

MAHENDRA ARTS & SCIENCE COLLEGE

(Autonomous)

Affiliated to Perivar University, Salem.

Accredited by NAAC with 'A' Grade & Recognized u/s 2(f) and 12(B) of the UGC Act 1956 Kalippatti - 637 501, Namakkal (Dt), Tamil Nadu.

DEPARTMENT OF STATISTICS

Number of Courses Focusing on Employability/ Entrepreneurship/ Skill Development

Programme : B.Sc., STATISTICS

S.No.	Year	Total No. of Courses	Employability (1)	Entrepreneurship (2)	Skill development (3)	Total No. of Courses (1+2+3)
1	2020-2021	44	15	9	8	32
2	2019-2020	43	14	7	5	26
3	2018-2019	42	15	6	4	25
4	2017-2018	27	7	2	2	11
5	2016-2017	12	4	1	-	5

V. Short Head of the Department

V. SHAMMUGA SUNDARAM, M.Sc., M.Phil., (Ph.D.,) Assistant Professor and Head, Department of Statistics, Mahendra Arts & Science C. lege. Kalippatti, Namr kkal Distrot.



PRINCIPAL

AMENDRA ARTS & SCIENCE COLLEGE

(Autonomous) Kalippatti (PO) - 637 501, Namakkal (Dfr



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DEPARTMENT OF STATISTICS

List of Courses Focusing on Employability/ Entrepreneurship/ Skill Development (Regulations - 2019)

Programme : B.Sc. STATISTICS

S.No.	Course Name	Course Code	Employability	Entrepreneurship	Skill development
1.	Descriptive Statistics	M19UST01	~		*
2.	Practical I : Descriptive Statistics	M19USTP01		√	
3.	Allied I : Mathematics I: Algebra , Integral Calculus and Fourier Series	M19UMMA01	1		
4.	Probability Theory	M19UST02	~		
5.	Practical II: Probability Theory	M19USTP02		√	
6.	Allied II: Mathematics II : Differential Equations and Laplace Transforms	M19UMMA02	~		
7.	Sampling Techniques	M19UST03	1		
8.	Distribution Theory	M19UST04	~		
9.	Allied III: Statistical Economics	M19UCMA03		1	
10.	Practical III : Sampling & Distribution Theory	M19USTP03		√ `	
11.	Quantitative Aptitude	M19USTS01			~
12.	NMEC I : English For Employability - I	M19NEN01	<i>P</i>		~
13.	Estimation Theory	M19UST05	1		
14.	Testing of Hypothesis	M19UST06	~		
15.	Allied IV: Psychological Statistics	M19UCMA04	80 1		~
16.	Practical IV : Estimation & Testing of Hypothesis	M19USTP04	PRINC	SCIENCE COLLEGE	
17.	Statistical Aptitude	M19USTS02	(Autono Caliopatti (PO) - 637	mous) 501. Namakkal (DT)	~

S.No.	Course Name	Course Code	Employability	Entrepreneurship	Skill development
18.	NMEC II : English For Employability - II	M19NEN03			~
19.	Official Statistics	M19UST07	~		
20.	Design of Experiments	M19UST08	~		
21.	Linear Programming and its Applications	M19UST09	\checkmark		
22.	Practical V : Design & Linear Programming	M19USTP05		\checkmark	
23.	Practical V I: Statistical Data Analysis (Lab Oriented)	M19USTP06		1	
24.	Actuarial Statistics	M19USTE01	~		
25.	Non Parametric Test	M19USTE02	~		
26.	Queuing theory	M19USTE03	~		
27.	Statistical Software Packages	M19USTS03			1
28.	Statistical Quality Control	M19UST10	1		
29.	Applied Statistics	M19UST11	~		
30.	Decision Theory and its applications	M19UST12	~		
31.	Practical V II: Applied Statistics & Decision Theory	M19USTP07		~	
32.	Stochastic Processes	M19USTE04	~		
33.	Numerical Analysis	M19USTE05	~		
34.	Regression Analysis	M19USTE06	~		
35.	Project	M19USTPR1		✓	
36.	Statistical Forecasting	M19USTS04	~		

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Head of the Department

V. SHANMUGA SUNDARAM, MSc., M.Phil., (Ph.D...) Assistant Professor and Head, Department of Statistics, Mahendra Arts & Science Cottlege, Katippatti, Name kkal District. PRINCIPAL PRINCI



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DEPARTMENT OF STATISTICS

List of Courses Focusing on Employability/ Entrepreneurship/ Skill Development (Regulations - 2019)

Programme : B.Sc. STATISTICS

S.No.	Name of the Course	Course Code	Employability/ Entrepreneurship/ Skill development	Year of introduction (during the last five years)
1.	Descriptive Statistics	M19UST01	Employability	2019 - 2020
2.	Practical I : Descriptive Statistics	M19USTP01	Entrepreneurship	2019 - 2020
3.	Allied I : Mathematics I: Algebra , Integral Calculus and Fourier Series	M19UMMA01	Employability	2019 - 2020
4.	Probability Theory	M19UST02	Employability	2019 - 2020
5.	Practical II: Probability Theory	M19USTP02	Entrepreneurship	2019 - 2020
6.	Allied II: Mathematics II : Differential Equations and Laplace Transforms	M19UMMA02	Employability	2019 - 2020
7.	Sampling Techniques	M19UST03	Employability	2019 - 2020
8.	Distribution Theory	M19UST04	Employability	2019 - 2020
9.	Allied III: Statistical Economics	M19UCMA03	Entrepreneurship	2019 - 2020
10.	Practical III : Sampling & Distribution Theory	M19USTP03	Entrepreneurship	2019 - 2020
11.	Quantitative Aptitude	M19USTS01	Skill development	2019 - 2020
12.	NMEC I : English For Employability - I	M19NEN01	Skill development	2019 - 2020
13.	Estimation Theory	M19UST05	Employability	2019 - 2020
14.	Testing of Hypothesis	M19UST06	Employability	2019 - 2020
15.	Allied IV: Psychological Statistics	M19UCMA04	Skill development	2019 - 2020
16.	Practical IV : Estimation & Testing of Hypothesis	M19USTPBARN	CIPAL Entrepretentabip	2019 - 2020
17.	Statistical Aptitude	M19USTS02 (Autor Kalippatti (PO) - 63	omous) Still deselopment	2019 - 2020

S.No.	Name of the Course	Course Code	Employability/ Entrepreneurship/ Skill development	Year of introduction (during the last five years)
18.	NMEC II : English For Employability - II	M19NEN03	Skill development	2019 - 2020
19.	Official Statistics	M19UST07	Employability	2019 - 2020
20.	Design of Experiments	M19UST08	Employability	2019 - 2020
21.	Linear Programming and its Applications	M19UST09	Employability	2019 - 2020
22.	Design & Linear Programming	M19USTP05	Skill Development	2019 - 2020
23.	Statistical Data Analysis (Lab Oriented)	M19USTP06	Entrepreneurship	2019 - 2020
24.	Actuarial Statistics	M19USTE01	Employability	2019 - 2020
25.	Non Parametric Test	M19USTE02	Employability	2019 - 2020
26.	Queuing theory	M19USTE03	Employability	2019 - 2020
27.	Statistical Software Packages	M19USTS03	Entrepreneurship	2019 - 2020
28.	Statistical Quality Control	M19UST10	Employability	2019 - 2020
29.	Applied Statistics	M19UST11	Employability	2019 - 2020
30.	Decision Theory and its applications	M19UST12	Employability	2019 - 2020
31.	Applied Statistics & Decision Theory	M19USTP07	Skill development	2019 - 2020
32.	Stochastic Processes	M19USTE04	Employability	2019 - 2020
33.	Numerical Analysis	M19USTE05	Employability	2019 - 2020
34.	Regression Analysis	M19USTE06	Employability	2019 - 2020
35.	Project	M19USTPR1	Entrepreneurship	2019 - 2020
36.	Statistical Forecasting	M19USTS04	Employability	2019 - 2020

V. Shert

Head of the Department V. SHANMUGA SUNDARAM, MSC. MPML. (PLD...) Assistant Professor and Head, Department of Statistics, Mahendra Arts & Science College, Katippatti, Name kkal Dist. ot.





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BACHELOR OF SCIENCE

SYLLABUS FOR B.Sc. STATISTICS

OUTCOME BASED EDUCATION - CHOICE BASED CREDIT SYSTEM

For the students admitted from the Academic Year 2019-2020 onwards PRINCIPAL AHENDRA ARTS & SCIENCE COLLEGF (Autonomous)

alippatti (PO) - 637 501, Namakkal (DT)

MAHENDRA ARTS & SCIENCE COLLEGE (Autonomous) (Affiliated to Periyar University) Department of Statistics B.Sc. STATISTICS

PREAMBLE:

Statistics is a discipline that is fundamental in decision making and policy formulation. It's descriptive and inferential roles not only formulate the basis of growth for almost all disciplines of the contemporary world, but also provide an array of non-traditional employment avenues ranging from that of sport-analysts to business analysts. The B.Sc. Statistics Programme focuses on statistical science and its application to real problems. The thrust of this programme is to prepare students to enter into a promising professional life even after graduation, as also provide to them a platform for pursuing higher studies leading to post-graduate or doctoral degrees. During the programme, Statistical packages will be used to reinforce students' theoretical and practical skills. Graduates may apply the knowledge gained in production industry, financial, medical and agriculture sectors.

I- PROGRAMME EDUCATIONAL OBJECTIVES:

- Undergraduate students are to be passionately engaged in initial learning with an aim to think differently as agents of new knowledge, understanding and applying new ideas in order to acquire employability/ self- employment.
- Undergraduate students are trained to take up higher learning programmes.
- Undergraduate students are made to be competent and socially responsible citizen of India.
- Undergraduate students are to be exposed to technical, analytical and creative skills.
- Undergraduate students are to be imparted with a broad conceptual background in the Biological sciences / Computing sciences / Languages and culture / Management studies / Physical sciences.

II - PROGRAMME OUTCOMES:

- A student of three year B.Sc. degree course will not be allowed to offer Statistics and Statistical Techniques simultaneously in any of the three years of the course.
- Students offering Statistics at the First year of the three-year B.Sc. course may be allowed to offer Statistical Techniques as one of their subjects in the second year of the three-year B.Sc. in place of Statistics.
- Students offering Statistical Techniques at the first year of the threeyear B.Sc. course may be allowed to offer Statistics as one of their subjects in the second year of the three-year B.Sc. course in place of Statistical Techniques.
- Students must complete all the practical's to the satisfaction of the teacher concerned.
- Students must produce at the time of practical examination, the laboratory journal along with the completion certificate signed by the Head of the Department.

III REGULATIONS AND SYLLABUS (with effect from 2019-2020 onwards)

1. Objectives of the Course:

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

The main objectives of the course is

- To build the basis for promoting theoretical and application aspects of Statistics.
- \circ To underline the statistics as a science of decision

making in the real life problems With the description of uncertainty.

 To emphasize the relevance of statistical tools and techniques of analysis in the study of inter-disciplinary sciences.

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

2. Eligibility Condition for Admission:

A Pass in the Higher Secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereto.

3. Duration of the Course:

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

The odd semesters will consist of the period from June to November of each year and the even semesters from December to April of each year. There shall be not less than 90 working days for each semester.

