and insignificant, level of significance and confidence, p value etc.  Ability to understand the concept of MP, UMP and UMPU tests  Ability to understand under what situations one would conduct the small sample and large sample tests (in case of one sample and two sample tests).  Ability to understand the difference between parameter & statistic and standard error &standard deviation.  Knowledge of the concept of Point and Interval Estimation and discuss characteristics of a good estimator.  Ability to understand and practice various methods of estimations of parameters.  Knowledge of the concept of Sampling distributions.  Knowledge of the sampling distribution of the sum and mean.  Ability to understand the t, F and chi-square distribution and to identify themain characteristics of these distributions.  Credits:04  Core: Compulsory  Max.Marks:75+25  Min. Passing Marks:  Total No. of Lectures-Tutorials-Practical(in hours per week):4-0-0.  Unit  Topic  Part A: STATISTICAL INFERENCE  Point Estimation: Introduction, Estimators and Estimate. Characteristics/Properties of Estimators:  Unbiasedness, Consistency, Efficiency- Most Efficient Estimator, Minimum Variance Unbiased (MVU) Estimators, Sufficiency- Factorization Theorem (Neyman), Invariance property of Sufficient Estimator, Fisher-Neyman Criterion for Sufficient Estimator, Cramer-Rao inequality and MVB	Course Code:-	Course Tit Distributi	tle: Statistical Inferencions and their related t	e and Sampling ests of Significance
<ul> <li>Knowledge of the terms like null and alternative hypotheses, two-tailed and onetailed alternative hypotheses, significant and insignificant, level of significance and confidence, p value etc.</li> <li>Ability to understand the concept of MP, UMP and UMPU tests</li> <li>Ability to understand under what situations one would conduct the small sample and large sample tests (in case of one sample and two sample tests).</li> <li>Ability to understand the difference between parameter &amp; statistic and standard error &amp;standard deviation.</li> <li>Knowledge of the concept of Point and Interval Estimation and discuss characteristics of a good estimator.</li> <li>Ability to understand and practice various methods of estimations of parameters.</li> <li>Knowledge of the concept of Sampling distributions.</li> <li>Knowledge of the sampling distribution of the sum and mean.</li> <li>Ability to understand the t, F and chi-square distribution and to identify themain characteristics of these distributions.</li> <li>Credits:04 Core: Compulsory</li> <li>Max.Marks:75+25 Min. Passing Marks:</li> <li>Total No. of Lectures-Tutorials-Practical(in hours per week):4-0-0.</li> <li>Unit Topic Lectures</li> <li>Part A: STATISTICAL INFERENCE</li> <li>Point Estimation: Introduction, Estimators and Estimate. Characteristics/Properties of Estimators:         <ul> <li>Unbiasedness, Consistency, Efficiency- Most Efficient Estimator, Minimum Variance Unbiased (MVU) Estimators, Sufficiency- Factorization Theorem (Neyman), Invariance property of Sufficient Estimator, Fisher-Neyman Criterion for Sufficient Estimator. Cramer-Rao inequality and MVB</li> </ul> </li> </ul>	Course outcomes:			
Credits:04 Core: Compulsory  Max.Marks:75+25 Min. Passing Marks:  Total No. of Lectures-Tutorials-Practical(in hours per week):4-0-0.  Unit Topic Part A: STATISTICAL INFERENCE  Point Estimation: Introduction, Estimators and Estimate. Characteristics/Properties of Estimators:  Unbiasedness, Consistency, Efficiency- Most Efficient Estimator, Minimum Variance Unbiased (MVU) Estimators, Sufficiency- Factorization Theorem (Neyman), Invariance property of Sufficient Estimator, Fisher-Neyman Criterion for Sufficient Estimator. Cramer-Rao inequality and MVB	<ul> <li>✓ Knowledge of tailed alternative and confidence</li> <li>✓ Ability to under sample and large tests).</li> <li>✓ Ability to under standard error &amp;</li> <li>✓ Knowledge of the discuss characte</li> <li>✓ Ability to under standard error &amp;</li> <li>✓ Knowledge of the Knowledge of the Knowledge of the Ability to under standard error &amp;</li> </ul>	the terms like null and a ve hypotheses, significate, p value etc. Instand the concept of Marstand under what situate as sample tests (in case of the concept of Point and pristics of a good estimate stand and practice various te concept of Sampling of the sampling distribution and the t, F and chi-squared to the sampling distribution and the t, F and chi-squared to the sampling distribution and the t, F and chi-squared to the sampling distribution and the t, F and chi-squared to the sampling distribution and the t, F and chi-squared to the sampling distribution and the t, F and chi-squared to the sampling distribution and the t, F and chi-squared to the sampling distribution and the t, F and chi-squared to the sampling distribution and the t, F and chi-squared to the sampling distribution the sampling distribution the total distribution to the sampling distribution the sampling distributio	alternative hypotheses, to ant and insignificant, learn and insignificant, learn and UMPU testions one would conduct of one sample and two seven parameter & statist and or.  Interval Estimation and or.  Is methods of estimation distributions.  of the sum and mean.  Is are distribution and to i	ts the small ample tic and as of parameters.
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Unit  Topic  Part A: STATISTICAL INFERENCE  Point Estimation: Introduction, Estimators and Estimate. Characteristics/Properties of Estimators: Unbiasedness, Consistency, Efficiency- Most Efficient Estimator, Minimum Variance Unbiased (MVU) Estimators, Sufficiency- Factorization Theorem (Neyman), Invariance property of Sufficient Estimator, Fisher-Neyman Criterion for Sufficient Estimator. Cramer-Rao inequality and MVB				
Point Estimation: Introduction, Estimators and Estimate. Characteristics/Properties of Estimators:  Unbiasedness, Consistency, Efficiency- Most Efficient Estimator, Minimum Variance Unbiased (MVU) Estimators, Sufficiency- Factorization Theorem( Neyman), Invariance property of Sufficient Estimator, Fisher-Neyman Criterion for Sufficient Estimator. Cramer-Rao inequality and MVB	Total No.	of Lectures-Tutorials-Pr	ractical(in hours per wee	No. of
Point Estimation: Introduction, Estimators and Estimate. Characteristics/Properties of Estimators: Unbiasedness, Consistency, Efficiency- Most Efficient Estimator, Minimum Variance Unbiased (MVU) Estimators, Sufficiency- Factorization Theorem (Neyman), Invariance property of Sufficient Estimator, Fisher-Neyman Criterion for Sufficient Estimator. Cramer-Rao inequality and MVB	Unit	Topic		Lectures
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	Car	8 h		1010

