Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur 440033

Scheme and Syllabus
Bachelor of Science (Statistics)

Submitted by
Board of Studies
Bachelor of Science (Statistics)

FYUGP-Scheme I-VIII Semester
Bachelor of Science (Honors/Research)
(STATISTICS - Major)
Four Year (Eight Semester Degree Course)
Teaching and Examination Scheme

B.Sc. Sem-I (STATISTICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
								Theory				Practical		
				(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Probability Theory	BST1T01	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Probability Theory	BST1P01	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Descriptive Statistics	BST1T02	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Descriptive Statistics	BST1P02	-	-	2	1	-	-	-	-	-	50	25
5	GE/OE	Refer GE/OE Basket	BGO1T01	2	-	-	2	3	80	20	40	-	-	-
6	GE/OE	Refer GE/OE Basket	BGO1T02	2	-	-	2	3	80	20	40	-	-	-
7	VSC	R For Beginners	BVS1P01	-	-	4	2	-	-	-	-	50	50	50
8	SEC	Refer SEC Basket	BVS1P02	-	-	4	2	-	-	-	-	50	50	50
9	AEC	English Compulsory	BAE1T01	2	-	-	2	3	50	50	40	-	-	-
10	VEC	Environmental Sci.	BVE1T01	2	-	-	2	3	80	20	40	-	-	-
11	IKS	Vedic Mathematics	BIK1T01	2	-	-	2	3	80	20	40	-	-	-
12	CC	Refer CC Basket	BCC1P01	-	-	4	2	-	-	-	-	-	100	50
Total				14	-	16	**22**		**530**	**170**		**125**	**275**	

B.Sc. Sem-II (STATISTICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Probability distributions	BST2T03	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Probability distributions	BST2P03	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Economic Statistics	BST2T04	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Economic Statistics	BST2P04	-	-	2	1	-	-	-	-	-	50	25
5	GE/OE	Refer GE/OE Basket	BGO2T03	2	-	-	2	3	80	20	40	-	-	-
6	GE/OE	Refer GE/OE Basket	BGO2T04	2	-	-	2	3	80	20	40	-	-	-
7	VSC	Excel for beginners	BVS2P03	-	-	4	2	-	-	-	-	50	50	50
8	SEC	Refer SEC Basket	BVS2P04	-	-	4	2	-	-	-	-	50	50	50
9	AEC	Second Language	BAE2T02	2	-	-	2	3	50	50	40	-	-	-
10	VEC	Constitution of India	BVE2T02	2	-	-	2	3	80	20	40	-	-	-
11	IKS	Indian Astronomy	BIK2T02	2	-	-	2	3	-	-	-	50	50	50
12	CC	Refer CC Basket	BCC2P02	-	-	4	2	-	-	-	-	-	100	50
Total				14	-	16	**22**		**530**	**170**		**125**	**275**	

Exit option: Award of UG Certificate in Major with 40-44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor

B.Sc. Sem-III (STATISTICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
								Theory				Practical		
				(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Statistical Methods	BST3T05	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Statistical Methods	BST3P05	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Applied Statistics	BST3T06	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Applied Statistics	BST3P06	-	-	2	1	-	-	-	-	-	50	25
5	Minor	Minor 1 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
6	Minor	Minor 1 (Refer Minor Basket)		-	-	2	1	-	-	-	-	25	25	25
7	Minor	Minor 2 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
8	Minor	Minor 2 (Refer Minor Basket)		-	-	2	1	-	-	-	-	-	50	25
9	GE/OE	Refer GE/OE Basket	BGO3T05	2	-	-	2	3	80	20	40	-	-	-
10	VSC	Refer VSC Basket	BVS3P05	-	-	4	2	-	-	-	-	50	50	50
11	AEC	Second Language	BAE3T03	2	-	-	2	3	50	50	40	-	-	-
12	FP	Field Project	BFP3P01	-	-	4	2	-	-	-	-	50	50	50
13	CC	Refer CC Basket	BCC3P03	-	-	4	2	-	-	-	-	-	100	50
Total				12	-	20	**22**		**450**	**150**		**150**	**350**	

B.Sc. Sem-IV (STATISTICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
								Theory				Practical		
				(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Statistical Inference	BST4T07	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Statistical Inference	BST4P07			2	1	-	-	-	-	25	25	25
3	DSC	SQC&LPP	BST4T08	2	-	-	2	3	80	20	40	-	-	-
4	DSC	SQC&LPP	BST4P08			2	1	-	-	-	-	-	50	25
5	Minor	Minor 3 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
6	Minor	Minor 3 (Refer Minor Basket)				2	1	-	-	-	-	25	25	25
7	Minor	Minor 4 (Refer Minor Basket)		2	-		2	3	80	20	40	-	-	-
8	Minor	Minor 4 (Refer Minor Basket)				2	1	-	-	-	-	-	50	25
9	GE/OE	Refer GE/OE Basket	BGO4T06	2	-	-	2	3	80	20	40	-	-	-
10	SEC	Refer SEC Basket	BVS4T06	-	-	4	2	-	-	-	-	50	50	50
11	AEC	Compulsory English	BAE4T03	2	-	-	2	3	50	50	40	-	-	-
12	CEP	Community Service	BCM4P01	-	-	4	2	-	-	-	-	50	50	50
13	CC	Refer CC Basket	BCC4P04	-	-	4	2	-	-	-	-	-	100	50
Total				12	-	20	**22**		**450**	**150**		**150**	**350**	