4. Course of Study:

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

5. Examinations :

The theory examination shall be three hours duration to each paper at the end of each semester. The practical examination shall be three hours duration to each paper at the end of each academic year. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

6. STRUCTURE OF THE PROGRAMME

		ţ.	SEMESTER-I						
Part	Course	Title of the	Course	Hrs We	5 / ek	No. of	Max. Mark		
	Category	Course	Coue	L	Ρ	cieuits	Int.	Ext.	Total
I	Language Course –I	Tamil - I/ French – I/ Hindi – I	M19UFTA01	5	-	3	25	75	100
II	Language Course – II	English – I	M19UFEN01	5	-	3	25	75	100
	Core Course- I	<mark>Descriptive</mark> Statistics	M19UST01	7	-	5	25	75	100
	Allied Course-I	Allied – I Mathematics- I	M19UMAA01	5	-	4	25	75	100
III	Core Practical – I	Practical –I Descriptive Statistics	M19USTP01	-	4	2	40	60	100
	Allied Practical – I	Allied Practical - I Mathematics *	M19UMAAP01	-	2	-	Ι	-	-
IV	Enhancement Compulsory Course-I	Value Education: Yoga	M19UVE01	2	-	2	25	75	100
		Total		24	6	19	165	435	600

	SEMESTER-II									
Part	Course Category	Title of the Course	Course Code	Hrs We	s / ek	No. of Credits	Max. Mark			
				L	P	Creuits	Int.	Ext.	Total	
I	Language Course –I	Tamil - II/ French – II/ Hindi – II	M19UFTA02	5	-	3	25	75	100	
II	Language Course – II	English – II	M19UFEN02	5	-	3	25	75	100	
	Core Course-II	<mark>Probability</mark> Theory	M19UST02	7	-	5	25	75	100	
	Allied Course-II	Allied - II <mark>Mathematics- II</mark>	M19UMAA02	5	-	4	25	75	100	
III	Core Practical - II	Practical – II Probability Theory	M19USTP02	-	4	2	40	60	100	
	Allied Practical - I	Allied Practical - I Mathematics	M19UMAAP01	-	2	2	40	60	100	
IV	Enhancement Compulsory Course - II	Environmental Studies	M19UES01	2	_	2	25	75	100	
		Total		24	6	21	205	495	700	

	SEMESTER –III								
Part	Course Category	Title of the	Course Code	Hrs We	s / ek	No. of Credits	N	Iax. Ma	rk
		Course		L	Р	Creans	Int.	Ext.	Total
I	Language Course-I	Tamil - III/ French – III/ Hindi – III	M19UFTA03	5	-	3	25	75	100
II	Language Course-II	English – III	M19UFEN03	5	5 - 3 25 75				100
	Core Sampling Course-III Techniques		M19UST03	5	-	4	25	75	100
III	Core Course-IV	Distribution Theory	M19UST04	5	-	4	25	75	100
	Allied Course-III	Allied - III Statistical Economics	M19UCMA03	4	-	4	25	75	100
	Core Practical – III	Practical – III Sampling & Distribution Theory	M19USTP03	-	2	2	40	60	100
IV	Non Major Elective Course –I	NMEC – I English for employmability - I	M19NEN01	2	-	2	25	75	100
IV	Skill Enhancement Course –I	SEC – I Quantitative Aptitude	M19USTS01	2	-	2	25	75	100
		Total		28	2	24	215	585	800

		SEN	AESTER –IV						
Part	Course Category	Title of the Course	Course Code	Hı We	:s / eek	No. of	Max. Mark		
				L	Р	Creatis	Int.	Ext.	Total
I	Language Course-I	Tamil - IV/ French – IV/ Hindi – IV	M19UFTA04	5	-	3	25	75	100
II	Language Course-II	English – IV	M19UFEN04	5	-	3	25	75	100
	Core Course-V	Estimation Theory	M19UST05	5	-	5	25	75	100
	Core Course-VI	Testing of hypothesis	M19UST06	5		4	25	75	100
III	Allied Course-IV	Allied - IV Psychological Statistics	M19UCMA04	4	I	4	25	75	100
	Core Practical – IV	Practical – IV Estimation & Testing of Hypothesis	M19USTP04	-	2	2	40	60	100
IV	Skill Enhancement Course – II	SEC – II Statistical Aptitude	M19USTS02	2	-	2	25	75	100
1.	Non Major Elective Course –II	NMEC – II – English for employability – II	M19NEN03	2	-	2	25	75	100
V	Extension	Activities	M19UEX01	-	-	1	-	-	-
		Total		2 8	2	26	215	585	800

		SE	MESTER -V						
Part	Part Course Category Title of the Course Course Code Hrs / Week No. of Credits Core Course-VII Official Statistics M19UST07 5 - 5 Core Course-VIII Design of Experiments M19UST08 5 - 5 Core Course-VIII Design of Experiments M19UST08 5 - 5 Core Course-IX Design of Experiments M19UST09 5 - 5 Core Course-IX Practical – V: Design & Linear Programming M19USTP05 - 4 2 III Core Practical – V Practical – VI: Statistical Data Analysis (Lab Oriented) M19USTP06 - 4 2	Μ	lax. Ma	rk					
				L	P	Cituits	Int.	Ext.	Total
	Core Course-VII	Official Statistics	M19UST07	5	-	5	25	75	100
	Core Course-VIII	Design of Experiments	M19UST08	5	-	5	25	75	100
	Core Course-IX	Linear Programming and its Applications	M19UST09	5	-	5	25	75	100
	Core Practical – V	Practical – V: Design & Linear Programming	M19USTP05	-	4	2	40	60	100
III	Core Practical – VI	Practical – VI: Statistical Data Analysis (Lab Oriented)	M19USTP06	-	4	2	40	60	100
		Actuarial Statistics	M19USTE01						
	Course –I	Non – Parametric <mark>Test</mark>	M19USTE02	5	-	4	25	75	100
		Queuing Theory	M19USTE03						
IV	Skill Enhancement Course –III	SEC – III Statistical Software Packages	SEC – III Statistical Software M19USTS03		-	2	25	75	100
		Total		22	8	25	205	495	700

	SEMESTER-VI									
Part	Course Category	Title of the Course	Course Code	Hr We	s / ek	No. of Credits	Μ	lax. Ma	ırk	
				L	P	Cicuits	Int.	Ext.	Total	
	Core Course-X	Statistical Quality Control	M19UST10	5	-	5	25	75	100	
	Core Course-XI	Applied Statistics	M19UST11	5	-	5	25	75	100	
	Core Course-XII	Decision Theory and its applications	M19UST12	5	-	5	25	75	100	
III	Core Practical – VII	Practical – VII: Applied Statistics & Decision Theory	M19USTP07	-	4	2	40	60	100	
		<mark>Stochastic</mark> Processes	M19USTE04						100	
	Elective Course -II	Numerical Analysis	M19USTE05	4	-	4	25	75		
		Regression Analysis	M19USTE06							
	Project Course	Project	M19USTPR1	5	-	5	40	60	100	
IV	Skill Enhancement Course –IV	SEC – IV Statistical Forecasting	M19USTS04	2	-	2	25	75	100	
		Total					205	495	700	
	0	VER ALL TOTAL		152	28	143	1210	3090	4300	

Summary of Credits, Hours and Mark Distribution

			N	o. of C	Credit	s		Total	Total	No. of	Max.
Part	Course Name	Ι	II	III	IV	V	VI	Credits	Hours	Courses	Marks
Ι	Language – I	3	3	3	3	-	-	12	20	4	400
II	Language – II	3	3	3	3	-	-	12	20	4	400
	Core	5	5	8	9	15	15	57	64	12	1200
	Core Practical	2	2	2	2	4	2	14	24	7	700
III	Elective	-	-	-	-	4	4	8	9	2	200
	Project	-	-	-	-	1	5	5	5	1	100
	Allied	4	4	4	4	I	I	16	18	4	400
	Allied Practical	-	2	-	-	I	-	2	4	1	100
	SEC	-	-	2	2	2	2	8	8	4	400
IV	NMEC	-	-	2	2	1	-	4	4	2	200
	Enhancement Compulsory Courses	2	2	-	-	-	-	4	4	2	200
V	Extension Activities	-	-	-	1	-	-	1	-	1	-
	Total	19	21	24	26	25	28	143	180	44	4300

ALLIED SUBJECTS FOR B.Sc. STATISTICS STUDENTS

Semester	Course Title	Course Code
Ι	Allied – I: Mathematics –I	M19UMAA01
ш	Allied – II: Mathematics –II	M19UMAA02
11	Allied Mathematics – Practical	M19UMAAP01
III	Allied – III: Statistical Economics	M19UCMA03
IV	Allied – IV: Psychological Statistics	M19UCMA04

ALLIED SUBJECTS OFFERED FOR OTHER MAJOR STUDENTS

Semester	Course Title	Course Code
I	Mathematical Statistics	M19USTA01
TT	Statistical Inference	M19USTA02
11	Allied Practical – Mathematical Statistics	M19USTAP01
III	Business Statistics	M19USTA03
117	Business Statistical Decision Techniques	M19USTA04
1V	Operation Research	M19USTA05

ELECTIVE COURSES

Semester	ELECTIVE – I		
	S.No	Name of the Course	Course Code
*7	1.	Actuarial Statistics	M19USTE01
V	2.	Non – Parametric Test	M19USTE02
	3.	Queuing Theory	M19USTE03
		ELECTIVE – II	
	S.No	Name of the Course	Course Code
	1.	Stochastic Processes	M19USTE04
VI	2.	Numerical Analysis	M19USTE05
	3.	Regression Analysis	M19USTE06

SKILL ENHANCEMENT COURSE:

Semester	Name of the Course	Course Code
III	Competitive Exam – I (Quantitative Aptitude)	M19USTS01
IV	Competitive Exam – II (Statistical Aptitude)	M19USTS02
V	Statistical Software Packages	M19USTS03
VI	Statistical Forecasting	M19USTS04

NON - MAJOR ELECTIVE COURSES OFFERED FOR OTHER MAJOR STUDENTS

Semester	Course Title	Course Code
	Applied Statistics	M19NST01
111	Statistical Survey	M19NST02
17.7	Statistical Methods	M19NST03
IV	Agricultural Statistics	M19NST04

IV SCHEME OF EXAMINATION:

1. Question Paper Pattern for Theory Papers

Time: Three Hours

Maximum Marks: 75

Part A: $(10 \times 1 = 10)$

Answer ALL Questions (Two Questions from Each Unit)

Part B: (10 x 2 = 20)

Answer ALL Questions (Two Questions from Each Unit)

Part C: (5 x 5 = 25)

Answer ALL Questions (One Question From Each Unit with internal choice)

Part D: (3 x 10 = 30)

Answer Any Three Questions out of Five Questions (One Question from Each Unit)

2. Question Paper Pattern for Practical Papers EXTERNAL MARK: 60 INTERNAL MARK: 40

QUESTION PATTERN

Answer any three Questions (3x20 =60) Questions from each Unit

3. Distribution of Marks:

The following are the distribution of marks for external and internal for End Semester Examinations and continuous internal assessment and passing minimum marks for Theory / Practical / Project papers of UG programmes.

ESE	EA Total	Passing Minimum for EA	CIA Total	Passing Minimum for CIA	Total Marks Allotted	Passing Minimum (ESE)
Theory	75	30	25	10	100	40
Practical	60	24	40	16	100	40
Project	60	24	40	16	100	40

The following are the Distribution of marks for the Continuous Internal Assessment in Theory / Practical papers of UG programmes.

THEORY

EVALUATION OF INTERNAL ASSESSMENT

Test : 15 Marks Assignment : 05 Marks Attendance : 05 Marks

Total : 25 Marks

The Passing minimum shall be 40% out of 25 marks (10 marks)

PRACTICAL

EVALUATION OF INTERNAL ASSESSMENT

Test 1	: 15 Marks
Test 2	: 15 Marks
Record	: 10 Marks
Total	: 40 Marks

The Passing minimum shall be 40% out of 40 marks (16 marks)

PROJECT

EVALUATION OF INTERNAL ASSESSMENT

Review 1	: 10 Marks
Review 2	: 10 Marks
Review 3	: 10 Marks
Pre-Viva	: 10 Marks
Total	: 40 Marks

The Passing minimum shall be 40% out of 40 marks (16 marks)

4. Passing Minimum:

The Candidates shall be declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Theory Exam mark) with minimum of 30 marks in the End Semester Theory Examinations.

The Candidates shall be declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Practical Exam mark) with minimum of 24 marks in the End Semester Practical Examinations.

5. Submission of Record Note Books for Practical Examinations

Candidates appearing for practical examinations should submit a bonafide record note books prescribed for practical examinations. The candidates failed to submit the record book shall not be permitted to appear for the practical examinations.