TI II	Method of Estimation: Method of Moments, Method of minimum Chi-Square, Method of Maximum Likelihood Estimation, Properties of Maximum Likelihood Estimators, Method of Minimum Variance, Method of Least Squares	08
III	Testing of Hypothesis: Statistical Hypothesis-Simple and Composite, Test of a Statistical Hypothesis, Null Hypothesis, Alternative Hypothesis, Critical Region, Two Type of Errors, Level of Significance, Power of the Test, Steps in Solving Testing of Hypothesis Problem, Optimum Test Under Different Situations-Most power test(MP test), Uniformly Most Powerful Test(UMP test), Neyman and Pearson Lemma and its application in testing simple Vs Simple hypothesis, Likelihood Ratio Test-Properties of Likelihood Ratio Test and its solution for testing simple hypothesis against simple alternative hypothesis.	08
īv	Interval Estimation: Confidence Interval and Confidence limits-concept of best confidence intervals, Confidence Intervals for Large Samples.	08

	Significance	
v	Random sample, parameter and statistic, sampling distribution of a statistic. Sampling distribution of Mean in Normal Population. Exact sampling distribution: definition and derivation of $p.d.f.$ of $\chi^2$ with n degrees of freedom(d.f) using m.g.f., nature of $\chi^2$ curve for different degrees of freedom, mean, variance, m.g.f., cumulative generating function, mode, additive property and limiting form of $\chi^2$ distribution.	04
VI	Exact sampling distributions- Student's t and Fisher t- distribution, Derivation of its p.d.f., nature of probability curve with different degrees of freedom, mean, variance, moments and limiting form of t	08

	distribution. Snedecore's F-distribution: Derivation of p.d.f., Probability curve with different degrees of freedom, mean variance and mode. Distribution of $1/F$ ( $n_1,n_2$ ). Relationship between t, F and $\chi^2$ distributions.	
VII	Tests of Significance for Large Sampling of Attributes- Test of Significance for Single Proportion, Test of Significance for Difference of Proportions, Sampling of Variables- Unbiased Estimate for Population mean(μ) and variance(σ²), Standard Error of Sample Mean, Test of Significance for Single Mean, Test of Significance for Difference of Means, Test of Significance the Difference of Standard Deviations, Test of Independence of Attributes- Contingency Tables, Yate's Correction (for 2x2 contingency Table)-Fisher's Exact test, Brandt and Snedecor Formula for 2Xk contingency Table.	10
VIII	Test of Significance for Small Samples: Test for Single Variance, χ²- test of Homogeneity of Correlation Coefficients, Bartlett's Test for Homogeneity of Several Independent Estimates of the Same Population Variance, t-test for Single Mean, t-test for Difference of Means, Paired t-test for Difference of Means, t-teat for Testing the Significance of an Observed Sample Correlation Coefficient. F-test for Equality of Two Population Variances, F-test for testing the Significance of an Observed Multiple Correlation Coefficient, F-test for Testing the Linearity of Regression. Applications of Z-transformation.	08

programme/Class:	Year: S	econd	Semester: Third
Diploma	Subject: S7	PATISTI	CS The second second
ourse Code:-	Course Title: Sa	mnling D	istributions and their related
ourse Code	Course Title. Sa	Test of Sig	gnificance Lab
ourse outcomes:			
fter completing this cours  1. Ability to conduct test  2. Ability to deal with pro  3. Ability to conduct test  6. Ability to conduct test  6. Ability to conduct test	of significance base shlems based on larg	d on t, F to	tests.
Credit	ts:02	Charles (4)	Core: Compulsory
Max.Marks		in. Passir	ng Marks:
Total No. of Lect			ours per week):0-0-4.
Total 140. of Lee	Topic	C. James a	No. of Lectures
2. Problems b. 3. Problems b. 4. Problems b. function.  ggested Readings: suggested for paper cod ggested Continuous Eva	Tuation Methods (	0 marks)	seal File/Record, Class
		a chall be	ac tollows:
ctivities and Overall perfe	ormance. The mark	S Silali UC	A CONTRACTOR OF THE PROPERTY O
ctivities and Overall perio	ormance. The mark	S SHAII OC	(05marks)
ctivities and Overall perfe cticalFile/Record	ormance. The mark	Silan oc	(05marks) (03marks)
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ctivities and Overall perfectical File/Record sInteraction ortPreparation/Presenta actical Examination Evaluation Evaluation Evaluation Evaluation Exercises. The marks shall actical Exercise(Major)01 ctical Exercise(Minor)01 a-voce	nation  nation Evaluation  nation shall be based be as follows: ix15Marks x10Marks	Methods d on Viva	(05marks) (03marks) (02marks) : (40Marks) -voce and Practical  15Marks 10Marks 15Marks
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burse prerequisites: To study this course, a student must have opted/passed the aper code.

Further Suggestions: In practical classes a series of lectures for any statistical software may be organized for students and they may be asked to use it to perform practical problems assigned to them.

Suggested readings:

1. Fundamentals of Statistics. Vol. II: A. M. Goon, M.K. Gupta and B. Dasgupta

2. Applied Statistics: P. Mukhopadhyay

3. Fundamental of Applied Statistics: S.C. Gupta and V. K. Kapoor

4. Sampling Techniques: W. G. Cochran

5. Sampling Techniques: Daroga Singh and F. S. Chaudhary

Suggested Online Links/Readings:

- http://heecontent.upsdc.gov.in/SearchContent.aspx
- https://swayam.gov.in/explorer?searchText=statistics
- https://nptel.ac.in/course.html
- https://www.edx.org/search?q=statistics
- https://www.coursera.org/search?query=statistics&

Programme/Class: Diploma	Year: Second	Semester: Fourth
9 70 10 7	Subject: STATISTIC	S
Course Code:-	Course Title: Sampling & Analysis of Variance	Techniques e (ANOVA)

### Course outcomes:

After completing this course a student will have:

- ✓ Ability to understand the concept of sampling and how it is different from complete enumeration.
- ✓ Knowledge of various probability and non-probability sampling methods along with estimates of population parameters

✓ Ability to identify the situations where the various sampling techniques shall be

- ✓ Knowledge of sampling and non-sampling errors.
- ✓ Knowledge of the concept of Analysis of Variance(ANOVA).
- ✓ Ability to carry out the ANOVA for One way and Two way Classification.
- ✓ Ability to carry out the post-hoc analysis.