Exit option; Award of UG Diploma in Major and Minor with 80-88 credits and an additional 4 credits core NSQF course/ Internship ORContinue with Major and Minor

B.Sc. Sem-V (STATISTICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
								Theory				Practical		
				(Th)	TU	P		Exam Hrs.	SEE	CIE	Min	SEE	CIE	Min.
1	DSC	Nonparametric Methods & Survival Analysis	BST5T09	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Nonparametric Methods & Survival Analysis	BST5P09	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Sampling survey Techniques and Indian Official Statistics	BST5T10	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Sampling survey Techniques and Indian Official Statistics	BST5P10	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Industrial Process and Quality Control	BST5T11	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Industrial Process and Quality Control	BST5P11	-	-	2	1	-	-	-	-	25	25	25
7	DSE	Elective 1	BST5T12	3	-	-	3	3	120	30	60	-	-	-
8	DSE	Elective 1	BST5P12	-	-	2	1	-	-	-	-	-	50	25
9	Minor	Minor 5 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
10	Minor	Minor 5 (Refer Minor Basket)		-	-	2	1	-	-	-	-	25	25	25
11	Minor	Minor 6 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
12	Minor	Minor 6 (Refer Minor Basket)		-	-	2	1	-	-	-	-	-	50	25
13	VSC	Refer VSC Basket	BVS5P07	-	-	4	2	-	-	-	-	50	50	50
14	CEP	Community Service	BCM5P02	-	-	2	1	-	-	-	-	25	25	25
Total				**13**	**-**	**18**	**22**	**-**	**520**	**130**	**--**	**150**	**300**	**-**

B.Sc. Sem-VI (STATISTICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
								Theory				Practical		
				(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Operations Research	BST6T13	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Operations Research	BST6P13	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Experimental designs	BST6T14	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Experimental designs	BST6P14	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Estimation Theory	BST6T15	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Estimation Theory	BST6P15	-	-	2	1	-	-	-	-	25	25	25
7	DSE	Elective 2	BST6T16	3	-	-	3	3	120	30	60	-	-	-
8	DSE	Elective 2	BST6P16	-	-	2	1	-	-	-	-	-	50	25
9	Minor	Minor 7 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
10	Minor	Minor 7 (Refer Minor Basket)		-	-	2	1	-	-	-	-	25	25	25
11	VSC	Refer VSC Basket	BVS6P08	-	-	4	2	-	-	-	-	50	50	50
12	OJT	Internship (Related to DSC)	BOJ6P01	-	-	8	4	-	-	-	-	100	100	100
Total				11	-	22	**22**		**440**	**110**		**225**	**325**	

Exit option: Award of UG Degree in Major with 120-132 credits OR Continue with Major and Minor

B.Sc. Sem-VII (Honors) (STATISTICS - Major)

S N	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Linear &non linear Modelling I	BST7T17	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Linear &non linear Modelling I	BST7P17	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Computational Statistics I	BST7T18	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Computational Statistics I	BST7P18	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Industrial Statistics	BST7T19	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Industrial Statistics	BST7P19	-	-	2	1	-	-	-	-	25	25	25
7	DSC	Testing Of Hypothesis	BST7T20	2	-	-	2	3	80	20	40	-	-	-
8	DSC	Testing Of Hypothesis	BST7P20	-	-	2	1	-	-	-	-	-	50	25
9	DSE	Elective 3	BST7T21	3	-	-	3	3	120	30	60	-	-	-
10	DSE	Elective 3	BST7P21	-	-	2	1	-	-	-	-	25	25	25
11	RM	Research Methodology	BST7T22	2	-	-	2	3	80	20	40	-	-	-
12	RM	Research Methodology	BST7P22	-	-	4	2	-	-	-	-	50	50	50
Total				13	-	14	**20**		**520**	**130**		**125**	**225**	

B.Sc. Sem-VIII (Honors) (STATISTICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Linear &non linear Modelling II	BST8T23	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Linear &non linear Modelling II	BST8P23	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Computational Statistics II	BST8T24	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Computational Statistics II	BST8P24	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Mathematical Programming	BST8T25	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Mathematical Programming	BST8P25	-	-	2	1	-	-	-	-	25	25	25
7	DSC	Sampling Theory	BST8T26	2	-	-	2	3	80	20	40	-	-	-
8	DSC	Sampling Theory	BST8P26	-	-	2	1	-	-	-	-	-	50	25
9	DSE	Elective 4	BST8T27	3	-	-	3	3	120	30	60	-	-	-
10	DSE	Elective 4	BST8P27	-	-	2	1	-	-	-	-	25	25	25
11	OJT	Apprenticeship (Related to DSC)	BOJ8P02	-	-	8	4	-	-	-	-	100	100	100
Total				11	-	18	**20**		**440**	**110**		**175**	**275**	