6. Project

The following guidelines to be followed for the Project with Viva-voce:

- 1. The project should be valued for 60 marks by an external examiner; however the Viva-Voce examination should be conducted by both the external examiner appointed by the College and the internal examiner / guide/teacher concerned.
- 2. The Project Report may consist a minimum of 60 pages.
- 3. The candidate has to submit the Project Report 20 days before the commencement of the VI Semester Examinations.
- 4. A candidate who fails in the Project/Dissertation or is absent may resubmit the report, on the same topic, with necessary modification / correction / improvements in the subsequent Even Semester Examinations for evaluation and shall undergo viva-voce Examination.

7. Note

SWAYAM / MOOC – Free Online Education

SWAYAM / MOOC is an instrument for self-actualization providing opportunities for a life-long learning. Here the student can choose from hundreds of courses, virtually every course taught at the college level, offered by the best teachers in India and elsewhere.

The students can choose an online SWAYAM / MOOC course during their period of study which will earn an extra credit and it will be transferred to the academic records of the students.

SEMESTER - I

Core Course- I	B.Sc. STATISTICS	2019 - 2020
Code:	DESCRIPTIVE STATISTIC	cs
M19UST01		

Unit- I

Origin and meaning of statistics – Primary and Secondary data – Types of variables – Diagrammatic representation of data – Graphic representation of data – Histogram , frequency polygon, frequency curve and O'Give.

Unit -II

Measures of Central Tendency – Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean – Inter relationship between A.M, G.M and H.M – Properties of a good average. **Unit –III**

Measures of dispersion – Range, Quartile Deviation, Mean Deviation and Standard Deviation – Co-efficient of Variation – Lorenz curve.

Unit- IV

Moments – Raw moments – Central moments – Relationship between raw and central moments – Measures of Skewness – Karl Pearson's coefficient of Skewness – Bowley's Co-efficient of Skewness – Measures of Kurtosis. **Unit- V**

Correlation – Types of correlation – Scatter diagram – Karl Pearson's coefficient of correlation – Properties – Spearman's Rank correlation coefficient – Regression – Least square method – Regression equations. **TEXT BOOK:**

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Fundamentals of Mathematical Statistics (11 th - Edition)	Gupta, S.C and Kapoor, V.K	Sultan Chand & Sons, New Delhi.	2004

REFERENCE BOOKS:-

S.No	Title of the Book	Author	Publishing Company	Year of Publication
1.	Fundamentals of	Goon Gupta	The World Press	1994
	Statistics	A.M and Das	Private Limited	
		Gupta		
2.	Statistical	Gupta, S.P	Sultan Chand & Sons,	2001
	Methods		New Delhi.	

Core Practical- I	B.Sc. STATISTICS	2019 - 2020
Code: M19USTP02	MAJOR PRACTICAL – I	
Credits: 2	Descriptive Statistics	

Unit - I

Diagrammatic representation of data – Graphic representation of data – Histogram, frequency polygon, frequency curve and O'Give.

Unit - II

Construction of Univariate and Bivariate frequency distribution – Computation of Measures of Central Tendencies.

Unit - III

Calculation of Measures of Dispersion – Skewness and Kurtosis.

Unit - IV

Calculation of Karl Person's coefficient of correlation and Spearman's

Rank Correlation coefficient.

Unit - V

Finding the two Regression Equations X on Y and Y on X and estimating unknown values of X and Y.

ALLIED - I	B.Sc. STATISTICS	2019 - 2020			
Code:	MATHEMATICS I : ALGEBRA, INTERGAL, CALCULAUS AND FOURIER SERIES				
M19UMAA01	CALCOLAUS AND FOURIER SERIES				

Unit – 1

Definition of matrix – Addition, Subtraction, Multiplication of matrices – Transpose of matrix – Adjoint of a matrix – Inverse of Matrix, Characteristic equation – Eigen values and Eigen vectors – Cayley Hamilton theorem (Statement ony)

Unit – 2

Ploynomial Equation – Imaginary and irrational roots – transformation of equation – Descarte's rules of signs – Problems

Unit – 3

Radius of Curvature in Cartesian and polar coordinates – Pedal equation of a curve – Radius of Curvature in polar coordinates.

Unit – 4

Intergral Calculus – Integration by parts – Definite integral and its properties – Reduction formula for $\int \cos^n x \, dx$, $\int \sin^n x \, dx$, $\int_0^{n/2} \sin^n x \, dx$, $\int_0^{n/2} \cos^n x \, dx$, $\int x^n e^{ax} x \, dx$, $\int_0^\infty x^n e^{ax} x \, dx$, problems.

Unit – 5

Fourier series – Definition – To find the Fourier coefficient of periodic functions of period 2π – even and odd functions – half range series – Problems.

TEXT BOOKS

S.No.	Title of the book	Author	Publisher	Year of Publication
1.	Algebra	T.K. Manicka	Vijay Nicole	2004
	Volume - I	Vasagam Pillai	Imprints	
		and	Pvt.Ltd, Nelson	
		S.Narayanan	Chmbers,	
			Chennai	

SEMESTER – II

Core Course - II	B.Sc. STATISTICS	2019 - 2020
Code: M19UST02	PROBABILITY THEOR	RY

Unit - I

Probability – Mathematical Probability - Statistical probability - Axiomatic approach to probability -Addition theorem - Multiplication theorem - Conditional probability - Bayes theorem - Independence of events – Pair wise and mutual independence of events.

Unit - II

Random Variable – Distribution function and its properties - Discrete random variable - Continuous random variable -Two dimensional random variable - Joint and marginal distribution function - Joint and marginal density function - Conditional distribution function and conditional probability density function.

Unit - III

Mathematical Expectation - Properties of expectation - Properties of variance - Co-variance – Correlation – Mean and Variance of a linear combination of a random variable.

Unit - IV

Moment Generating Function- Properties of moment generating function -Cumulents and their properties - Moment generating function and its properties - Characteristic function and its properties - Inversion theorem.

Unit - V

Chebyshev's inequality - Weak law of large numbers - Probability generating function - Simple problems.

TEXT BOOK:-

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Fundamental of Mathematical Statistics (11 th -	Gupta, S.C and Kapoor, V.K	Sultan Chand & Sons, New Delhi.	2004
	Edition)			

REFERENCE BOOKS:-

S.No.	Title of the	Author	Publishing Company	Year of
	Book			Publication
1.	Introduction to	Mood A.M	McGraw Hill	1974
	the theory of	Graybill, F.A	Publishing Co.nc, New	
	Statistics	and Bose, D.C	York	
2.	Fundamentals	Goon Gupta	The World Press	1982
	of Statistics	A.M., and Das	Private Limited,	
		Gupta	Calcutta.	

Core Practical- II	B.Sc. STATISTICS	2019 - 2020	
Code:	MAJOR PRACTICAL – II		
Credits: 2	Probability Theory		

Unit - I

Discrete and continuous random variables – Finding Probabilities -Distribution functions and moments.

Unit - II

Addition theorem - Multiplication theorem - Problems.

Unit - III

Conditional probability - Bayes Theorem Problems.

Unit - IV

Joint and marginal distribution function – Joint, marginal and conditional density function - Problems

Unit - V

Bivariate distribution - Discrete and Continuous Random Variable -Mathematical Expectation – Conditional Expectations- Calculation of Variance, Co - variance and Correlation Coefficients.

ALLIED - II	B.Sc. STATISTICS	2019 - 2020
Code:	MATHEMATICS II : DIFFERNTIAL	CALCULAUS,
M19UMAA02	LAPLACE TRANSFORMATI	ONS

Unit – 1

Second order differential equation with constant coefficient – Particular integral of the type e^{ax} , cos aX, or Sin aX, x^n , $e^{ax}V$ where V is any function of Cosax or Sin ax or x or x^2 .

Unit – 2

Formation of Partial differential equation by equation by eliminating arbitrary constants and arbitrary functions – Problems – definition – Complete, Particular, singular and general integrals

Unit – 3

Solutions of standard types of Partial differential equations - Clairauts's form.

Unit – 4

Laplace transformation - definition -Standard formula- Elementary theorems – Problems

Unit – 5

Inverse Laplace transforms – Standard formula – Elementary theorems – Problems.

TEXT BOOKS

S.No.	Title of the book	Author	Publisher	Year of Publication
1.	Differential Equations And Laplace Transforms	Dr.P.R. Vittal	Margham Publications, Chennai - 600017	2002
2.	Allied Mathematics	Dr.P.R. Vittal	Margham Publications, Chennai - 600017	2002

SEMESTER – III

Core Course - III	B.Sc. STATISTICS	2019 - 2020
Code: M19UST03	SAMPLING TECHNIQUES	

Unit - I

Basic concepts of sampling and population – Principle steps of sampling theory - Sampling Unit - Sampling frame - Complete enumeration versus sampling - Merits and demerits - Basic concepts of sampling distribution -Sampling errors – Non-sampling errors - Sources of non – sampling errors.

Unit - II

Simple random sampling with and without replacement - Lottery method - Use of random number tables - Estimation of population parameters – Mean, Variance and proportion - simple random sampling for proportion.

Unit - III

Stratified random sampling - Principle of stratification - Estimation of population mean and variance; Allocation techniques - Equal allocation - Proportional allocation - Neyman's allocation and Optimum allocation.

Unit - IV

Systematic sampling Estimation of mean and its sampling variance – Comparison of simple - stratified and systematic sampling.

Unit - V

Regression estimation – Linear regression estimate – Regression estimate with preassigned 'b' and regression estimates computed from sample.

TEXT BOOK:-

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Sampling Techniques	William G. Cocharan	John wiley sons, New York.	2008

REFERENCE BOOKS:-

C No	Title of the Author Book	A	Dubliching Commons	Year of
5.NO .		Author	Publishing Company	Publication
1.	Theory and	Daroga Singh	New Age International	1996
	analysis of	and Choudary	Publishers, New Delhi.	
	sample survery	F.S.		
	designs			
2.	Fundamentals of	Gupta S.C	Sultan Chand &	2007
	Applied	and Kapoor	Company,New Delhi.	
	Statistics 4 th	V.K.		
	Edition			
3	Sampling Theory	Desraj	New Age International Pvt. Ltd, New Delhi.	1997

SEMESTER – III

Core Course - IV	B.Sc. STATISTICS	2019 - 2020
Code: M19UST04	DISTRIBUTION THEOR	Y

Unit - I

Univariate discrete distribution – Bernoulli, Binomial , Poisson, Geometric, Hyper geometric and Negative Binomial distributions - Recurrence relation for moments - Additive property - Moment generating function -Characteristic function and limiting case of Binomial as Poisson distribution.

Unit - II

Continuous Univariate distributions – Uniform, Normal, Exponential, Cauchy – Derivation of moments, Moment Generating function (M.G.F), Characteristic function.

Unit - III

Gamma distribution – Beta distribution- Mean and Variance and their properties – Sampling distributions – Standard error.

Unit - IV

Derivation of 't' distribution and its properties and applications – Derivation and properties of 'F' distribution and its uses.

Unit - V

Derivation and properties of Chi-square distribution – Uses of Chi-square distribution – Relationship between t, F and Chi-square distributions.

TEXT BOOK:-

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Fundamentals of	Gupta, S.C	Sultan Chand & Sons, New Delhi.	
	Mathematical	and		2004
	Statistics	V.K.Kapoor		

REFERENCE BOOK:-

S.No.	Title of the Book	Author	Publishing Company	Year of	
				Publication	
1.	An introduction to probability theory and mathematical statistics	Rohatgi, V.K	Wiley Eastern Ltd., New Delhi.	1985	

Core Practical- III	B.Sc. STATISTICS	2019 - 2020	
Code: M19USTP03	MAJOR PRACTICAL – III Sampling & Distribution Theory		
Credits: 2			

Unit - I

Simple random sampling – Drawing sample from the population with and without replacement – Estimation of population mean, total, variance and its S.E.