	Credits:04	Core:	Compulsory
	May Marks:75+25	Min. Passing Marks:	
	T. 131 of Lastures Tutor	ials-Practical(in hours per we	eek):4-0-0.
Unit	Total No. of Lectures-Tutor		No. of Lectures
APER I	: Sampling Techniques & A	nalysis of Variance (ANOV	/A)
AI EKI	PART A: SAN	APLING Techniques	
I	Introduction, Type of Samp Probability sampling, Paran Sampling Distribution of S Sampling vs complete enum and frame, sampling and no precision and efficiency of	tatistic, Standard Error, meration, sampling units on-sampling errors, sampling estimators.	08
Simple random sampling with and without replacement, definition and procedure of selecting a sample, Estimates of: population mean, total and proportion, variance of these estimates, estimates of their variances and sample size determination.		08	
III	Stratified random sampling population mean and total,	: Technique, estimates of variances of these	06

	estimates, proportional and optimum, Neyman allocations and their comparison with SRS. Practical difficulties in allocation, estimation of gain in precision, post stratification and its performance. Systematic sampling: Technique, estimates of population mean and total, variances of these estimates(N=nk). Comparison of systemic sampling with SRS and stratified sampling in the presence of linear trend.	
IV	Introduction to Ratio and regression methods of estimation, first approximation to the population mean and total (for SRS of large size), variance of these estimates and estimates of these variances, variances in terms of correlation coefficient for regression method of estimation and their comparison with SRS.	08

	PART B: ANALYSIS OF VARIANCE	
V	Introduction to Analysis of Variance (ANOVA) and Definition, Causes of Variation Classification of ANOVA, one way classification with one observation per cell, One way classification with 'm' observations per cell, Two way classification with one observation per cell: Mathematical model, Sum of squares for various causes of variation, Expected value of Sum of Squares, Degrees of freedom for Sum of Squares, ANOVA Table and related tests of Significance.	30

# Suggested readings:

- 1. Design and Analysis of Experiments: M. N. Das and N. C. Giri.
- 2. Fundamentals of Statistics. Vol.II: A.M. Goon, M.K. Gupta and B. Dasgupta.
- 3. Applied Statistics: P. Mukhopadhyay.
- 4. Fundamental of Applied Statistics: S.C. Gupta and V. K. Kapoor
- 5. Sampling Techniques: W.G. Cochram
- 6. Sampling Theory: Des Raj and Chandok
- 7. Sample Theory of Surveys with Applications: V.G. Panse and P. V. Sukhatme.
- 8. Sampling Techniques: Daroga Singh and F. S. Chaudhary
- 9. Survey Sampling: P. Mukhopadhyay

Suggested OnlineLinks/Readings:

http://heecontent.upsdc.gov.in/SearchContent.aspx

# https://swayam.gov.in/explorer?searchText=statistics https://nptel.ac.in/course.html

- https://www.edx.org/search?q=statistics
- https://www.coursera.org/search?query=statistics&

This course can be opted as a minor elective by the students of following subjects: Open to all(Other Faculty)

# Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:

Quiz/Assignment	(05 marks)
Class Test-I	(10 marks)
Class Test-II	(10 marks)

Programme/Class: Diploma	Year: Second	Semester: Fourth
	Subject: STATISTICS	A Complete of the Complete Com
Course Code:-	Course Title: Sampling Analysis of Variance l	g Techniques and Lab

#### Course outcomes:

After completing this course a student will have:

- 2. Ability to perform ANOVA for one way and two classifications.
- 3. Ability to perform post-hoc analysis.
- 4. Ability to draw a simple random sample with the help of table of random
- 5. Ability to estimate population means and variance in simple random sampling.
- 6. Ability to deal with problems based on Stratified random sampling for population means (proportional and optimum allocation).
- 7. Ability to deal with problems based on Systematic random sampling.

Credits:02	Core: Compulsory
Max.Marks:50	Min. Passing Marks:
Total No. of Lectures-Tutorials-Pra	actical(in hours per week):0-0-4.
Topic	No. of Lectures

1. Problems based on drawing a simple random	
sample with the help of table of random numbers.	
2. Problems based on estimation of population means and variance in simple random	
sampling.	and the second second second
3. Problems based on Stratified random sampling	30
for population means (proportional and optimum	
allocation). 4. Problems based on Systematic random sampling	
5. Problems based on Analysis of variance in one-way	And the state of t
and two-way classification.	Jew J
	Y

Suggested Readings:

As suggested for paper I & II

Suggested Continuous Evaluation Methods (10 marks):

Continuous Internal Evaluation shall be based on Practical File/Record, Class Activities and Overall performance. The marks shall be as follows:

position of the second second second second			(05 mark	s)
Practical File/Record			(03 marks	3
Class Interaction	Service (Service)	- Orange State Control	1 (8-500) M (100) M (100)	March 1968 (1967) 206
Report Preparation/Pres	entation	7	(02marks	1000

Suggested Practical Examination Evaluation Methods: (40Marks)

Practical Examination Evaluation shall be based on Viva-voce and Practical Exercises. The marks shall be as follows:

W I Consider	Major) 01x15Marks	miles y de f	5 Marks
Practical Exercise	Minor)01x10Marks	1	0 Marks
	THIOI ) OTATO I CALLED	Warrana Jan 1: 1	5 Marks
Viva-voce	· or the conformal filth		
	옷하는 경기를 걸었으면 경기를 가게 되어 되었다. 모든		

There shall be 04- 05 Practical Exercises in Examination comprising 01 as Major(Compulsory) and 03-04 as Minor(Students have to attend any 01).

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Course prerequisites: To study this course, a student must have opted/passed the paper code.