Four Year UG Honours Degree in Major and Minor with 160-176 credits

B.Sc. Sem-VII (Research) (STATISTICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
								Theory				Practical		
				(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Linear &non linear Modelling I	BST7T17R	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Linear &non linear Modelling I	BST7P17R	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Computational Statistics I	BST7T18R	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Computational Statistics I	BST7P18R	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Mathematical Programming	BST7T19R	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Mathematical Programming	BST7P19R	-	-	2	1	-	-	-	-	25	25	25
7	DSE	Elective 3	BST7T20R	3	-	-	3	3	120	30	60	-	-	-
8	DSE	Elective 3	BST7P20R	-	-	2	1	-	-	-	-	-	50	25
9	RM	Research Methodology	BST7T21R	2	-	-	2	3	80	20	40	-	-	-
10	RM	Research Methodology	BST7P21R	-	-	4	2	-	-	-	-	50	50	50
11	RP	Research Project/ Dissertation (Core)	BRP7P01	-	-	6	3	-	-	-	-	75	75	75
Total				11	-	18	**20**		**440**	**110**		**175**	**275**	

'R' in the subject code indicates 'Research'.

B.Sc. Sem-VIII (Research) (STATISTICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
								Theory				Practical		
				(Th)	TU	P		Exam Hrs.	SEE	CIE	Min	SEE	CIE	Min
1	DSC	Linear &non linear Modelling II	BST8T22R	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Linear &non linear Modelling II	BST8P22R	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Computational Statistics II	BST8T23R	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Computational Statistics II	BST8P23R	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Sampling Theory	BST8T24R	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Sampling Theory	BST8P24R	-	-	2	1	-	-	-	-	25	25	25
7	DSE	Elective 4	BST8T25R	3	-	-	3	3	120	30	60	-	-	-
8	DSE	Elective 4	BST8P25R	-	-	2	1	-	-	-	-	-	50	25
9	RP	Research Project / Dissertation (Core)	BRP8P02	-	-	14	7 (4+2 +1)	-	-	-	-	175	175	175
Total				09	-	22	**20**		**360**	**90**		**225**	**325**	

'R' in the subject code indicates 'Research'.

Four Year UG Honours with Research Degree in Major and Minor with 160-176 credits

Total Credits:

1. Three Year UG Degree Program: 132
2. Four Year UG Degree Program: 172

Abbreviations: Generic/Open Electives: OE, Vocational Skills & Skill Enhancement Courses: VSEC, Vocational Skill Courses: VSC, Skill Enhancement Courses: SEC, AbilSTy Enhancement Courses: AEC, Indian Knowledge Systems: IKS, Value Education Courses: VEC, On Job Training (Internship/Apprenticeship): OJT, Field Project: FP, CommunSTy Engagement & Service: CEP, Co-curricular Courses: CC, Research Methodology: RM, Research Project: RP

VSC Basket (Statistics)

Semester	Course Category	Name of Course	BoS	Course Code
I	**VSC**	R For Beginners2	Statistics	**BVS1P01**
II	**VSC**	Excel for beginners	Statistics	**BVS2P03**
III	**VSC**		Statistics	**BVS3P05**
V	**VSC**		Statistics	**BVS5P07**
VI	**VSC**		Statistics	**BVS6P08**

Basket for ELECTIVE (DSE) Category Courses (STATISTICS)

Semester	Course Category	Name of Course	Course Code
V	Elective 1	A. Statistical Computing Using C/C++ programming B. Survival analysis	BST5T12
VI	Elective 2	A Data Mining B. Stochastic Models in Finance	BST6T16
VII (Honors)	Elective 3	A. Demography B. Actuarial Statistics	BST7T21
VIII (Honors)	Elective 4	A. Time series Analysis B. Bioassay	BST8T27
VII (Research)	Elective 3	A. Demography B. Actuarial Statistics	BST7T20R
VIII (Research)	Elective 4	A. Time series Analysis B. Bioassay	BST7T25R

'R' in the subject code indicates 'Research'.

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Faculty of Science & Technology

Programme: B. Sc. (Statistics)

STATISTICS - MAJOR

B Sc SEM I & SEM II Syllabus

Sr Number	Semester	Course Code	Course Category	Name of course	Credits
1	I	BST1T01	DSCI	Probability Theory	2
2	I	BST1T02	DSCII	Descriptive Statistics	2
3	II	BST1T03	DSCIII	Probability Distributions	2
4	II	BST1T04	DSCIV	Economic Statistics	2

STATISTICS - MAJOR

POs

At the time of graduation, Students will be able to

PO1.Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO2.Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
PO3. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO5. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
PO7. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

PSOs:

Upon completion of the program, students would be able to

1. recall basic facts about statistics and should be able to display knowledge of conventions such as notations,terminology.
2. get adequate exposure to global and local concerns that explore them many aspects ofmathematical sciences.
3. Be equipped with statistical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
4. apply their skills and knowledge that is translate information presented verbally into statistical form, select and use appropriate statistical formulae or techniques in order toprocess the information and draw the relevant conclusion.
5. develop a positive attitude towards statistics as an interesting and valuable subject of study.
6. acquire basic knowledge of diagrammatic & graphical representation of Data with and without software.