Unit - II

Stratified random sampling - Estimation of mean and variance of the

population mean - Variance of the estimator of mean under proportional and optimum allocations.

Unit - III

Systematic sampling: Estimation of mean and its variance.

Unit - IV

Ratio and Regression methods of estimation based on simple random sampling.

Unit - V

Fitting of Binomial and Poisson distribution - Testing goodness of fit using chi-square test.

ALLIED III	OFFERED TO STATISTICS	2019 - 2020	
Code:			
M19UMCA03	STATISTICAL ECONOMICS		
Credit: 4			

Unit - I

Meaning and definition of Economics - Nature and Scope of Economics-Business Economics - Meaning, Objectives, Nature and Scope of Business Economics - Role of business Economist.

Unit - II

Demand - Meaning, Definitions - Law of demand - Exceptions, Changes in Demand - Demand Determinants - Importance - Elasticity of Demand -Types of elasticity of demand.

Unit - III

Production - Meaning - Production Function - Short Run and Long Run -Supply - Determinants, Law of Supply - Elasticity of Supply - Meaning, Types of elasticity of supply

Unit - IV

Cost Concepts - Kinds of Cost - Cost and output Relationship - Shortrun and Long-run cost curves. Revenue - Total Revenue - Average Revenue -Marginal Revenue - Curves under Perfect & Imperfect Competition - Break Even Analysis.

Unit - V

Market Structure - Kinds of Markets, Pricing under Perfect Competition -Monopoly, Monopolistic Competition, Oligopoly. Pricing: Objectives - Pricing methods - Inflation - Deflation.

B.SC STATISTICS & BBA

ENGLISH FOR EMPLOYABILITY-I

UNITI

Greeting – Introducing – Inviting a person – Thanking – Seeking permission – Offering suggestions – Giving advice – Asking questions –Complaining and Apologizing – Giving instructions.

UNIT II

Writing effective business letters: Inquiry and Sales letters, Claim, Refusal and Adjustment

UNIT III

Visual Aids: PowerPoint presentation, video, flip chart, paper hangouts, white or black board, over head projector, Graphic Aids.

UNIT IV

Formal and informal reports - E-mail message

UNIT V

Writing cover letters - Preparing resume

Prescribed Text Books:

S.NO	TITLE OF THE BOOK	AUTHOR	PUBLISHER	YEAR OF PUBLICATION
1	Writing Business Matters.	Peter, F.	ACE-Loyola: Chennai. (Chapter VII, Section 2)	2003
2	Handbook for Business Writing.	Baugh, L.S., Frayar, M., Thomas, D.	NTC Business Books: Illinois. (Chapter 2)	1987
3	Writing Business Matters.	Peter, F.	ACE-Loyola: Chennai	2003
4	101 Best Resumes to sell yourself.	Block, J.A.	New Delhi: Tata VII, Section 3) McGraw- Hill. (Chapter I, Sections 1, 3, 7)	2003

SEMESTER – III

SKILL ENHANCEMENT COURSE -I

SEC-I	B.Sc., Statistics	2019 - 2020			
Code: M19USTS01	οι ι α νίτιτα τι τίτα. Α ατιτιτίστ				
Credits: 2	QUANIIIAIIVE APIIIUIE				
Unit - <u>I</u>					
H.C.F & L.C.M	I of Numbers-Simplification.				
(Section-I: 2 &	54)				
Unit - II					
Square Roots a	and Cube Roots-Averages.				
(Section-I: 5 &	56)				
Unit - III	,				
Problems on N	Problems on Numbers - Problems on Ages.				
(Section-I: 7 &	58)				
Unit - IV	, ,				
Percentages- Profit & Loss.					
(Section-I: 10 & 11)					
Unit - V					
Simple interest- Compound interest.					
(Section-I: 21 & 22)					

TEXT BOOK:

S.No.	Name of the Book	Author	Publisher	Year Of Publication.
1.	Quantitative Aptitude For Competitive Examinations	R.S.Aggarwal	S.Chand & Co Ltd,152, Annasalai, Chennai.	2001
SEMESTER - IV

Core Course – V	B.Sc. STATISTICS	2019 - 2020
Code: M19UST05	ESTIMATION THEORY	

Unit - I

Statistical Inference – Characteristics of good estimators – Invariance property of consistent estimators – Most efficient estimators.

Unit - II

Minimum Variance Unbiased Estimator (MVUE) - Uniqueness property of MVUE - Cramer - Rao inequality - Regularity conditions – Minimum Variance Bound Estimator (MVBE).

Unit - III

Sufficient statistic - Statement of Neyman - Factorization theorem -Concept of Blackwellisation - Statement and proof of Rao - Blackwell theorem.

Unit - IV

Methods of estimation - Maximum likelihood estimator (MLE. and their properties - Method of moments - Methods of minimum chi-square and modified minimum chi-square.

Unit - V

Interval estimation - Distinction between point estimation and interval estimation - Confidence interval and confidence Coefficients - Construction of confidence intervals for mean, difference of means and variance.

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
	Fundamental of	Gupta, S.C	Sultan Chand & Sana New	
1.	Mathematical Statistics	and Kapoor,	Dalhi	2004
	(11 th - Edition)	V.K	Demi.	

REFERENCE BOOKS:-

S.No.	Title of the Author Publishing Comp		Publishing Company	Year of	
	Book			Publication	
1.	Introduction to	Mood A.M	McGraw Hill	1974	
	the theory of	Graybill, F.A	Publishing Co.nc, New		
	Statistics	and Bose, D.C	York		
2.	Fundamentals	Goon Gupta	The World Press	1982	
	of Statistics	A.M., and Das	Private Limited,		
		Gupta	Calcutta.		

Core Course – VI	B.Sc. STATISTICS	2019 - 2020
Code: M19UST06	TESTING OF HYPOTHESIS	

Unit - I

Statistical Hypothesis - Simple and composite hypothesis - Critical Regions - Types of errors - Level of Significance - Size and power of the test -Most powerful (MP) test - Neymann - Pearson Lemma - UMP test.

Unit - II

Large Sample Tests – Test for the mean of a normal population – test for the equality of means of two normal populations – test for the variance of a normal population – test for the equality of variances of two normal populations.

Unit - III

Small Sample Tests : t-Test - single mean - difference of means - paired t-test.

Unit - IV

Likelihood Ratio (LR) test - Procedure – Properties – Simple Applications. Chi- Square, Goodness of fit and independence of attributes.

Unit - V

Non-Parametric Tests: Sign, Wilcoxon's Signed rank test and Run test for one sample problems. Median, Mann – Whitney test for two sample problems – Kruskal – Wallis test- Simple applications.

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
	Fundamental of	Gupta, S.C	Sultan Chand & Same Nam	
1.	Mathematical Statistics	and Kapoor,	Dalhi	2004
	(11 th - Edition)	V.K	Deim.	

REFERENCE BOOKS:-

C No	Title of the	A	Dublishing Componen	Year of
5.NO .	Book	Author	Publishing Company	Publication
1.	Introduction to	Mood A.M	McGraw Hill	1974
	the theory of	Graybill, F.A	Publishing Co.nc, New	
	Statistics	and Bose, D.C	York	
2.	Fundamentals of	Goon Gupta	The World Press	1982
	Statistics	A.M., and Das	Private Limited,	
		Gupta	Calcutta.	

Core Practical- IV	B.Sc. STATISTICS	2019 - 2020	
Code: M19USTP04	MAJOR PRACTICAL – IV		
Credits: 2	Estimation & Testing of Hypothesis		

Unit - I

Estimation of parameters of statistical model binomial and Poisson distributions – Construction of confidence intervals for mean and variance.

Unit - II

Method of maximum likelihood and method of moments – Fitting of Binomial, Poisson, Normal, Exponential distributions. **Unit - III**

Jnit - III

Testing of hypothesis on the parameters of Binomial, Normal, Exponential and Cauchy distributions, when alternatives are one sided / two sided.

Unit - IV

Test of significance: Large sample - Single proportion- difference of proportions – Single mean – difference of two means – correlation coefficient – Chi square test for independence of attributes.

Unit - V

Test of significance: Small sample test – t test for single mean – difference of two means – paired t test – F test for equality of two variances.

Allied – II	OFFERED TO STATISTICS	2019 - 2020	
Code: M19UCMA04	PSYCHOLOGICAL STATISTICS		
Credit: 4		PSYCHOLOGICAL STATISTICS	

Unit – I

Nature of organizational Behavior – Meaning, Definition –Concept of organization – Nature – Features – Importance - Role of organizational Behavior

Unit – II

Perception – Process – Perpetual selectivity – Internal and External conflicts – Managerial applications in perception

Unit –III

Personality – Determinants- Development – Measurement – Theories of Personality – Attitudes and Values – Nature - Components – Factors in Value Formation – Types of Values.

Unit – IV

Communication – Functions – Process - Barriers – Types of Communication - Stress management – Forms – Stages – Causes – Effects of Stress

Unit – V

Organizational Change – Nature of Change – Factors in organizational Change – Process of Planed change – Response to Change – Resistance to change – Factors in resistance to change – Overcoming resistance to change – Change agent – Role of Change agent

Text Book:

S. No.	Title of the Book	Author	Publisher	Year of Publication
1.	Organizational Behaviour	J. Jayasankar	Margham Publications, Chennai	2012

NMEC II	B.SC STATISTICS & BBA	2019 - 2020		
Code: M19NEN01	ENGLISH FOR EMPLOYABILITY-II			
Credit: 2				

Unit I

Language and Communication - Communication in Organization

Unit II

Advertising -Functional Communication

Unit III

Business Correspondence: Internal Correspondence, External Correspondence, Sales Correspondence, Personalized Correspondence, Circulars. Technical Proposals

Unit IV

Notice, Agenda and Minutes, Job Interview

Unit V

Group Discussion, Analysis and Interpretation

Prescribed Text Books:

S.NO	TITLE OF THE BOOK	AUTHOR	PUBLISHER	YEAR OF
				PUBLICATION
1	Strengthen Your English for	Т.М.	Emerald	2005
	competitive Examinations.	Farhathullah &	Publishers,	
		D.S.Kesava Rao	Chennai.	
2	The Oxford Guide to Writing	Seely, John	UK:OUP	2013
	and Speaking.			

SEMESTER - IV

SEC – II	B.Sc. STATISTICS	2019 - 2020
Code: M19USTS02	STATISTICAL APTITUDE	£

Unit - I

Statistics – Classification, Tabulation and Frequency Distribution – Diagrammatic and Graphical Representation.

Unit - II

Measures of Central Tendency – Measures of Dispersion, Skewness and Kurtosis.

Unit - III

Elementary Probability – Mathematical Expectation – Sampling Methods.

Unit - IV

Theory of Estimation – Testing Parametric Hypothesis.

Unit - V

Regression and Correlation Methods.

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Programmed	Agarwal, B.L	New Age International	2013
	Statistics		Publishers.	

Core Course – VII	B.Sc. STATISTICS	2019 - 2020	
Code: M19UST07	OFFICIAL STATISTICS		
Credits: 5			

UNIT-I

Official Statistics: Present official statistical systems in India –Ministry of Statistics and Programme Implementation - NSSO, CSO and their functions -Registration of vital events - Statistical organization – Population Statistics. **UNIT-II**

Agricultural Statisticsx – Indices of Agricultural production – Miscellaneous Agricultural Statistics - Industrial statistics – ASI – Indices of Industrial Production and profits.

UNIT-III

Price statistics – <mark>Price index numbers</mark> – <mark>Trade Statistics in India – Labour Statistics in India – Financial Statistics in India - Labour Bureau; Index number of Retail prices – Indices of security prices.</mark>

UNIT-IV

Wage statistics – trade statistics – Financial statistics – National income statistics - National sample surveys – Activities and publications of CSO and the Department of Statistics, Government of Tamil Nadu - National Income compilation.