**Further Suggestions:** 

In practical classes a series of lectures for any statistical software may be organized for students and they may be asked to use it to perform practical problems assigned

Programme/C		: Third	Semester	: Fifth
	Subjec	t: STATISTIC	cs	
Course Code:-	Course Ti	tle: Numerical ent (DOE)	Analysis & Desi	gn of
<ul> <li>✓ Knowledge</li> <li>✓ Ability to positive and without</li> <li>✓ Ability of use</li> <li>✓ Ability of use</li> <li>✓ Ability of use</li> </ul>	g this course a student wing this course a student wing of the concept of Design erform the basic symmetry missing observations. Inderstand finite Different anderstand Relationship be understand Stirling &Bess anderstand Trapezoidal rule and numerical problem.  Credits:04  Max.Marks:75+25	of experiment aric designs CRL ces etween Δ and E el's formula le, Simpson's re ns based on these	ule and	м,
		10 hours not	week):4-0-0.	promise and
- 1	Lectures-Tutorials-Practi	DIC		No.of Lectures
Unit		(IMENT(DOE)	And the same of th	ordinación que y la deservación de la constantinación de la consta
ľ	Finite differences: Define Relationship between $\Delta$ operators $\Delta$ and E with the problems.	heir associated	mathematical	08
П	Interpolation: Interpolation for equal and unequal interval-Newton's forward and backward formula, Lagrange's interpolation formula, Newton's divided differences formula, Central difference formula, Newton- Gauss forward and backward formula,			08
	Stirling &Bessel's formu	TO MAY TO BELLY HE		

IV	rule and W	Numerical integration- Trapezoidal rule, Simpson's rule and Weddle's rule and numerical problems based on these rules.			d 08	
V	principles of Randomiza	Experiments: In of design of expandion and Local in Design Theorem	eriments- R control and	eplication,	10	
VI	Analysis andesigns. Ra Statistical A other design Analysis andesigns. Mi	randomized de de Efficiency Co ndomized Block Analysis and Eff ns. Latin square de Efficiency Co ssing plot techning Observations.	omparisons v k Design- La iciency Con Design-Lay mparisons v	with other ayout, nparisons with out, Statistical with other rsis of Designs	20	
Programme	/Class: B.Sc.	and stated to the second	r: Third	Ser	nester: Fifth	+
	A Brown Row Line	Subject: STAT	ISTICS	transfer Two		+
Course Code	- Manager	Course Title:	MULTIVARI NONPARA	IATE ANALYSIS METRIC METH	IODS	
✓ Ability to ✓ Ability to ✓ Ability to ✓ Ability to	o conduct test of deal with mu o understand the ounderstand bige of the applied estimates of	variate normal cations of multive	s of matrice listribution variate norm d dispersion	s in order to stu and its applicat al distribution	ions and Maximu	m
✓ Likelihoo ✓ Ability to	apply distribu	N. 18				
T iledihad	ises.		A forder of	Core:	Compulsory	
✓ Likelihoo ✓ Ability to	Credits:	04	Min. Passi	Core: (ing Marks:	Compulsory	
Likelihoo ✓ Ability to sample ca	Credits:	04	The state of the section	ing Marks:		

J	Bivariate Normal Distribution- Moment Generating Function of Bivariate Normal Distribution, Marginal Distribution of Bivariate Normal Distribution, Conditional Distribution of Bivariate Normal Distribution.	10	
II	Multivariate Normal Distribution: Density function, Derivation and properties of Multivariate Normal Distribution, Linear Combination, Marginal and Conditional distributions, MGF of Multivariate Normal Distribution. Distribution of sample mean and sample Co-variance matrix(without proof), Maximum likelihood estimators of its parameters.	20	
ш	Theory of Linear estimation, Estimability of linear parametric functions, Multiple Linear Regression Model, Least square estimation of parameters. Test of hypothesis in a linear model.	10	
ŢV.	Nonparametric tests: Introduction and Comparison with Parametric Tests, The Single Sample Case- The Chi-Square Goodness-of-Fit Test, The Kolmogorov-Smirnov One-Sample Test, The One Sample Runs Test for Randomness, The Case of One Sample, Two Measures or Paired Replicates- The Sign Test, The Wilcoxon Signed Ranks Test. Two Independent Samples- The Chi-Square Test for Two Independent Samples, The Median Test, The Wilcoxon-Mann-Whitney Test, and The Kolmogorov- Smirnov Two-Sample Test.	20	

Suggested Continuous Evaluation Methods:
Continuous Internal Evaluation shall be based on allotted Assignment and
Class Tests. The marks shall be as follows:

	(05marks)
Quiz/Assignment	(10marks)
	(10marks)
Class Test-II	(10marks)

#### Suggested Readings:

- 1. An Introduction to Multivariate Statistical Analysis: T.W. Anderson
- 2. Multivariate Analysis: A.M. Kshirsagar.
- 3. Multivariate Analysis- Theory & Applications: K.C. Bhuyan
- 4. Nonparametric Statistical Inference: J.D. Gibbons and S. Chakraborty

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/inear Estimation and Design of Experiment: D.D. Joshi. Introduction Methods of Numerical Analysis: S.S. Sastry

Numerical Analysis: Bhupende r Singh 8 Numerical Analysis: Goyal & Gupta

#### Suggested Online Links/Readings:

- http://heecontent.upsdc.gov.in/SearchContent.aspx
- https://swayam.gov.in/explorer?searchText=statistics
- https://nptel.ac.in/course.html
- https://www.edx.org/search?q=statistics
- https://www.coursera.org/search?query=statistics&

Programme/Class:	Year: Third	Semester: Fifth
B.Sc.	Subject: STATISTICS	- 1 1
Course Code:-	Course Title: Non Pa Numerical Analysis	rametric Methods, &DOE Lab

- ✓ Ability of understand finite Differences
- ✓ Ability of understand Relationship between ∆ andE
- ✓ Ability of understand Stirling &Bessel's formula ✓ Ability of understand Trapezoidal rule, Simpson's rule and Weddle's rule and numerical problems based on these rules.

Credits:02	Core: Compulsor
	Min. Passing Marks:
Max.Marks:50	11 Prosticel(in hours per week):0-0-4.
Total No. of Lectures-Tuto	orials-Practical(in hours pe r week):0-0-4.
	pic Lectures

<ol> <li>Problems based on Non-parametric tests for one sample.</li> <li>Problems based on Non-parametric tests for two samples.</li> <li>Problems based on Rank and Inverse of a matrix.</li> <li>Problems based on Relationship between Δ and E.</li> <li>Problems based on Stirling &amp;Bessel's formula.</li> <li>Problems based on Trapezoidal rule, Simpson's rule and Weddle's rule and numerical problems based on these rules.</li> </ol>	30
on these rules.	

#### Suggested Readings:

As suggested for paper I & II.