STATISTICS
SEMESTER I

SUBJECT: STATISTICS
B.Sc.– I SEMESTER – I
Paper I
CODE - BST1T01

DSC I - PROBABILITY THEORY (2 CREDITS – 30 Hrs)

OBJECTIVES

A majority of topics in Statistics depend upon a strong foundation of Probability theory It also serves as base for applied probability theory. Another basic concept is that of a random variable , its distribution and associated properties. This course includes topics like Conditional probability, Baye's theorem,p.m.f., p.d.f., moments,etc.

OUTCOMES:

Students acquire knowledge about : independence of random variables, applications of Bayes' theorem, expectation of a random variable, etc.

Unit-I (7 Hrs)

(A) Important concepts in Probability: Definition of Probability,Classical and relative frequency approach to Probability. Richard Von Mises, Cramer and Kolmogorov's approaches to Probability, merits and demerits ofthese approaches. Only general ideas to be given.

(B) Random Experiment: Trial, sample point and sample space, definition of an event, operation of events, mutually exclusive and exhaustive events. Discrete sample space, properties of Probability based on axiomaticapproach.

Unit-II (7 Hrs)

(A) Conditional Probability: Independence of events, pairwise and mutual independence,theoremson independence.

(B) Bayes' theorem: Theorem and its applications. Chebyshev's inequality and applications with problems.

Unit-III (8 Hrs)

(A) Random variables: Definition of discrete random variables, ,idea of continuous random variable,

Probability mass function, Probability density function,

(B) Probability density function: Illustrations of random variables and its properties,expectation of a randomvariable and its properties.

Unit-IV (8 Hrs)

A) Moments: Measures of location, dispersion, skewness and kurtosis

(B) Probability generating function (if it exists): Moment generating function, their properties and uses

PRACTICALS ON PAPER I (I Credit)(15 Hrs)	
Sr Number	**Title of the practical**
1	Evaluation of Probabilities usingaddition theorems
2	Evaluation of Probabilities using multiplication theorems
3	Evaluation of Probabilities using concepts of counting technique
4	Problems on independence ofevents, pairwise independence ,Mutual independence
5	Problems on probabilities usingBayes' theorem.
6	Exercises on mathematical expectations
7	Finding measures of centraltendency,

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2. Edward P.J, Ford J.S And Lin(1974): PROBABILITY FOR STATISTICALDECISION MAKING,PRENTICE HALL
3. **Goon A. M,Gupta M. K, Das Gupta,B (1999):** Fundamentals OfStatistics, Vol Ii, World Press, Calcutta**.**
4. Mood A.M,Graybill F.A And Boes D.C (1974): INTRODUCTION TO THEORY OF STATISTICS, Mcgraw HILL.
5. Freund J. E: Mathematical Statistics (Prentice Hall India)
6. P. L. Meyer: Introductory Probability and Statistical Applications, (Oxford and IBH)
7. SudhaPurohit, GoreS.D., Deshmukh S. R: 'Statistics Using R' (Narosa)
8. Walpole Ronald E.: INTRODUCTION TO STATISTICS, Macmillan,
9. KVS Sarma, Statistics Made Simple: Do it yourself on PC (PHI)

SUBJECT: STATISTICS

B.Sc. – I SEMESTER – I Paper II

CODE - BST1T02

DESCRIPTIVE STATISTICS (2 CREDITS – 30 Hrs)

OBJECTIVES:

Students acquire knowledge about analysis of quantitative data, concepts central tendency , dispersion,etc.

OUTCOMES:

Students learn various measures of dispersion, correlation coefficient, measures ofcentral tendency and theirapplications

Unit-I (7 Hrs)

(A) Analysis of Quantitative data: Uni-variate data - Concepts of central tendency and location, Measures of central tendency: Mean, Median and Mode, Geometric Mean and Harmonic mean (Definitions, merits and demerits, properties, theoretical problems), weighted averages

Unit-II (7 Hrs)

(B) Concepts of dispersion, Measures of dispersion: Range, Mean Deviation, Quartile deviation andstandard deviation (Definitions, merits and demerits and properties), Measures of and relative dispersion: coefficient of dispersion and coefficient of variation, Moments: Rawand Central moments, expression for central moments in terms of raw moments, Sheppard's corrections for moments for grouped data (without derivation

Unit-III (8 Hrs)

(C) Partition values: Quartiles, Deciles, Percentiles (definition, formulae and procedure for finding these values graphically), Concepts of skewness and kurtosis and their measures including those based on quantiles),Box plot, q-q plot and their use in describing data.

Unit-IV (8 Hrs)

(D) Bivariate Data: Scatter diagram, Product moment correlation coefficient and its properties. Coefficient of determination (ANOVA APPROACH). Concepts of error in regression (NORMALITY OF ERRORS).

Principle of least squares. Fitting of linear regression and related results. Rank correlation—Spearman's andKendall's measures.

PRACTICALS ON PAPER II (I Credit) (15 Hrs)	
Sr Number	**Title of the practical**
1	Calculation of various Measures of central tendency and Dispersion
2	Calculation of various Measures of Dispersion
3	Calculation of Quartiles and drawing box plots (Manually).
4	Calculation of Quartiles and drawing box plots (Manually).
5	Calculation of Measures of dispersion, skewness and kurtosis
6	Problems on calculation of coefficient of correlation
7	Problems on calculation of coefficient of rank correlation
8	Problems on fitting of lines of regression.