UNIT-V

Statistical information on Indian Economy published by Reserve Bank of India - Statistics of Department of Economics and Statistics of State Governments. **REFERENCE BOOK:-**

S.No.	Title of the Book	Author	Publishing Company	Year of
				Publication
1.	Statistical	Gupta and	Sultan Chand	2008
	Methods	Kapoor	Publications	

Core Course - VIII	B.Sc. STATISTICS	2019 - 2020
Code: M19UST08	DESIGN OF EXPERIMEN	NTS

Unit - I

Principles of Experimental Designs - Replication, Randomization and Local control technique – Basic designs - Analaysis of variance (ANOVA) – Statistical Analysis of One way and Two way classified data concepts and applications.

Unit - II

LSD test – SNK test – Duncan's multiple range test – Tukey (HSD) test -Multiple Comparison methods.

Unit - III

Analysis of Completely Randomized Design (CRD) - Randomized Block Design (RBD) and Latin Square Design (LSD) and their efficiencies - missing plot techniques (One missing Observation in RBD, LSD).

Unit - IV

Analysis of Factorial design- 2² - 2³ factorial designs - Concepts of Confounding – Analysis of 3² factorial experiments.

Unit - V

Analysis of Split plot design - Balanced Incomplete Block Design (BIBD) (Concepts only).

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Fundamentals of	Gupta S.C	Gupta S.C and Kapoor V.K	2009
	Applied Statistics,	and Kapoor		
	4 th , Edition.	V.K		

REFERENCE BOOKS:-

S No	Title of the	A	Dublishing Osmasar	Year of	
5.NO .	Book	Author	Publishing Company	Publication	
1.	Fundamentals of	Goon Gupta	The World Press	1982	
	Statistics	A.M., and Das	Private Limited,		
		Gupta	Calcutta.		
2.	Design and analysis of experiments, 3 rd Edition.	Das M.N and Giri N.C.	New Age International publication	2007	

Core Course - IX	B.Sc. STATISTICS	2019 - 2020
Code: M19UST09	LINEAR PROGRAMMING AND ITS	APPLICATIONS

Unit - I

Introduction – Origin – Nature of OR – Structure – Characteristics – OR in Decision Making – Models in OR – Phase of OR – Uses and Limitations of OR – LPP – Mathematical formulation of LPP – Graphical Methods.

Unit - II

LPP – Standard form of LPP – Maximization – Minimization – <mark>Simplex method – Artificial variable technique – Big-M methods</mark>.

Unit - III

Duality in LPP – Formulation of Dual LPP – Primal and Dual relationship – Solving LPP using Dual concepts – Dual simplex methods.

Unit - IV

Transportation problem – Balanced – Unbalanced T.P. – Initial basic feasible solution – North West Corner Rule – Row minima – Column minima – Matrix minima (LCM) – Vogels approximation method – Optimum solution – MODI method.

Unit - V

Assignment problem – Introduction – Balanced – Unbalanced – Maximization – Minimization – Hungarian methods. **TEXT BOOK:-**

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Operations Research	Kanti Swarup, P.K.Gupta, Manmohn	Sultan Chand and sons, New Delhi.	1980

REFERENCE BOOKS:-

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Operations Research and Application	Sharma, J.K	Mc.Millan and Company, New Delhi.	1997
2.	Operations Research	Nita H.Shah, Ravi M.Gor, Hardik Soni	PHI Learning Private Limited, New Delhi.	2010

Core Practical- V	B.Sc. STATISTICS	2019 - 2020
Code: M19USTP05	MAJOR PRACTICAL – V Design & Linear Programming	

Unit - I

Statistical Analysis of One Way - Two Way Classification - Multiple Comparison methods.

Unit - II

Analysis of CRD, RBD and LSD - Missing plot techniques in RBD and LSD with one missing observation.

Unit - III

Analysis of factorial experiments 2² and 2³ using Yates Algorithm – Analysis of 3² factorial experiments.

Unit - IV

Linear programming problem – Graphical Method – Simplex Method – Big – Method – Two phase method (Not more than three constraints).

Unit - V

Transportation Problem – By NWC rule – Matrix minima – Vogel's Approximation Method – Optimum solution by MODI Method – Balanced & Unbalanced TP. Assignment Problem – Balanced & Unbalanced AP (Hungarian Method).

Core Practical- VI	B.Sc. STATISTICS	2019 - 2020
Code: M19USTP06	MAJOR PRACTICAL – V STATISTICAL DATA ANALY	71 7SIS

Unit - I

Graphs and diagrams – Pie , bar, line and scatter diagrams - Histogram and Normal probability plot.

Unit - II

Formation of discrete and continuous frequency distributions - descriptive statistics.

Unit - III

Correlation coefficient Rank correlation - Regression: Simple and multiple linear regressions.

Unit - IV

Compare means: Independent sample t test and paired t- test - Cross tabulation and Chi-square – test.

Unit - V

One way and two way ANOVA.

Elective Course - I B.Sc. STATISTICS		2019 - 2020
Code: M19USTE01	ACTUARIAL STATISTICS	S

Unit - I

Present value and accumulated value at fixed rate and varying rates of interest – effective rate of interest corresponding to a nominal rate of interest – annuity – types of annuities excluding perpetuity – derivation of the formula for $a_n\%$, $s_n\%$, a..n% and s..p% simple problems.

Unit - II

Derivation of the formula for a(p)n%, s(p)n%, a..(p)n% and s..(p)n%simple problems – redemption of loan by uniform early payment – definitions of sinking fund – redemption of loan by a sinking fund (uniform early payment) simple problems.

Unit - III

Mortality table: Definition- Uses – mentioning the types and the construction of a mortality table – complete and incomplete mortality table – computing the probabilities of survival and death using LIC (1970-1973) Mortality table- defining expectation of life, complete expectation of life and central death rate – simple problems.

Unit - IV

Principles of Insurance – Types of assurance – temporary assurance, pure endowment assurance, endowment assurance and whole life assurance – Expressions for present values of assurance benefits under temporary assurance, pure endowment assurance, endowment assurance and whole life assurance plans – simple problems

Unit - V

Definitions of premium, Natural premium level, Annual Premium, Net Premium and Office Premium – Expressions for level annual premium under temporary assurance, pure endowment assurance, endowment assurance and whole life assurance plans – simple problem involving the calculations of level annual present annual premium, office premium and the four types of plans only.

SNo	Title of the	Author	Publishing Company	Year of
5.NO.	Book	Author		Publication
1.	Mathematics		Insurance Institute of India.	
	Basis of Life			
	Insurance			

Elective Course – I	B.Sc. STATISTICS	2019 - 2020
Code: M19USTE02	NON – PARAMETRIC TI	EST

Unit - I

Introduction of non-parametric test – Its comparison with parametric test – Advantage and limitations of non-parametric test.

Unit - II

Test for randomness – Run test – Test for rank correlation co-efficient – Sign test.

Unit - III

Comparison of two populations: median test – Mann Whitney U test – Wilcoxon signed rank test for paired observations.

Unit - IV

Comparison of several populations: Median test for several samples – Kruskal Walli's test – Friedman ANOVA.

Unit - V

Testing of goodness of fit by Kolmogorov – Smirnov test – chi-square test for uniformity of data – Distinction between non-parametric and distribution free tests.

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
	Non-parametric			
1.	methods for	Gibbons, J.D.	New York	1976
	quantitative analysis			

REFERENCE BOOK:-

S.No.	Title of the	Author	Publishing Company	Year of
	Book			Publication
1.	Statistical	Desphande,	Practice Hall of India,	1997
	Analysis of non-	J.V.	New Delhi.	
	normal data	Gune,A.P.		
		Shanubhogur,		

Elective Course – I B.Sc. STATISTICS		2019 - 2020
Code: M19USTE03	QUEUING THEORY	

Unit - I

Queuing system – Kendal's terminology – Classification of States – Poisson axioms.

Unit - II

Distribution of arrival and departure under Poisson queues.

Unit - III

Pure Birth – Death process – transient state and steady state solution.

Unit - IV

M/M/1; ∞ / FIFO queuing Model – steady state solution - Averages – Little's formula.

Unit - V

M/M/1; N / FIFO queuing model – steady state solution –Averages – simple problems.

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Fundamentals of Applied Statistics	Kanti Swarup, P.K.Gupta and Man Mohan	Sultan Chand and Sons, New Delhi.	d 1985
RE	FERENCE BOOK:-			
S.N	o. Title of the Book	Author	Publishing Company	Year of Publication
1.	Operations Research	P.K.Gupta and D.S.Hira	S.Chand and Co., Ltd, New Delhi.	1983

SEC – III	B.Sc. STATISTICS	2019 - 2020
Code: M19USTE03	STATISTICAL SOFTWARE PACKAGES	

Unit - I

Introduction to SPSS – Starting SPSS – SPSS Main Menus – Working with the Data Editor – SPSS Viewer – Importing and Exporting data.

Unit - II

Types of variables - Probability value (p-value) – Descriptive Statistics - Frequencies using SPSS.

Unit - III

Basic Concepts of One Sample t-test, Independent Samples t-test, Paired samples t-test using SPSS.

Unit - IV

Basic concepts of ANOVA – One Way and Two Way ANOVA.

Unit - V

Chi-square Test for Independence using SPSS – Bi-variate Correlation and Regression using SPSS.

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
	Statistical Methods			
	for Practice and	Ajai J Gaur		2008
1.	Research A guide to	and Sanjaya	Sage Publications.	
	data analysis using	S. Gaur		
	SPSS, First Edition			

Core Course - X	B.Sc. STATISTICS	2019 - 2020
Code: M19UST10	STATISTICAL QUALITY CONTROL	

Unit - I

Basic concepts of quality – Meaning of quality – Quality of design – Quality of conformance – Specification of quality concepts of S.Q.C. – Causes of variation.

Unit - II

Process control – Control chart – Basis of control chart – uses - Rational subgroups – Control charts for variables (\overline{X} , R and S – Charts).

Unit - III

Control charts for Attributes (P, np, c for fixed and varying sample sizes) – comparison of control charts for variable and attributes – Applications of theory of runs in quality control.

Unit - IV

Product control – Acceptance sampling – Sampling inspection by attributes – Producer's and consumer's risk, AQL, LTPD, IQL – Single, Double sampling plan procedure, OC, AOQ, AOQL, ASN and ATI curve.

Unit - V

Sequential sampling plan procedure – Estimation of parameters – OC, AOQ, ASN curve - Multiple sampling - Comparison between single - Double and multiple sampling.

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Statistical Quality Control	Mahajan, M	Dhanpat Rai & co (p) Ltd., Delhi.	2001
2.	Fundamentals of Applied Statistics	Gupta, S.C. & Kapoor, V.K.	Sultan Chand & Sons, New Delhi.	2007

REFERENCE BOOK:-

S.No.	Title of the	Author	Publishing Company	Year of
	Book			Publication
1.	Quality control	Duncan, A.J	Irwin inc. Home wook	1974
	and industrial			
	statistics			

Core Course – XI	B.Sc. STATISTICS	2019 - 2020
Code: M19UST11	APPLIED STATISTICS	

Unit - I

Concept of time series – Source of time series data – Component of time series – Additive and Multiplicative models – Resolving the components of time series – Trend – Methods of measuring trend – Semi average method – Method of moving average – Method of least squares.

Unit - II

Seasonal variation – Seasonal index – Methods of measuring seasonal index – Simple average method – Ratio to moving average - Ratio to trend method – Link relatives method – Cyclical variation – Measurement of cyclical variation – Method of periodogram analysis – Auto regression series of first order and second order.

Unit - III

Basis of Index Numbers – Definition – uses - Problems in the construction – Different types of Index Numbers – Simple Index Numbers – Weighted Index Numbers – Laspeyre's Index Numbers – Paasche's Index Numbers – Fisher's Index Numbers – Marshall & Edge worth Index Numbers – Dorbish & Bowley's Index Numbers.

Unit - IV

Optimum tests of Index Numbers – Time reversal test – Factor Reversal Test – Circular Test – Chain base Index Number – Conversion of FBI into CBI and Vice versa – Uses of Index Numbers - Cost of living Index Numbers.

Unit - V

Statistical system in India – Official sources of statistics – Functions of NSSO – CSO – Importance of Census – Census and data collection.