## Suggested Continuous Evaluation Methods (10 marks):

Continuous Internal Evaluation shall be based on Practical File/Record, Class Activities and Overall performance. The marks shall be as follows:

Activities and	and the fact of the		100	1/6)
0.00000	CHUNANT NOT STATE		(05 m	
Practical File/Re	cord 💮 💮 🗀		(03 m	arks)
Fractica			(00-	
Class Interaction	1 (2) (2) (2) (3)		(02m	arks)
Despera	tion/Presentation	The same of the sa		market and repair of the second section is been
Report Prepara	V. 1. 2. 10. 10.			

#### Suggested Practical Examination Evaluation Methods: (40Marks) Practical Examination Evaluation shall be based on Viva-voce and Practical Exercises. The marks shall be as follows:

	15Marks
cal Exercise (Major) 01x15Marks	10Marks
al Exercise (Major) 01x10Marks	15Marks

There shall be 04-05 Practical Exercises in Examination comprising 01 as Major (Compulsory) and 03-04 as Minor(Students have to attend any 01).

Course prerequisites: To study this course, a student must have opted/passed the Paper code.

further Suggestions:

Students may be asked to perform practical problems assigned to them by using MS
Excel/any Statistical software.

Programme, B.Sc.	Class:	Year	r: Third	Semester: Sixth
Dioci	MINI Y	Subje	ct: STATISTICS	
ourse Code:		Course Title: S Programming		ontrol and Computer
Ability to the Ability to	inderstand inderstand inderstand understand understand understand understand	the OC,ASN,AC the Basics of cor the Flow Charts	t for attributes ouble sampling plans nd Consumer's risk OQL and LTPD of Sam nputer and Algorithm Language.	mpling Plans
Ability to	understand	tile Dasies er	V Comments	Core: Compulsory
C +		Credits: 04	Min. Passing Marks	S:
	Max.N	Marks:75+25	ls-Practical(in hours p	er week):4-0-0.
	Total No. of	Lectures-Tutoria	IS-Fraction(III	No. of Lectures
	T	Tonic	The Carlot of th	
PA	PER I: S	tatistical Quali Progra	ty Control and Co	onte
1	Introduction of Quality Product C		ses, Process Control a	nd 08
II	Control Contro	harts for variables: R) & (X, \sigma) Charts h when standards are not given, Cheo ontrol Charts for F R & \sigma-Chart-Setti	Control Charts for s-Setting the Control are given and when cking the Control of lange and Standard ing the Control Limits on and when standards Control of process.	O6

II	Control chart for attributes: p(Fraction Defective), d(Number of Defective)& c(Number of Defects) Chart-Setting the Control Limits both when Standards are given and when Standards are not given, Checking the Control of process.	06
IV	Sampling Inspection by Attributes-Single and double sampling plans, Producer's and Consumer's risk, OC, ASN, AOQL and LTPD of Sampling Plans.	10
V	Basics of computer- Introduction, origin, Development, Uses and Limitation of Computers. Type of Computers, Computer Structure, Input-unit, Output unit, CPU, secondary storage, High Level and Low Level languages, compiler and interpreter. Computer Arithmetic: Floating point representation of numbers, arithmetic operations with normalized floating-point numbers. Number systems- Binary, decimal, octal and hexadecimal number systems and their conversions into each other. Binary arithmetic's, (Addition, subtraction &division).	06
VI	Flow Charts and Algorithm: Concepts of chart, algorithm and programming. Flow charts and algorithms for the following: Mean, Standard Deviation, Coefficient of Correlation, Straight line fitting. Trapezoidal rule, Simpson's 1/3 and 3/8 <sup>th</sup> rules.	10
VII	Basics of C Language, Simple Statistical Operations using C Programming, History of C Language Variable and Data type: Identifiers in C, Variables and Data types and Constants. Control Flow Statements, Working With Functions, Stack, Queue, Linked List, Tree	08
VIII	Basics of R Software: use of sequence, repeat code in R	. 06

Continuous Internal Evaluat Tests. The marks shall be as	ion shall be based or follows:	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	1. Page 10, 15	
Quiz/Assignment  Care	Jan Ban	(05m;	800 TO	restand

most-I	******	- State American
s Test-1		(10marks)
luss Test-II		(10
<u>Circ</u>		(10marks)

Year: Third	Semester: Sixth	
Subject: STATISTIC	CS	
Course Title: APPLIED STATISTICS AN EDUCATIONAL STATISTICS		
	Subject: STATISTIC	

After completing this course a student will have:

- ✓ Familiarity with different aspects of Applied Statistics and their use in real life situations.
- Ability to understand the concept of Time series along with its different components.
- ✓ Knowledge of Index numbers and their applications along with different types of Index numbers.
- ✓ Familiarity with various demographic methods and different measures of mortality and fertility.
- ✓ Ability to understand the concept of life table and its construction.
- ✓ Knowledge to understand the concept of statistical quality control and different control charts for variables and attributes.
- ✓ Ability to understand the Scaling individual test item in terms of difficulty.
- ✓ Ability to understand the Z score and Z-scaling.
- ✓ Ability to understand the T-scores, uses of T-scores

	Credits:04	Con	re: Compulsory
	Max.Marks:75+25	Min. Passing Marks: .	
	Total No. of Lectures-Tutorial	ls-Practical(in hours per	week):4-0-0.
Unit	Topic		No. of Lectures
1 124 124 124 124	Economic Time Series: series – trends, seas components with thei multiplicative models, de method, semi-averages n	onal, cyclic and ir illustrations Addit etermination of trend- g	irregular 15 ive and raphic ve fitting
	Analysis of seasonal	uates, moving average	memou.

	to trend method, ratio to moving average method and link relative method.	
П	Index Numbers: Definition, problems involved in the construction of index numbers, calculation of index numbers- simple aggregate method, weighted aggregates method, simple average of price relatives weighted average of price relatives, link relatives, chair indices, value index numbers, price and quantity index numbers, Laspeyre's, Paasche's, Marshall-Edgeworth and Fisher's index numbers.	10
ш	Time and factor reversal tests of index number consumer price index number and its uses. Base shifting, splicing and deflecting of index numbers.	10
<b>IV</b>	Vital Statistics: Introduction, measurements of population, rates and ratios of vital events Measurement of mortality: CDR, SDR (w.r.t. Age and sex), IMR, Standardized death rates, Life (mortality) tables: definition of its main functions and uses Measurement of fertility and reproduction: CBR, GFR and TFR. Measurement of population growth: GRR NRR-birth, death and fertility rates, gross and ne reproduction rates, elements of lifetable.	15
<b>V</b> .	Scaling individual test item in terms of difficulty, sigma scaling, Z score and Z-scaling, standard scores, normalized scores, T-scores, uses of T-scores, comparison of T-scores and standard scores, percentile scores, scaling of rankings in items of normal probability curve, Reliability of Test scores, methods of determining test reliability, validity of test scores, methods of calculation of validity.	10