REFERENCES:

1 **Bhat B.R,Srivenkataramana T And RaoMadhava K.S(1997): STATISTICS: A BEGINNER'S TEXT,VOLI,NEW AGE INTERNATIONAL (P) LTD.**

2. Goon A. M,Gupta M. K, Das Gupta,B (1999): FUNDAMENTALS OF STATISTICS, VOL I, WORLD PRESS, CALCUTTA.

3. CroxtonF.E,Cowden D.J And Kelin S(1973): APPLIED GENERAL STATISTICS, PRENTICE HALL OF INDIA

4. Agrawal B. L.: BASIC STATISTICS (New Age International Publishers)

5. Sudha Purohit, GoreS.D., Deshmukh S. R.: Statistics Using R (Narosa)

6 Christian S. Albright, Wayne L. Winston, Zappe Christopher J. : Decision Making using Microsoft Excel(CENGAGE Learning) MS Excel

Vocational Skills Courses (VSC)

	Semester I (VSC)	**For Statistics major**
	Name of the Paper – R for Beginners	
	Paper code - BVS1P01 2 Credits (4 hrs practical per week)	
	List of Practical's	
1	**INTRODUCTION TO R**	
1.1	Introduction	
1.2	R as a statistical software and language	
1.3	R as a calculator	
1.4	R preliminaries	
1.5	Methods of data input	
1.6	Data accessing or indexing	
1.7	Some useful built-in functions	
1.8	Graphics with R	
1.9	Getting help	
1.10	Saving, storing and retrieving work	
2	**DESCRITPIVE STATISTICS**	
2.1	Introduction	
2.2	Diagrammatic representation of data	
2.3	Graphical representation of data	
2.4	Measures of central tendency	
2.5	Measures of dispersion	
2.6	Measures of skewness and kurtosis	
2.7	Selection of representative samples	
2.8	Drawing Histogram using R	
3	**CORRELATION AND REGRESSION ANALYSIS**	
3.1	Introduction	
3.2	Correlation	
3.3	Inference procedures for correlation coefficient	
3.4	Linear Regression	
3.5	Validation of linear regression model	

B.Sc. SEMESTER – I

BVE1T01: ENVIRONMENTAL SCIENCE

COURSE OUTCOMES:

At the end of the course, students shall be able to:

- Explain the basics of Environmental Science and Atmospheric Science along-with the components of Environment
- Explicate the importance of Environmental Education.
- Elucidate the fundamentals of atmospheric science including formation, depletion and effects of ozone layer and acid rain on environment.
- Describe the various physical and chemical characteristics and properties of Water and Soil
- Understand the Ecology and its allied branches
- Comprehend about Population and Community Ecology
- Study the changes in Population by understanding the concept of Population ecology

Unit-I: Basics of Environmental Science (7.5 Hrs)

A. Introduction of Environmental Science: Definition, Types, Classification, Characteristics, Components and principles of environment. Scope and need for environmental science, Multidisciplinary nature of environmental science, Environmental ethics.
B. Environmental Education: Goals, Objectives and principles of environmental education, formal and non-formal environmental education, environmental programme, importance of environmental education, environmental awareness.
C. Components of Environment: Atmosphere (Structure and composition),hydrosphere – distribution of water, hydrological cycle, global water balance, lithosphere – Internal structure of Earth, types of rocks, Biosphere- Boundaries of biosphere.

Unit-II: Basics of Atmospheric Science (7.5 Hrs)

A. Atmospheric Chemistry: Structure of atmosphere based on temperature, photochemical reaction in the atmosphere, temperature inversion and lapse rate, smog formation, types of smog (sulphur and photochemical smog), adverse effect of smog on human being, aerosol.
B. Green House Effect: Greenhouse gases, relative contribution and effects of greenhouse effect, control of greenhouse gases. Ozone depletion: chemistry of ozone depletion, Dobson Unit, ozone depleting substances (ODS), ozone hole, consequences of ozone depletion, mitigation measures and international protocols.
C. Acid Rain: Chemistry of Acid Rain, effect of acid rain on ecosystem, control measures. Precipitation – Forms of precipitation (rain, drizzle, snow, sleet, and hail), types of precipitation (conventional, orographic, and cyclonic).

Unit-III: Basics of Ecology (7.5 Hrs)

A. Ecology: Definition, subdivision and modern branches of ecology, ecology spectrum, scope of ecology. Application and significance of ecology to human beings.
B. Abiotic Factors: Temperature: effect of temperature on plants and animals, Adaptation to meet extreme temperature. Light: Zonation in marine habitat, effects of light on plants and animals, Microclimate and fire, Shelford law of tolerance, Leibigs law of minimum.
C. Biotic Factor: Inter specific relationship Positive: Mutualism (symbiosis), commensalism, proto-cooperation Negative: Parasitism, predation, competition, Antibiosis, Neutralism.