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Fundamentals of Applied Statistics	Gupta, S.C. & Kapoor, V.K.	Sultan Chand & Sons, New Delhi.	2007

REFERENCE BOOK:-

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Fundamentals of Statistics V-	Goon, A.M.,Gupta, Statistics V- M.K and Das Gupta, B Calcutta.	World press Ltd.,	1994
	II		Calcutta.	

Core Course - XII	B.Sc. STATISTICS	2019 - 2020
Code: M19UST12	DECISION THEORY AND ITS APPLICATIONS	

Unit - I

Game Theory – Introduction – Two person zero sum game: - Maximin – Minimax principle – Game's with saddle points - Game's without saddle points – Dominance property – Graphical solutions of 2 x n and n x 2 Games – Reducing Game problem by LPP.

Unit - II

Decision theory – Introduction- Types of Decision Making Environment – Decision Making under uncertainty – Maximin criterion – Maximax criterion – Minimax criterion – Laplace criterion – Hurwitz criterion – Decision Making under risk – EMV – EOL – EVPI - Decision Tree Analysis – Concepts only.

Unit - III

Sequencing problem – Problems with n-jobs on two machines – problems with n-jobs on three machines – problems with n-jobs on m-machines -Replacement problem – Replacement of items that deteriorate with time – selection of best machine amongst two.

Unit - IV

Queuing system – Kendal's terminology – Classification of States – Poisson axioms - Distribution of arrival and departure under Poisson queues - M/M/1; ∞ / FIFO queuing Model - M/M/1; N / FIFO queuing model.

Unit - V

Network analysis – Basic concepts – Constraints in network – Construction of network – Critical path method (CPM) - Program Evaluation Review Technique (PERT).

TEXT BOOK:-

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
		Kanti		
1.	Operations	Swarup,	Sultan Chand and sons, New Delhi.	1980
	Research	P.K.Gupta,		
		Manmohn		

REFERENCE BOOKS:-

S No	Title of the	Author	Dublishing Componen	Year of
5.110.	Book	Author	Fublishing Company	Publication
1.	Operations	Sharma, J.K	Mc.Millan and	1997
	Research and		Company, New Delhi.	
	Application			
2.	Operations	Nita H.Shah,	PHI Learning Private	2010
	Research	Ravi M.Gor,	Limited, New Delhi.	
		Hardik Soni		

Core Practical- VII	B.Sc. STATISTICS	2019 - 2020
Code: M19USTP07	MAJOR PRACTICAL – V APPLIED STATISTICS & DECISIO	'II)N THEORY

Unit - I

Construction of control charts for variables: \overline{X} , R and S charts. Control charts for attributes of fixed and varying sample size – p, np and C charts.

Unit - II

Acceptance samplig plan for attributes: single sampling plan – OC, AOQ, ASN and ATI curves; Double sampling plan – OC, AOQ, ASN and ATI curves. **Unit - III**

Estimation of trend by moving averages, least square methods – First degree and second degree polynomials - Computation of quarterly and monthly trends.

Unit - IV

Decision theory - Decision making under deterministic & probabilistic situations – EMV. Sequencing problem n jobs on two machines and n jobs on three machines.

Unit - V

Replacement problem – Items that deteriorate gradually and money value constant with time – Money value changing with time. **Network analysis – Critical Path Method (CPM. and PERT)**.

Elective Course - II	B.Sc. STATISTICS	2019 - 2020
Code: M19USTE04	STOCHASTIC PROCESS	8

Unit - I

Basic Concepts: Definition and examples of Stochastic Processes – Classification of general stochastic processes into discrete and continuous time – Discrete and continuous state spaces – Types of stochastic processes – Elementary problems.

Unit - II

Markov chain – Definition and examples of Markov chain – Transition Probability Matrix – Classification of states – Recurrence – Simple problems.

Unit - III

Basic limit theorem of Markov chain (Statement only) – Stationary probability distribution – Applications – Continuous Time Markov chain. **Unit - IV**

Continuous Time Markov chain: Pure birth process, Poisson process, Birth

and Death process – Simple problems.

Unit - V

Applications of Markov Chain: Social mobility, disease and recovery, consumer behavior, discount for insurance premium.

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Stochastic Processes	Medhi, J	Wiley Eastern Ltd, New Delhi.	1982
2.	First Course in Stochastic Processes	Karlin, S & Taylor, H.M	Academic Press.	1966

REFERENCE BOOK:-

SNo	Title of the	Author	Publishing Company	Year of
5.110.	Book	Author		Publication
1.	Stochastic	Ross,S.M.	Wiley, New York	1983
	Process			

SEMESTER-VI

Elective Course - II	B.Sc. STATISTICS	2019 - 2020
Code: M19USTE05	NUMERICAL ANALYSIS	

Unit - I

Solution of Algebraic and transcendental equations- Method of successive bisection - Method of Regula-Falsi - The Secant method - Newton - Raphson iterative method.

Unit - II

Finite Differences: Definition and properties of Forward Difference Operator, Backward Difference Operator and Shift Operator - Relations between them - n^{th} differences of polynomials - Difference Equations.

Unit - III

Interpolation with equal and unequal intervals: Newton- Gregory forward Interpolation and Backward Interpolation formula for equal intervals- Lagrange Interpolation formula for unequal intervals.

Unit - IV

Numerical Differentiation: Numerical Differentiation based on Newton's Forward and Backward Interpolation formulas - Computation of Second order derivatives numerically.

Unit - V

Numerical Integration: General quadrature for equidistant ordinate -Trapeziodal rule - Simpson 1/3 and 3/8 rules- Weddle's rule - Simple applications.

TEXT BOOK:

S.No.	Title of the	Author	Publisher	Year of
	Book			Publication
1.	Numerical	Dr.A.Singaravelu	Meenakshi	2009
	Methods		Agency	

REFERENCE BOOKS:

S.No.	Title of the Book	Author	Publisher	Year of Publication
1.	Introducing	S. S. Sastry	Prentice Hall of	3 rd Edition
	methods of		India private	2002
	Numerical		limited, New	
	analysis		Delhi	
2.	Numerical	P.Kandasamy,	Chand &	2009
	Methods	K.Thilagavath,	Company	
		K.Gunavathy	limited,	
			NewDelhi	

Elective Course - II	B.Sc. STATISTICS	2019 - 2020
Code: M19USTE06	REGRESSION ANALYSI	S

Unit - I

Simple regression models with one independent variable, assumptions, estimation of parameters, standard error of estimator, testing the significance of regression coefficients, standard error of prediction.

Unit - II

Fitting of straight line by matrix method (General Linear model), Analysis of variance, General linear hypothesis testing in regression situation weighted least squares bias in regression estimates.

Unit - III

Multiple regression analysis: Estimation of parameters. Partial regression Coefficient, OLS and ML estimation, Coefficient of multiple R² and adjusted R². Polynomial regression model.

Unit - IV

Multiple regression analysis: Hypothesis testing about individual regression coefficients, testing the overall significance of the sample regression, testing the equality of two regression coefficients, prediction with multiple regression.

Unit - V

Dummy variable regression models: ANOVA and ANACOVA models. Selection of variables is regression. Forward, backward & optimum method.

SNo	Title of the Pools	Authon	Publishing Compony	Year of	
5.NO .	The of the book	Author	Publishing Company	Publication	
1.	Applied Regression	Draper N.R.	John Wiley & Sons	1981	
	Analysis	& Smith .H			
2.	Basic Econometrics	D.N.Gujarati	Tata Mc Graw Hill Publishing	2008	

REFERENCE BOOK:-

S No	Title of the	Author	Publishing Company	Year of
5.NO.	Book	Autioi	i ublishing company	Publication
1.	Mathematical	J.N. Kapoor	S.Chand and	1989
	Statistics	and H.C.	Co., Ltd,	
		Saxena	New Delhi.	
2.	Introduction to	R.V. Hogg and	Macmillan	1989
	mathematical	A.T. Craig	Publishing	
	Statistics		Co.,Inc.	

SEC – IV	B.Sc. STATISTICS	2019 - 2020
Code: M19USTS04	STATISTICAL FORECASTI	NG

Unit - I

Concept of partial correlation – Concept of multiple correlation - Simple applications.

Unit - II

Concept of regression - Liner, Non liner regression - Regression line -

Regression Coefficient – properties of regression coefficient.

Unit - III

Curve fitting- methods – liner equations – methods of least square.

Unit - IV

Regression curves – conversion of data into linear form (Power curve, Exponential curves).

Unit - V

Growth curve fittings – Exponential - Gompertz and logistic curves.

TEXT BOOK:-

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Fundamental of Mathematical Statistics, 11 th edition	Gupta, S.C, and Kapoor, V.K	Sultan Chand and sons, New Delhi.	2004

REFERENCE BOOK:-

S.No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Mathematical Statistics, 4 th edition	Hogg, R.V. and Craig, A.T.	Colliar Mac.Millan Publishers.	1978



MAHENDRA ARTS & SCIENCE COLLEGE

(Autonomous)

Affiliated to Periyar University, Salem. Accredited by NAAC with 'A' Grade & Recognized u/s 2(f) and 12(B) of the UGC Act 1956 Kalippatti – 637 501, Namakkal (Dt), Tamil Nadu.

DEPARTMENT OF STATISTICS

List of Courses Focusing on Employability/ Entrepreneurship/ Skill Development (Regulations - 2016)

Programme : B.Sc. STATISTICS

S.No.	Course Name	Course Code	Employability	Entrepreneurship	Skill Development
1.	Descriptive Statistics	M16UST01	~		
2.	Allied I: Mathematics I	M16UMMA01	\checkmark		
3.	Probability Theory	M16UST02	~		
4.	Allied II: Mathematics II	M16UMMA02	~		
5.	Major Practical – I: Descriptive Statistics	M16USTP01		~	
6.	Sampling techniques	M16UST03	\checkmark		
7.	Distribution Theory	M16UST04	✓		
8.	SBEC-I : Competitive Exam-I	M16USTS01			1
9.	Major Practical – II: Sampling Techniques	M16USTP02		1	
10.	Theory of Estimation	M16UST04	\checkmark		
11.	Testing of hypothesis	M16UST06	\checkmark		
12.	SBEC-II : Competitive Exam-II	M16USTS02			~
13.	Design of Experiments	M16UST07	\checkmark		
14.	Major Practical – III: Estimation Theory	M16USTP03		1	
15.	Major Practical – IV: SPSS	M16USTP04		√	
16.	Stochastic Process	M16USTE01	\checkmark	804	
17.	Actuarial statistics	M16USTE04	~	PRINCIP	AL
18.	Non-parametric Test	M16USTS03	✓ ✓	(Autonomous alippatti (PO) - 637 501, N	s) amakkal (DT)

S.No.	Course Name	Course Code	Employability	Entrepreneurship	Skill Development
19.	Indian Official Statistics	M16USTS04	~		
20.	Statistical Quality Control	M16UST08	\checkmark		
21.	Applied Statistics	M16UST09	~		
22.	Major Practical – V: Applied Statistics	M16USTP05		✓	
23.	Numerical Analysis	M16USTE07	~	×	3
24.	SBEC-V: Statistical Forecasting	M16USTS05			× .
25.	SBEC – VI: Regression Analysis	M16USTS06			1
26.	Project	M16USTPR1		✓	

V-Short

Head of the Department

V. SHANMUGA SUNDARAM, M.S. M.PHL. (PLD.) Assistant Professor and Head, Department of Statistics, Mahendra Arts & Science College, Kalippatti, Namrikkal Distost

Principal

PRINCIPAL MAHENDRA ARTS & SCIENCE COLLEGE (Autonomous) Kalippatti (PO) - 637 501. Namakkal (DT)

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(Autonomous) Kalippatti (PO) - 637 501. Namakkal (DT



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DEPARTMENT OF STATISTICS

List of Courses Focusing on Employability/ Entrepreneurship/ Skill Development (Regulations - 2016)