Suggested Readings:

1. Fundamentals of Applied Statistics: S. C. Gupta and V. K.Kapoor.

2. Fundamentals of Statistics Vol- I & II: A. M. Goon, M. K. Gupta and B.Dasgupta.

3. New Mathematical Statistics: Bansi Lal and S.Arora.

4. Basic Statistics: B. L.Aggarwal.

5. Programmed Statistics: B. L.Aggarwal.

From P2

Introduction to Theory of Statistics: G. Udny, M. G, Kendal

### suggested OnlineLinks/Readings:

- http://heecontent.upsdc.gov.in/SearchContent.aspx
- https://swayam.gov.in/explorer?searchText=statistics
- https://nptel.ac.in/course.html
- https://www.edx.org/search?q=statistics
- https://www.coursera.org/search?query=statistics&

#### Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:

Ouiz/Assignment	(05 marks)
The state of the s	(10 marks)
Class Test-I Class Test-II	(10 marks)

Programme/Class: B.Sc.	Year: Third	Semester: Sixth
D.SC.	Subject: STATISTICS	
Course Code:-	Course Title: Statistical C Applied Statistics & Con Lab	QualityControl,
<ol> <li>Ability to solve Production</li> </ol>	blem based on Control Charts for blem based on Control chart for blem based on Time Series blem based on Index Numbers blem based on Vital Statistics blem based on application of R a blem based on application of R is blem based on application of Ex	s Calculator.
8. Ability to solve 1100	dits:02	Core: Compulsory
Max.Marl	or Desired	Marks:
Total No. of Le	ctures-Tutorials-Practical(in ho	urs per week):0-0-4.
10001110.012		

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7. Problem based on application of R in simple data  8. analysis Problem based on application of Excel in data analysis	5. Prob 6. Prob Calc	lem based lem based lem based culator.	on Index I on Vital S on applica	Numbers tatistics tion of R as	
		simple da	ta		30

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#### aggested Readings:

As suggested for paper I & II.

## Suggested Continuous Evaluation Methods (10 marks):

Continuous Internal Evaluation shall be based on Practical File/Record, Class Activities and Overall performance. The marks shall be as follows:

Practical File/Record (05 marks)
Class Interaction (03 marks)
Report Preparation/Presentation (02marks)

#### Suggested Practical Examination Evaluation Methods: (40Marks)

Practical Examination Evaluation shall be based on Viva-voce and Practical Exercises. The marks shall be as follows:

Practical Exercise(Major)01x15Marks	15Marks
Practical Exercise(Minor)01x10Marks	10Marks
Viva-voce	15Marks

There shall be 04-05 Practical Exercises in Examination comprising 01 as Major(Compulsory) and 03-04 as Minor (Students have to attend any 01).

Course pre requisites: To study this course, a student must have opted/passed the paper code.

# SUBJECT: STATISTICS (MINOR SYLLABUS)

programme Year		Course Title		Teaching Hours
	THEORY: PAPER I		04	60
Ι	Statistical Methods &Probabili ty Theory	Statistical Methods & Probability Theory		
	Practical : S	tatistical Methods Lab	02	30
		THEORY: PAPER I  Statistical Methods &Probabili ty Theory	THEORY: PAPER I  Statistical Methods & Probabili & Probability Theory  Practical: Statistical Methods	THEORY: PAPER I  Statistical Statistical Methods & Probabili & Probability Theory  Practical: Statistical Methods  O2

10/08/2021 10/08/2021 10/8/2021

gramme	Year	Cours	Course Title		Teaching Hours
Diploma in I	п	THEORY: PAPER I  Statistical Inference, Sampling Techniques & Analysis of Variance (ANOVA)	Statistical Inference, Sampling Techniques & Design of Experiments	il sections	60
Diploma in Basic Statistics		Practical : Sa Design of Ex	mpling Survey, periments and stributions Lab	02	30

Programme/Class: Certifi	icate Year: First
	Subject: STATISTICS
Course Code:-	Course Title: Statistical Methods &
	Probability Theory
Course outcomes:	The state of the s

After completing this course a student will have:

- ✓ Knowledge of Statistics, its scope and importance in various fields.
- ✓ Ability to understand concepts of sample vs. population and difference between different types of data.
- ✓ Knowledge of methods for summarizing data sets, including common graphical tools (such as box plots, histograms and stem plots). Interpret histograms and boxplots.
- ✓ Ability to describe data with measures of central tendency and measures
  of dispersion.
- ✓ Ability to understand measures of skewness and kurtosis and their utility
  and significance.
- ✓ Gain knowledge about Indian Official Statistics.

	Credits:04	Core: E	lective
	Max.Marks:75+25	Min. Passing Marks:	
т		ls-Practical(in hours per week):	4-0-0.
Unit	Торі	C - A DI CACH STONE	No. of Lectures
Dane	r I:STATISTICAL METH	ODS & PROBABILITY THI	EORY
I	Qualitative & Quantitat Nominal, Ordinal, Interv	Statistics, Statistical data: ive. Scales of measurement: val and Ratio. Organization of Diagrammatic and Graphical	04
п	Measures of dispersion Mean Deviation, Varian Mean Square Deviation Moments, Factorial	Mathematical and Positional), Range, Quartile Deviation, ice, Standard Deviation, Roof, Coefficient of Variation, moments, Skewness and corrections and Charlier's	08