Unit-IV: Ecosystems and food chain (7.5 Hrs)

A. Ecosystem: Definition, structure and function of ecosystem, types of ecosystem: Terrestrial (forest, grassland, desert, cropland), Aquatic (Marine and freshwater)
B. Food chain: Definition & types: Grazing food chain, detritus food chain, and parasitic food chain, food web in forest and grassland ecosystem. Ecological pyramids (number biomass and energy), energy flow in ecosystem (Y- shaped). Energy flow and the law of thermodynamics.
C. Biogeochemical Cycles: Definition, classification, gaseous cycle (oxygen, carbon and nitrogen) Sedimentary cycle (phosphorus and sulphur).

Reference Books:

1. Text Book of Environment: K M Agrawal, P.K. Sikdar, and S.C. Deb, Mc'Millan Publication, Mumbai.
2. Man and Environment: M.C. Dash and P.C. Mishra, Mc'Millan Publication, Mumbai.
3. Environmental Science: S.C. Santra, New Central Book Pvt.Ltd, Kolkatta.
4. Environmental Problems and Solution: D.K. Asthana, S.Chand Publication, New Delhi.
5. Environmental Chemistry: S.S. Dara, S.Chand Publication ,New Delhi.
6. Environmental Chemistry: A.K. Dey, New Age International Publishers,2001.
7. A Textbook of Environmental Studies: Dr S.Satyanarayan, Dr S.Zade, Dr S Sitre and Dr **P.U. Meshram, Allied Publishers, New Delhi.**
8. Environmental Biology: Biswarup Mukherjee, Tata McGraw-Hill Publishing Company Ltd, New Delhi,1996.
9. Animal Ecology and Distribution of Animals: Veer Bala Rastogi , Rastogi Publication, Meerut (U.P).
10. Ecology and Environment: P.D.Sharma, Rastogi Publication ,Meerut (U.P).
11. Fundamentals of Environmental Biology: S. Arora, Kalyani Publishers.
12. Environmental Biology: P.K.G. Nair, Himalaya Publication.
13. Environmental Biology: K.C. Agrawal, Agro Botanical Publisher ,Bikaner,1994

Indian Knowledge System (IKS)

SEM1: VEDIC MATHEMATICS (BIK1T01)

Course Outcomes: This course will enable the students to

1. Improve speed and accuracy in numerical calculations
2. Acquire IQ skills and high-end technical knowledge
3. gain test taking skills & creativity of calculations

UNITS	TOPICS	HOURS
Unit 1	(i)Addition - Subtraction - Combined operations - Beejank (ii) Multiplication methods: Urdhwatiryagbhayam, Nikhilam, Ekanyunen, Ekadhiken, Antyayordashakepi. (iii) Vinculum - Operations. (iv) Awareness of 1 to 5 Vedic sutras as per Shankaracharya Bharthikrishan Teerthji Swamiji's book.	**8**
Unit 2	(i) Division methods : Nikhilam, Paravartya Yojayet, Dhwajank(ii) GCD and LCM (iii) Expression of GCD in terms of two numbers.	**8**
Unit 3	(i) Divisibility tests, Osculation & Reverse osculation. (ii) Division Algorithm, Quotient & Remainder. (iii) Duplex method.	**7**
Unit 4	i) Squares & Square-roots for 6 digit number. (ii) Cubes & Cube-roots for 6 digit number, Contribution of Indian Mathematicians in Arithmetic.	**7**
	TOTAL	**30 HRS**

Reference Books:

1. Tirthaji B.K. (1965) Vedic Mathematics, MotilalBanarsidass
2. Bidder G.P. (1856) On Mental Calculation. Minutes of Proceedings, Institution ofCivil Engineers (1855-56), 15, 251-280
3. Scripture E.W. (1891) American Journal of Psychology. Vol. IV 1-59
4. Mitchell F.D. (1907) American Journal of Psychology. Vol. XVIII 61-143
5. Aitken A.C. (1954) The Art of Mental Calculation: With Demonstrations. Transactions of the Society of Engineers. 45, 295-309
6. Dow A. (1991) A Unified Approach to Developing Intuition in Mathematics, Scientific Research on the Transcendental Meditation and TM-Sidhi Program Vol 5,3386-3398
7. Williams K.R. (1984) Discover Vedic Mathematics. Vedic Mathematics Research Group
8. Nicholas, Williams, Pickles (1984) Vertically and Crosswise. Inspiration Books

STATISTICS

SEMESTER II

SUBJECT: STATISTICS
B.Sc– I SEMESTER–II Paper III

DSC 3 **CODE– BST2T03**

PROBABILITY DISTRIBUTIONS (2 CREDITS – 30 Hrs)

Unit-I (7 Hrs)

(A) Discrete distributions: Discrete Uniform distribution (Finding Mean, Variance),Bernoulli, Binomial, Poisson Finding (Mgf and pgf, Mean, Variance, mode, skewness and kurtosis, recurrence relation for central moments and for probabilities, additive property),

Unit-II (7 Hrs)

Geometric distribution (Finding Mgf and Mean, Variance, Lack of memory property, problems), Negative Binomial Distribution (Finding Mgf and Mean, Variance, problems), and Hypergeometric, (Finding Mean, Variance, problems)

Unit-III (8 Hrs)

Continuous Univariate Probability distributions: Continuous Uniform (Finding Mgf and Mean,Variance), Normal distribution.Properties of normal distribution,Finding Mgf and Mean, mode,

median, Variance, recurrence relation for central moments, skewness and kurtosis, additive property, standardNormal variable, Area property of Normal distribution and Problems based on that.