Programme : B.Sc. STATISTICS

S.No.	Name of the Course	Course Code	Employability/ Entrepreneurship/ Skill development	Year of introduction (during the last five years)	
1.	Descriptive Statistics	M16UST01	Employability	2016 - 2017	
2.	Allied I : Mathematics I	M16UMAA01	Employability	2016 - 2017	
3.	Probability Theory	M16UST02	Employability	2016 - 2017	
4.	Major Practical – I: Descriptive Statistics	M16USTP01	Entrepreneurship	2016 - 2017	
5.	Allied II : Mathematics II	M16UMAA02	Employability	2016 - 2017	
6.	Sampling Techniques	M16UST03	Employability	2017 - 2018	
7.	Distribution Theory	M16UST04	Employability	2017 - 2018	
8.	SBEC-I : Competitive Exam-I	M16USTS01	Skill development	2017 - 2018	
9.	Theory of Estimation	M16UST05	Employability	2017 - 2018	
10.	Major Practical – II: Sampling Techniques	M16USTP02	Entrepreneurship	2017 - 2018	
11.	SBEC-II : Competitive Exam-II	M16USTS02	Skill development	2017 - 2018	
12.	Testing of hypothesis	M16UST06	Employability	2017 - 2018	
13.	Design of Experiments	M16UST07	Employability	2017 - 2018	
14.	Major Practical – III: Estimation Theory	M16USTP03	Entrepreneurship	2017 - 2018	
15.	Major Practical – IV: SPSS	M16USTP04	Entrepreneurship	2017 - 2018	
16.	Stochastic Process	M16USTE01	Employability	2017 - 2018	
17.	Actuarial Statistics	M16USTE04	Employability	2017 - 2018	
18.	Non-Parametric Test	M16USTS03	Employability TAHENDRA ARTS & SCIENCE	2017 - 2018	
19.	Indian Official Statistics	M16USTS04	Employability Kalippetil (PO)- 637 501. Namak	kal 2017 - 2018	
20.	Statistical Quality Control	M16UST08	Employability	2017 - 2018	
S.No.	Name of the Course	Course Code	Employability/ Entrepreneurship/ Skill development	Year of introduction (during the last five years)	
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21.	Applied Statistics	M16UST09	Employability	2017 - 2018	
22.	Major Practical – V: Applied Statistics	M16USTP05	Entrepreneurship	2017 - 2018	
23.	Numerical Analysis	M16USTE07	Employability	2017 - 2018	
24.	SBEC-V: Statistical Forecasting	M16USTS05	Skill development	2017 - 2018	
25.	SBEC – VI: Regression Analysis	M16USTS06	Skill development	2017 - 2018	
26.	Project	M16USTPR1	Entrepreneurship	2017 - 2018	

V- Show Head of the Department

V. SHANMUGA SUNDARAM, M.Sc. M.Phil. (PM.D.) Assistant Professor and Head, Department of Statistics, Mahendra Arts & Science Cr 'lege, Kalippatti, Name kkal District.

Principal

PRINCIPAL

TAHENDRA ARTS & SCIENCE COLLEGE

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NAHEW ARTS & SCIENCE

BACHELOR OF SCIENCE CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR B.Sc. STATISTICS

For the students admitted from the Academic Year 2016-2017 onwards

MAHENDRA ARTS & SCIENCE COLLEGE (Autonomous) Kalippatti (PO) - 637 501 Namakkal (DT

BACHELOR OF SCIENCE

BRANCH - STATISTICS

CBCS PATTERN (2016 - 2017) REGULATIONS

1. OBJECTIVES

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

The main objectives of the course is

 $\hfill\square$ To build the basis for promoting theoretical and application aspects of Statistics.

 \Box To underline the statistics as a science of decision making in the real life problems With the description of uncertainty.

 To emphasize the relevance of statistical tools and techniques of analysis in study of inter-disciplinary sciences.

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

2. ELIGIBILITY CONDITION FOR ADMISSION

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

3. DURATION OF THE COURSE

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

b) The odd semesters will consist of the period from June to November of each year and the even semesters from December to April of each year. There shall be not less than 90 working days for each semester.

4. COURSE OF STUDY

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

5. EXAMINATIONS

The theory examination shall be three hours duration to each paper at the end of each semester. The practical examination shall be three hours duration to each paper at the end of each academic year. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

6. SCHEME OF EXAMINATIONS

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

7. QUESTION PAPER PATTERN FOR ALL CORE, ALLIED & ELECTIVE COURSES & SKILL BASED ELECTIVE COURSES

7.1. Question Paper Pattern for Core Paper (Theory):

Time: Three hours

Maximum Marks: 75

Part - A $(10 \times 2 = 20)$

Answer ALL questions

(Two questions from each unit)

Part - B (5 x 5 = 25)

Answer ALL questions

(One question from each unit with internal choice)

Part - C $(3 \times 10 = 30)$

Answer any THREE questions out of FIVE questions

(One question from each unit)

7.2. Question Paper Pattern for SBEC:

Time: Three hours

Maximum Marks: 75

Part - A ($10 \ge 2 = 20$)

Answer ALL questions

(Two questions from each unit)

Part - B (5 x 5 = 25)

Answer ALL questions

(One question from each unit with internal choice)

Part - C (3 x 10 = 30)

Answer any THREE questions out of FIVE questions

(One question from each unit)

Note: No equal weightage is required for each unit. Question paper may be set irrespective of the units.

Evaluation of Continuous Internal Assessment (CIA)

The components for continuous internal assessment (CIA. are

Test - 10 marks

Seminar - 5 marks

Assignments - 5 marks

Attendance - 5 marks

Total 25 marks

Time: Three hours

maximum: 60 marks

Answer Any THREE questions out of FIVE questions

(One question from each unit)

Distribution of Marks for Core and Allied Practical:

University Examination (Written Practical)	-	60 marks
Continuous Internal Assessment (CIA)	-	40 marks
(Including Practical Record)		
Total	-	100 marks

Evaluation of Continuous Internal Assessment (CIA)

The components for continuous internal assessment (CIA. are

Record	-	25 marks
Test	-	10 marks
Attendance	-	5 marks
Total		40 marks

8. PASSING MINIMUM

The candidate shall be declared to have passed the examination if the candidate Secure not less than 30 marks out of 75 marks in the University Examination (UE) in each theory paper and 10 marks (out of 25) in the Continuous Internal Assessment (CIA) in each theory paper.

For the Practical paper, a minimum of 24 marks (out of 60) in the University Examination (UE. and 16 marks (out of 40) in the Continuous Internal Assessment (CIA) is required to pass the examination.

The CIA of each practical paper includes evaluation of record. However submission of record for the University Practical Examination is mandatory.

Maximum marks passing minimum Examination

	CIA	UE	Total	CIA	UE	Total
Theory paper	25	75	100	10	30	40
Practical paper	40	60	100	16	24	40

9. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in the First Class. All other successful candidates shall be declared to have passed in the Second Class.

Candidates who obtained 75% of the marks in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who pass all the examinations prescribed for the course in the first instance and within a period of three academic years from the year of admission to the course only are eligible for University Ranking.

- 1. **Passing Minimum** is 40% of the ESE and also 40% of the minimum of the paper / course.
- 2. Minimum Credits to be earned: For THREE year Programme: Best 140 Credits.

(Part I and II: Languages, Part III Major, Elective, Part -IV Soft Skills and Part V: Extension activities).

3. Marks and Grades:

The following table gives the marks, grade points, letter grades and classification to indicate the performance of the candidate.

Conversion of Marks to Grade Points and Letter Grade (Performance in a Course/ Paper)

Range of Marks	Grade Points	Letter Grade	Description
90 - 100	9.0 - 10.0	Ο	Outstanding
80 - 89	8.0 - 8.9	D+	Excellent
75 - 79	7.5 - 7.9	D	Distinction
70 - 74	7.0 - 7.4	A+	Very Good
60 - 69	6.0 - 6.9	A	Good
50 - 59	5.0 - 5.9	В	Average
40 - 49	4.0 - 4.9	С	Satisfactory
00 - 39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

 C_i = Credits earned for course i in any semester. G_i = Grade Point obtained for course i in any semester.

n refers to the semester in which such courses were credited.

For a Semester:

Sum of the multiplication of grade points by the credits of the courses

GPA =

Sum of the credits of the courses in a semester

GRADE POINT AVERAGE [GPA] = $\sum_{i} C_{i} G_{i} / \sum_{i} C_{i}$ For the entire programme: CUMULATIVE GRADE POINT AVERAGE [CGPA] = $\sum_{n} \sum_{i} C_{ni} G_{ni} / \sum_{n} \sum_{i} C_{ni}$

Sum of the multiplication of grade points by the credits of the entire programme

CGPA =

Sum of the credits of the courses of the entire programme

ССРА	GRADE	CLASSIFICATION OF FINAL RESULT
9.5-10.0	O+	First Class With Examplary
9.0 and above but below 9.5	0	Thist Class with Exemplary
8.5 and above but below 9.0	D++	
8.0 and above but below 8.5	D+	First Class With Distinction [*]
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	
6.5 and above but below 7.0	A+	First Class
6.0 and above but below 6.5	А	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	В	Second Class
4.5 and above but below 5.0	C+	Third Close
4.0 and above but below 4.5	С	Tinitu Class
0.0 and above but below 4.0	U	Re-appear

*The candidates who have passed in the first appearance and within the prescribed semester of the UG Programme (Major, Allied and Elective Courses Alone. are eligible.

10. MAXIMUM DURATION FOR THE COMPLETION OF THE UG PROGRAMME:

The maximum duration for completion of the UG Programme shall not exceed twelve semesters.

11. COMMENCEMENT OF THIS REGULATION:

The CBCS regulations shall take effect from the academic year 2016-2017 ie, for the students who are admitted to the first year of the course during the academic year 2016-2017 and thereafter.

12. TRANSITARY PROVISION

Candidates who were admitted to the UG course of study prior to 2016-2017 shall be permitted to appear for the examination under those regulations for a period of three years ie, up to and inclusive of the examinations of April/May 2016. Thereafter they will be permitted to appear for the examination only under the regulations then in force.

LIST OF COURSES

1. CORE COURSES: (Theory 9 + Practical 4): 13

(i) CORE THEORY : 9

- 1. Descriptive Statistics
- 2. Probability Theory
- 3. Sampling Techniques
- 4. Distribution Theory
- 5. Theory of Estimation
- 6. Testing of Hypothesis
- 7. Design of Experiments
- 8. Statistical Quality Control
- 9. Applied Statistics

(ii) CORE PRACTICAL: 4

- 1. Major practical I (Based on Core theory papers 1 & 2)
- 2. Major practical II (Based on core theory papers 3, 4 & 5)
- 3. Major practical III (Based on core theory papers 6 & 7)
- 4. Major practical IV

(Based on core theory papers - 8 & 9)

II. CORE ELECTIVES: 3

- 1. Stochastic Processes
- 2. Actuarial Statistics
- 3. Numerical Analysis
- 4. Bio-Statistics

III. ALLIED COURSES (Theory 4 + Practical 2)

(i). ALLIED THEORY: 4

- 1. Mathematics I
- 2. Mathematics II
- 3. Linear Programming and its Applications
- 4. Decision Theory and its Applications.