Ш	Meaning of Correlation, Scatter diagram, Karl Pearson's Coefficient of Correlation. Assumptions Underlying Karl Pearson's Correlation Coefficient. Correlation coefficient for a Bivariate Frequency Distribution. Linear regression, Properties of Regression Coefficients.	05
IV	Index Numbers: Definition, problems involved in the construction of index numbers, Characteristics and uses of index Numbers. calculation of index numbers simple aggregate method, weighted aggregate method. value index numbers, price and quantity index numbers, Laspeyre's, Paasche's, Marshall Edgeworth and Fisher's index numbers.  Vital Statistics: Introduction, measurements of population, rates and ratios of vital events Measurement of mortality: CDR, SDR (w.r.t. Age and sex), IMR, Standardized death rates Measurement of fertility and reproduction: CBR GFR and TFR.  Educational Statistics: Scaling individual test item in terms of difficulty, sigma scaling, Z score and Z-scaling, standard scores, normalized scores, T-scores, uses of T-scores, comparison of T-scores and standard scores, percentile scores, scaling of rankings in items of normal probability curve, Reliability of Test scores, methods of determining test reliability, validity of test scores, methods of calculation of validity.	09
	The second of th	vá
v	Indian Statistical System: Present official Statistical System in India, Methods of collection of official Statistics, their reliability and limitation and the principal publications containing such statistics on the topics- population, agriculture, industry, trade, price, labour and employment, transport and communication, banking and finance.	04
VI	Probability Theory Introduction: Brief History, Basic Terminology, and Mathematical (or Classical or 'a Priori') Probability- limitation of Mathematical Probability. Statistical (or Empirical) Probability, Limitation of Empirical Probability. Subjective Probability. Mathematical tools: Preliminary Notations of sets- Elements of	06

		1 1
	sets, Operation on sets, Algebra of sets. Axiomatic approach to probability- Random experiment Sample Space and Elementary events, Acceptable assignment of probabilities, Natural assignment of probabilities, Axiomatic Probability, Algebra of Events.	
VII	Some Theorems on Probability-Addition theorem of Probability, Extension of Addition theorem of Probability to n Events, Boole's Inequality Conditional Probability, Multiplication Theory of Probability for Independent Events.	06
	Extension of Multiplication theorem of Probability to n Events, Pair Wise Independent Events, Mutually Independent events, Probability of Occurrence of at least one of the events. Bayes' Theorem (without proof).	
VIII	Random variables: Discrete and Continuous. Distribution functions, probability mass function, and probability density function. Joint distribution of two random variables- marginal and conditional distribution, Independence of two random variables. Transformation of random variables. Expectation-theorem on expectation of sum of random variables and product of independent random variables. Conditional Expectation.	
IX	Moments and Moment Generating function, Cumulant Generating function, Characteristic function, Uniqueness and Inversion Theorems (without proof). Chebyshev's inequality, Weak Law of Large numbers (without proof) and Central Limit	04
X	Theorem (without proof).  Bernoulli distribution and its moments, Binominal distribution: Moments, recurrence relation for the moments, moment generating function (m.g.f.), additive property, characteristics function (c.f.), cumulants, probability generating function (p.g.f.) and recurrence relation for the probabilities of Binominal distribution, Poisson Distribution: Poisson distribution as a limiting case of Binominal distribution, moments, mode, recurrence relation for moments, m.g.f., c.f., cumulants and p.g.f. of poison distribution, additive property of independent poisson variates. Discrete uniform distribution, Continuous uniform distribution: Moments, m.g.f. characteristic	06

	function and mean deviation.	
		4
XI	Normal distribution as a limiting form of binominal distribution, chief characteristic of Normal distribution: mode, median, m.g.f., c.g.f. and moments of Normal distribution, a linear combination of independent normal variates, points of inflexion, mean deviation about mean, area property of Normal distribution, importance and fitting of normal distribution.	0

Suggested Readings:

- 1. Fundamentals of Mathematical Statistics: S. C. Gupta and V. K. Kapoor.
- 2. Fundamentals of Statistics Vol- I: A. M. Goon, M. K. Gupta and B.Dasgupta.
- 3. New Mathematical Statistics: Bansi Lal and S.Arora.
- 4. Basic Statistics: B. L. Aggarwal.
- 5. Programmed Statistics: B. L.Aggarwal.
- 6. An Introduction to Theory of Statistics: G. Udny, M. G, Kendal.
- 7. Guide to current Indian Official Statistics, Central Statistical Office, GOI, NewDelhi.

Suggested OnlineLinks/Readings:

- http://heecontent.upsdc.gov.in/SearchContent.aspx
- https://swayam.gov.in/explorer?searchText=statistics
- https://nptel.ac.in/course.html
- https://www.edx.org/search?q=statistics
- https://www.coursera.org/search?query=statistics&

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:

This course can be opted as a minor elective by the students of following subjects:

Open to all(OtherFaculty)

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluations hall be based on allotted Assignment and Class Tests. The marks shall be as follows:

Assignment  S Test-I	1000	(10 marks)
ss Test-II		(10 marks)
Programme/Class: Certificate in Elementary Statistics	Year: Fir	st
Subj	ect: STATISTICS	
Course Code:-	Course Title:	Statistical Methods Lab
		Jul 10108/20
	Chry	10/8/20
	par is a complete, representation of the second representation of the second Virginia of the second	Jan Bridge

rogramme/Class: Diploma	Year: Second	
	Subject: STATISTICS	,
irse Code:-	Course Title: Statistical Inference, Samplin Techniques & Design of Experiments	ıg
and confidence, p value etc. Ability to understand the co. Ability to understand under sample and large sample te tests).  Ability to understand the difference of the concept of discuss characteristics of a second of the concept of	dent will have: a null and alternative hypotheses, two-tailed and as, significant and insignificant, level of significant and situations one would conduct the small as (in case of one sample and two sample and two sample and two sample and two sample and insignificant and interval Estimation and ood estimator.  The Point and Interval Estimation and ood estimator. The Sampling distributions are distributions of the sum and mean. The and chi-square distribution and to identify the distributions. The sic concepts of Sampling Techniques. The sampling methods like Simple Random and insignificant and insignificant, level of Sampling along with Ratio and mation The sic concepts of Design of Experiment and Designs	cance
Credits:0  Max.Marks:75	Min. Passing Marks:	Special Control
Total No. of Lecture	-Tutorials-Practical(in hours per week):4-0-0.	100
7. W. J. Lee, N.	Topic Lectures	
Unit Statistical Inference, Sampling	g Distributions and their related test of Signifi d Design of Experiments	cance