Unit-IV (8 Hrs)

(A) Continuous Univariate distributions: Exponential (Finding Mgf and Mean, Variance, Lack of memory property), Gamma with one parameter and gamma with two parameters (Finding Mgf and Mean, Variance, Additive property), Beta distributions of both types (Finding r^{th} moment, Mean and variance).

PRACTICALS ON PAPER III (I Credit) (15 Hrs)	
Sr Number	**Title of the practical**
1	Fitting of Binomial distribution (Manually)
2	Fitting of Poisson distribution (Manually)
3	Fitting of Normal distribution
4	Problems on Area Property of Normal distribution
5	Simple problems on Geometric distribution
6	Simple problems on Hypergeometric distribution
7	Simple problems on Negative Binomial distribution

REFERENCES:

1. Bhat B.R, Srivenkataramana T And RaoMadhava K.S. (1997): STATISTICS: A BEGINNER'S TEXT,VOLII,NEW AGE INTERNATIONAL (P) LTD.

2. Edward P.J, Ford J.S And Lin(1974): PROBABILITY FOR STATISTICAL DECISIONMAKING,PRENTICE HALL.

3. Goon A. M,Gupta M. K, Das Gupta,B (1999): FUNDAMENTALS OF STATISTICS, VOL I, WORLDPRESS, CALCUTTA.

4. Mood A.M,Graybill F.A And Boes D.C (1974): INTRODUCTION TO THE THEORY OF STATISTICS,McGRAW HILL.

5. Freund J. E: Mathematical Statistics (Prentice Hall India)

6. SudhaPurohit, GoreS.D., Deshmukh S. R: 'Statistics Using R' (Narosa)
7. Meyer P.L.: INTRODUCTORY PROBABILITY AND STATISTICAL APPLICATIONS (Oxford and IBHPublishing Company)

8. Christian S. Albright, Wayne L. Winston, Zappe Christopher J. : Decision Making using Microsoft Excel (CENGAGE Learning)

9. KVS Sarma, Statistics Made Simple: Do it yourself on PC (PHI)

SUBJECT:

STATISTICS B.Sc.– I

SEMESTER–II Paper IV

DSC 4 CODE– BST2T04

ECONOMIC STATISTICS (2 CREDITS –30 Hrs)

OBJECTIVES:

1. To give the students' knowledge of Index numbers, cost of living index, national income
2. To let the students, know about laws of Demand and Supply and how the market keeps changing in accordance with time

OUTCOMES:

1. Students have gained knowledge about the market statistics, inflation and deflation,consumers priceindex, wholesale price index, etc
2. How to compute National income and understand the purchasing power of money
3. Market demand and price relation, supply and its relation to price, elasticities of priceand effect of timeseries on market

Unit-I (7 Hrs)

(A) Index number: Its definition, applications of index numbers, price relatives and quantityor volume relatives, link and chain relatives, problems involved in computation of index numbers, use of averages, simple and weighted aggregative and simple and weighted average methods, Laspeyre's, Paasche's, Marshall Edgeworth's, Walsch's, Kelly's Drobish Bowley's and Fisher's quantity and price index numbers, Time and Factor reversal tests of index numbers.

Unit-II (7 Hrs)

(B) Base shifting, Splicing of index number series, Consumer Price Index: steps in its construction, methods and uses, Index of Industrial Production: method of construction and itsuses, Wholesale price index number: method of construction and its uses, concept of purchasing power of money, inflation and deflation, Methods of computation of national income.

Unit-III (8 Hrs)

(C) Demand Analysis: Demand and Supply function, Static laws of demand and supply, priceelasticity of demand, price elasticity of supply, Income and cross elasticity of demand. Engel' law and Engel's curves, analysis of income and allied size distribution – Pareto distribution, fitting of Pareto's law, Lorenz curve andGini's coefficient.

Unit-IV (8 Hrs)

(D) Time Series Analysis: Economic time series, its different components, illustrations, additive and multiplicative models, methods of determination of trend, analysis of seasonal fluctuations, methods of construction of seasonal indices. Estimation of elasticity from time series data: Leontief's method, Pigou's method

PRACTICALS ON PAPER IV (I Credit) (15 Hrs)	
Sr Number	**Title of the practical**
1	Construction of price and quantity Index numbers by simple aggregativemethod.
2	Construction of price and quantity Index numbers by weighted aggregative method. Using Laspeyre's, Paasche's, Mashall Edgeworth's, Walsch's, Drobish-Bowley's, Fisher's method and Kelly's fixed weight method.
3	Construction of price indices using simple and weighted average of price relatives using arithmetic mean and geometric mean.
4	Construction of chain base indices.
5	Problems on base shifting of index numbers.
6	Construction of cost-of-living index numbers by (i) aggregateexpenditure method (ii)family budget method.
7	Determination of trend in a time series using moving average method.
8	Determination of trend in a time series using least square method.
9	Construction of seasonal indices using ratio to moving average method.
10	Construction of seasonal indices using ratio to trend method.
11	Construction of seasonal indices using link relative method.
12	Fitting of demand curve / function and Estimation of price elasticity ofdemand from time series data.
13	Fitting of Pareto curve to income data.
14	Fitting of Lorenz curve of concentration.

REFERENCES

1 Croxton F.E and Cowden D.J. (1969): Applied General Statistics, Prentice Hall of India.

2 Goon A.M., Gupta M.K., Das Gupta. B. (1986): Fundamentals of Statistics, Vol.II, World Press, Calcutta

3 Gupta and Mukhopadhyay P.P.: Applied Statistics, Central Book Agency

4 Hooda R P: 'Statistics for Business and Economics'; MACMILAN Business books, third edition

5 Nagar A. L. and Das R. K. : Basic Statistics; Oxford University Press

6 Asthana and Shrivastav: Applied Statistics of India ,Chaitanya Publishing House

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Vocational Skill Courses (VSC) for Sem II

For Statistics major

	Semester II (VSC)
	Name of the Paper - EXCEL for Beginners
	Paper code – BVS2P03 2 Credits (4 hrs practical per week)
	List of Practicals
1	Data Entry, Editing & saving
2	Establishing and copying formulae ,Built in functions – Copy and paste. Find and Replace
3	Sorting - A tool that allows you to arrange data in ascending or descending order. Study of statistical function .
4	Introduction to spreadsheet, reading data, manipulating
5	Basic spreadsheets operations & functions – IF, nested IF, VLOOK UP, H LOOK UP,Functions that allow you to search for specific data in a table and return corresponding values.
6	Pivot Tables- An interactive table that allows you to summarize and analyze large amounts of data.
7	Conditional Formatting - A feature that allows you to control the type of data that can be entered into a cell.
8	Data Validation - A feature that allows you to control the type of data that can be entered into a cell.
9	Filtering - A technique that allows you to display only specific rows of data based on certain criteria.
10	Trend Analysis A technique that allows you to identify patterns and trends in data over time.
11	Charts and Graphs Plotting different type of diagrams (Bar ,subdivided Bar ,multiple bar etc) Visual representations of data that allow you to identify trends and patterns.
12	Plotting Scatter diagram
13	Problems on Calculation of coefficient of Correlation
14	Problems on Calculation of coefficient of rank Correlation
15	Problems on fitting of lines of regression
16	Fitting of Binomial distribution
17	Fitting of Poisson l distribution
18	Fitting of Normal distribution

SEM 2 : CONSTITUION OF INDIA (BVE2T02)

Syllabus

UNIT – I:

- Historical Background to the Framing of the Indian Constitution: General Idea about the Constituent Assembly of India.

UNIT – II

- Preamble – Nature and key concepts/Constitutional values, Socialism, Secularism, Democracy, Justice, Liberty, Equality and Fraternity

- Salient Features of the Constitution of India

UNIT – III

- General study about the kinds, nature and importance of; Fundamental Rights, Directive Principles of State Policy and Fundamental Duties.

UNIT –IV

Introduction of the Constitutional Institutions and Authorities;

- Central Legislature and Executive (Parliament of India, President of India and Council of Ministers)
- State Legislature and Executive (State legislative Assemblies, Governors and Council of Ministers)
- Higher Judiciary (Supreme Court of India and High Courts)

Indian Knowledge System (IKS)

SEM2: INDIAN ASTRONOMY (BIK2T02)

Course Outcomes: This course will enable the students to understand that

1. It is possible to create a map of the intellectual growth of a culture usingastronomy as a probe.
2. The growth of Indian astronomy occurs in distinct stages analogous to phasetransitions of the evolution of cultures
3. Indian Astronomy therefore provides an excellent window to the pastdramatic transitions.

UNITS	TOPICS	HOURS
Unit 1	Astronomy in Prehistoric Era, Astronomy in Vedic Era, Vedang Jyotish, Astronomical References In Religious Scriptures, Astronomies of the West	**8**
Unit 2	Arya Bhatta, Panch Siddhantika of Varahamihira, Surya Siddhanta Varahamihira to Bhaskar Acharya-II, Siddhant Shiromani of Bhaskar Acharya-II, Bhaskar Acharya-II to Jai Singh, Jai Singh and his Observatories.	**8**
Unit 3	After Jai Singh, Interaction with the Astronomies of the World, Modern Era Astronomy , Our Universe, Cosmology	**7**
Unit 4	Panchang Horoscope and Astrology , Siddhantas, Karnas and Koshtakas, Observational Instruments of Indian Astronomy	**7**
	TOTAL	**30 HRS**

Reference Books:

1. The Story Of Astronomy In India, Chander Mohan, Pothi.com
2. Indian Astronomy: An Introduction. Front Cover · S. Balachandra Rao.Universities Press, 2000
3. Astronomy in India: A Historical Perspective, Thanu Padmanabhan,Springer Science & Business Media
4. Hindu Astronomy, W. Brennand, Alpha Editions
5. Origin and Growth of Astronomy in India, https://www.tifr.res.in/~archaeo/FOP/FOP%20pdf%20of%20ppt/Vahia%20Origin% 20of%20Astronomy.pdf