1		
I	Point Estimation: Introduction, Estimators and Estimate. Characteristics/Properties of Estimators: Unbiasedness, Consistency, Efficiency- Most Efficient Estimator, Minimum Variance Unbiased (MVU) Estimators, Sufficiency- Factorization Theorem (Neyman).	02
II	Method of Estimation: Method of Moments, Method of minimum Chi-Square, Method of Maximum Likelihood Estimation, Properties of Maximum Likelihood Estimators, Method of Minimum Variance, Method of Least Squares.	04
Ш	Testing of Hypothesis: Statistical Hypothesis-Simple and Composite, Test of a Statistical Hypothesis, Null Hypothesis, Alternative Hypothesis, Critical Region, Two Type of Errors, Level of Significance, Power of the Test, Steps in Solving Testing of Hypothesis Problem, Optimum Test Under Different Situations-Most power test(MP test), Uniformly Most Powerful Test(UMP test), Neyman and Pearson Lemma and its	04
īV	application in testing simple Vs Simple hypothesis.  Interval Estimation: Confidence Interval and Confidence limits-concept of best confidence intervals, Confidence Intervals for Large Samples.	02
v	Exact sampling distribution: definition and derivation of $p.d.f.$ of $\chi^2$ with n degrees of freedom(d.f) using m.g.f., nature of $\chi^2$ curve for different degrees of freedom, mean, variance, m.g.f., cumulative generating function, mode additive property and limiting form of $\chi^2$ distribution.	04
VI	Exact sampling distributions- Student's t and Fisher t-distribution, Derivation of its p.d.f., nature of probability curve with different degrees of freedom, mean, variance, moments and limiting form of t distribution. Snedecore's F-distribution: Derivation of p.d.f., Probability curve with different degrees of freedom, mean variance and mode. Distribution of 1/F (n1,n2). Relationship between t, F and $\chi$ 2 distributions.	04

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VII	Tests of Significance for Large Sampling of Attributes- Test of Significance for Single	
1	Proportion, Test of Significance for Difference of	04
	Proportions, Sampling of Variables- Unbiased	
	Estimate for Population mean( $\mu$ ) and variance( $\sigma$ 2),	
	Standard Error of Sample Mean, Test of Significance	
1	for Single Mean, Test of Significance for Difference	
	of Means, Test of Significance the Difference of	
Fire Live	Standard Deviations, Test of Independence of	
	Attributes- Contingency Tables.	-
	Test of Significance for Small Samples: Test for	
	Single Variance, $\chi^2$ - test of Homogeneity of	04
VIII	Correlation Coefficients, Bartlett's Test for	. 04
·	Homogeneity of Several Independent Estimates of the	
	Same Population Variance, t-test for Single Mean, 1-	
	test for Difference of Means, Paired t-test for	
	Difference of Means, t-teat for Testing the	
	Significance of an Observed Sample Correlation	
	Coefficient E-test for Equality of Two Population	
	Variances, F-test for the equality of k population	
IX	- to tests: Introduction and Comparison	
2.	Toste The Single Salliple Case	*
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	- A TOOK INC DAILIDIO TOOLS	
	I	
-	Measures or Paired Replicates- The Sign Test, The Wilcoxon Signed Ranks Test. Two Independent Wilcoxon Signed Ranks Test for Two Independent	
	Samples- The Chi-Square Test for Vilcoxon-Mann-Samples, The Median Test, The Wilcoxon-Mann-Samples, The Median Test, The Wilcoxon-Mann-Samples and Median Test for Vilcoxon-Mann-Samples and Median Te	
	Samples, The Median Test, The Whosters Whitney Test, and The Kolmogorov- Smirnov Two-	
	Sample Test.	
		02
IX	Type of Sampling- Purposive Samplings	
	a title maling Parameter allu Statistic	
	Triate hutton of Statistic, Statistic Diagram	
	a ting we complete enumeration, sampling unto	
	frame sampling and non-sampling citois,	
	precision and efficiency of sampling estimators.	First Control of the Control
X	Simple random sampling with and without	
	replacement, definition and procedure of selecting a	04
	sample, Estimates of: population mean, total and	
	proportion, variance of these estimates, estimates of their variances and sample size determination.	
A Park Sand	their variances and sample size determination.	

XI	Stratified random sampling: Technique, estimates of population mean and total, variances of these estimates, proportional and optimum, Neyman allocations and their comparison with SRS. Practical difficulties in allocation, estimation of gain in precision, post stratification and its performance. Systematic sampling: Technique, estimates of population mean and total, variances of these estimates(N=nk). Comparison of systemic sampling with SRS and stratified sampling in the presence of linear trend.	04
XII	Introduction to Ratio and regression methods of estimation, first approximation to the population mean and total (for SRS of large size), variance of these estimates and estimates of these variances, variances in terms of correlation coefficient for regression method of estimation and their comparison with SRS.	04
XIII	Introduction to Analysis of Variance (ANOVA) and Definition, Causes of Variation Classification of ANOVA, one way classification with one observation per cell, One way classification with 'm' observations per cell, Two way classification with one observation per cell: Mathematical model, Sum of squares for various causes of variation, Expected value of Sum of Squares, Degrees of freedom for Sum of Squares, ANOVA Table and related tests of Significance.	06
XIV	Design of Experiments: Introduction, need and principles of design of experiments- Replication, Randomization and Local control and their importance in Design Theory. Completely randomized design- Layout, Statistical Analysis and Efficiency Comparisons with other designs. Randomized Block Design- Layout, Statistical Analysis and Efficiency Comparisons with other designs. Latin square Design-Layout, Statistical Analysis and Efficiency Comparisons with other designs.	06

#### Suggested readings:

1. Design and Analysis of Experiments: M.N. Das and N.C. Giri.

2. Fundamentals of Statistics. Vol.II: A.M. Goon, M.K. Gupta and B.Dasgupta.

3. Applied Statistics: P. Mukhopadhyay.

4. Fundamental of Applied Statistics: S.C. Gupta and V.K. Kapoor

ampling Techniques: W.G.Cochram ampling Theory: Des Raj and Chandok

Sample Theory of Surveys with Applications: V.G. Panse and P.V.Sukhatme.

. Sampling Techniques: Daroga Singh and F.S. Chaudhary

9. Survey Sampling: P. Mukhopadhyay

#### Suggested OnlineLinks/Readings:

- http://heecontent.upsdc.gov.in/SearchContent.aspx
- https://swayam.gov.in/explorer?searchText=statistics
- https://nptel.ac.in/course.html
- https://www.edx.org/search?q=statistics
- https://www.coursera.org/search?query=statistics&

This course can be opted as a minor elective by the students of following subjects:

Open to all(OtherFaculty)

#### Suggested Continuous Evaluation Methods:

Continuous Internal Evaluations hall be based on allotted Assignment and Class Tests. The marks shall be as follows:

Quiz/Assignment	(05 marks)
Class Test-I	(10 marks)
	(10 marks)

Programme/Class: Diploma	Year: Second
	Subject: STATISTICS
Course Code:-	Course Title: Sampling Survey, ANOVA, Design of Experiments and Sampling Distributions Lab

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