(ii). ALLIED PRACTICALS: 2

Allied I: Mathematics Practical

Allied II: Operations Research (Based on Allied theory papers 3 & 4)

IV. SKILLS BASED ELECTIVE COURSES: 6

- 1. Competitive Exam-I
- 2. Competitive Exam-II
- 3. Competitive Exam-III
- 4. Competitive Exam-IV
- 5. Non-Parametric Tests
- 6. Statistical Forecasting
- 7. Indian Official Statistics

V. NON MAJOR ELECTIVE COURSES: 2

- 1. Communication Skills
- 2. Statistical Computing

VI.ENVIRONMENTAL STUDIES: 1

VII.VALUE EDUCATION: 1

VIII.EXTENSION ACTIVITIES: 1

B.Sc., STATISTICS

CBCS PATTERN

SYLLABUS

(For candidates admitted from 2016 - 17onwards)

SEMESTER - I

	Par	Course Paper Title	Hours	Credi	Marks			Remarks	
Sem	rar t		Paper Title	Theory & Practical	t	C I A	UE	Tota l	
I	Ι	Tamil	Tamil I	6	3	25	75	100	
	II	English	English I	6	3	25	75	100	
	III	Core Theory Paper I	Descriptive Statistics	6	5	25	75	100	
		Allied Theory Paper I	Mathematics I	5	2	25	75	100	
		Allied - I Practical	Mathematics Practical *	2	-	-	-	-	
		Core Practical I	Major Practical I *	3	-	-	-	-	
	IV	Value Education (Yoga)		2	2	25	75	100	
		Total		30	16	No cour - 5	of rses	500	

Semester II

G	Par	Course Paper Title	Hours	Credi	Marks			Remarks	
Sem	t		Paper Title	Theory & Practical	t	CI A	UE	Tota l	
П	Ι	Tamil	Tamil II	6	3	25	75	100	
	II	English	English II	6	3	25	75	100	
	III	Core Theory Paper II	Probability Theory	6	5	25	75	100	
		Allied Theory Paper II	Mathematics II	5	2	25	75	100	
		Allied - I Practical	Mathematics Practical **	2	4	40	6 0	100	
		Core Practical I	Major Practical I **	3	4	40	60	100	
	IV	Environmental Studies		2	2	25	75	100	
		Total		30	23	No cou - 7	of rses	700	

		Course	D	Hours		Marks			Remarks
Sem	Part		Paper Title	Theory & Practical	Credit	CIA	UE	Total	
	Ι	Tamil	Tamil -III	5	3	25	75	100	
	II	English	English- III	5	3	25	75	100	
		Core Theory- III	Sampling techniques	4	4	25	75	100	
	тт	Core Theory – IV	Distribution Theory	4	4	25	75	100	
III	111	Allied	Operation Research -I	4	4	25	75	100	
		Core Practical- II	Sampling and Operation Research	2	2	40	60	100	
	IV	NMEC-I	Skills for Employment - I	2	2	25	75	100	
	V	SBEC-I	Competitive Exam-I	2	2	25	75	100	

SEMESTER - III

G		Course	Paper Title	Hours Theory	Cradit		Rema rks		
Sem	Part			& Practical	Credit	CIA	UE	Total	
	Ι	Tamil	Tamil -IV	5	3	25	75	100	
IV	II	English	English- IV	5	3	25	75	100	
		Core Theory- IV	Theory of Estimation	7	5	25	75	100	
	III	Allied	Operation Research -II	5	4	25	7 5	100	
		Core Practical-III	Estimation Theory	2	4	40	60	100	
	IV	NMEC-II	Skills for Employment - II	2	2	25	75	100	
	V	SBEC-II	Competitive Exam-II	2	2	25	75	100	
	III	Allied Practical - II	Allied Practical – II - Excel	2	3	40	60	100	

SEMESTER – IV

			SEME	STER - V					
Sem	Part	Course	Paper Title	Hours	Cro		Remarks		
				& Practical	dit	CIA	UE	Total	
	Ι	Core Theory-V	Testing of hypothesis	6	5	25	75	100	
	II	Core Theory- VI	Design of Experiments	6	5	25	75	100	
		Core Elective-I	Stochastic Process	5	5	25	75	100	
V		Core Elective-II	Actuarial statistics	5	5	25	75	100	
	IV	SBEC-III	Non-parametric Test	2	2	25	75	100	
	V	SBEC-IV	Indian Official Statistics	2	2	25	75	100	
	III	Core Practical-IV	Practical – IV - SPSS	4	3	40	60	100	

G	Part	Course	Paper Title	Hours Theory			5	Remarks	
Sem				& Practical	Credit	CIA	UE	Total	
	Ι	Core Theory- VII	Statistical Quality Control	6	5	25	75	100	
	Π	Core Theory- VIII	Applied Statistics	5	5	25	75	100	
		Core Practical-V	Practical-V Statistical Quality Control	4	3	40	60	100	
VI	III	Core Elective-II	Numerical Analysis	5	4	25	75	100	
-		SBEC-V	Statistical Forecasting	2	2	25	75	100	
	IV	SBEC-VI	Regression Analysis	2	2	25	75	100	
	III		Project	6	5	25	75	100	
	V	Extension activ	vities	-	1	-	_	-	

SEMESTER - VI

Core Course – I: DESCRIPTIVE STATISTICS Paper M16UST01

UNIT - I

Collection and sources of statistical data - Formation of frequency distribution - discrete and continuous - Exclusive and Inclusive - cumulative frequency distribution (O'gives) - Representation of data - Graphs and Diagrams - Bar diagrams, Histogram, Pie diagram.

UNIT - II

Univariate data - Measures of Central Tendency - Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean - Inter Relationship between A.M, G.M and H. M - Weighted A.M - properties of a good average.

UNIT - III

Measures of dispersion - Range, Quartile Deviation, Mean Deviation and Standard Deviation - Inter Relationship between Q.D., M.D., and S.D. - Co-efficient of Variation - Lorenz curve.

UNIT - IV

Moments - Raw moments, Central moments - Relation between raw and central moments - Measures of skewness - Karl Pearson's coefficient of skewness - Bowley's co-efficient of Skewness - Measures of Kurtosis.

UNIT - V

Correlation - types of correlation- Scatter diagram - Karl Person's co-efficient of correlation - properties - Spearman's Rank correlation co-efficient - Concurrent deviation Method - Correlation co-efficient for grouped data.

- 1. Gupta, S.C, and Kapoor, V.K. (2004). *Fundamental of Mathematical Statistics (11th edition)*, Sultan Chand & Sons, New Delhi.
- 2. Goon Gupta A.M and Das Gupta, (1994). *Fundamentals of Statistics*, The World Press Private Limited, Calcutta.
- 3. S.P.Gupta, (2001). Statistical Methods, Sultan Chand & Sons, New Delhi.

MAJOR PRACTICAL I: DESCRIPTIVE STATISTICS Paper Code: M16USTP01

UNIT – I

Formation of frequency distribution- Computation of Measures of Central Tendencies.

UNIT - II

Calculation of Measures of dispersion- Skewness and Kurtosis.

UNIT - III

Correlation Analysis - Product Moment correlation - Rank correlation.

UNIT-IV

Regression Analysis - Regression lines of two variables.

$\boldsymbol{UNIT-V}$

Rank of the matrix - Inverse of the matrix - Solution of simultaneous equations of three

variables using matrix inverse method.

ALLIED MATHEMATICS – I

(For B.Sc. Statistics, Physics& Chemistry

Major Students admitted from the year 2016 - 2017 onwards)

Allied - I		2016 - 2017
M16UMAA01		
Credit: 4	ALGEDKA, INTEGKAL CALCULUS AND FOUKIEF	SERIES

Unit I

Definition of Matrix – Addition, Subtraction, Multiplication of Matrices. Transpose of a Matrix – Adjoint of a Matrix – Inverse of the Matrix. Characteristic Equation – Eigen Values and Eigen Vectors – Cayley Hamilton Theorem (Statement only) Unit II

Polynomial Equations – Imaginary and Irrational roots – Transformation of Equation – Descartes' rule of signs – Problems.

Unit III

Radius of Curvature in Cartesian and polar coordinates – Pedal Equation of a curve – Radius of curvature in P-R Coordinates.

Unit IV

Integral Calculus – Integration by Parts – Definite integrals and its properties – Reduction formula for $\int \cos_n x dx$, $\int \sin_n x dx$, $\pi/2 \int \sin_n x dx$, $\pi/2 \int \cos_n x dx$, $\infty \int \cos_n x dx$, $\infty \int \cos_n x dx$, $\infty \int \cos_n x dx$, $\sqrt{2} \int \cos_n x dx$, $\sqrt{2$

Fourier Series – Definition – To find the Fourier coefficients of periodic functions of period 2Π – even and odd functions – Half range series – problems.

Text Books:-

S.No	Title of the Book	Author	Publishing Company	Year of
				Publication
1.	Algebra Volume-I	T.K.Manickavas	Vijay Nicole Imprints Pvt	2004
		agamPillai and	Ltd, # C-7 Nelson Chmbers.	
		S.Narayanan.	115,NelsonManickam Road,	
			Chennai – 600029.	
2.	Algebra Calculus and	Dr.P.R.Vittal.	Margham Publications, 24,	2000
	Trigonometry		RameswaramRoad ,T.Nager,	
			Chennai -600017.	

Reference Books:-

S.No	Title of the Book	Author	Publishing Company	Year of
				Publication
1.	Calculus	N.P. Bali	Krishna PrakasanMandhir, 9,	1994.
			Shivaji Road, Meerut (UP).	
2.	Calculus	D. Sudha	Emerald Publishers, 135, Anna	1988
			Salai, Chennai – 600002.	

Core Course – II: PROBABILITY THEORY

Paper Code: M16UST02

UNIT – I

Concepts of Random experiment - Trial - Sample point - Sample space, Event, Algebra of Events, Mutually Exclusive - Exhaustive events, definition of probability, classical, statistical and Axiomatic approach - Properties of Probability, Theorems on Probability - Addition theorem, total theorem on probability – Conditional probability - Multiplication theorem – Baye's theorem.

UNIT - II

Concept of random variable - Discrete random variable, continuous random variables, probability mass function - Probability density function, distribution function - Properties of distribution function - Independence of random events and random variable - Pair wise independence and mutual independence.

UNIT - III

Mathematical expectation of random variables - Properties of mathematical expectation - moments - Raw moments, central moments - Measures of location and dispersion of a random variable – Tchebychev' s inequality and its application.

UNIT - IV

Moment generating function of a random variable - their properties and its uses - cumulants - Characteristic functions - Properties of characteristic function - simple examples - Inversion theorem, (statement only) - Statements and Application of weak law of large numbers.

UNIT - V

Bivariate distribution - Distribution functions of bivariate random variable and its properties - probability mass and density functions, marginal and conditional distributions - Conditional expectation - Concept of regression lines - covariance and correlation.

- 1. A. Santhakumaran (2006). Probability theory and Test of Hypothesis
- 2. S.C.Gupta and V.K. Kapoor (2004). *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons Publications, New Delhi.
- 3. J.N.Kapur and H.C.Saxena (1989). *Mathematical Statistics*, S.Chand and Company Ltd., New Delhi.
- 4. Marek. Fisz, (1961). *Probability Theory and Mathematical Statistics*, John Wiley and Sons.

ALLIED MATHEMATICS - II

(For B.Sc. Statistics, Physics & Chemistry Major Students admitted from the year 2016 - 2017 onwards)

Allied - II		2016 - 2017
M16UMAA02	DIFFERENTIAL EQUATIONS AND LAPLA	CE
Credit: 4	TRANSFORMS	

Unit I

Second order differential equation with constant coefficient - particular intergral of the type e^{ax} , cosax or sinax, x^n , $e^{ax}V$ where V is any function of cosax or sinax or x or x^2 Unit II

Formation of partial differential equation by eliminating arbitrary constants and arbitrary functions – problems – definitions – complete, particular, singular and general integrals.

Unit III

Solutions of standard types of partial differential equations – clairauts's form.

Unit IV

Laplace transforms – definitions – Standard formula – Elementary theorems – problems.

Unit V

Inverse Laplace transforms – Standard formula – Elementary theorems – problems.

Text Books:-

S.No	Title of the	Author	Publishing Company	Year of
	BOOK			Publication
1.	Differential	Dr.P.R.Vittal	Margham Publications,	2002
	Equations and		Chennai -600017.	
	Laplace			
	Transforms			
2.	Allied	Dr.P.R.Vittal.	Margham Publications,	2002
	Mathematics		24, RameswaramRoad	
			,T.Nager, Chennai -	
			600017.	
3.	Allied	A.Singaravelu	Meenakshi	2002
	Mathematics	_	Publishers,120,Pushpa	
			Nagar, Medavakkam,	
			Chennai – 601302.	

Reference Books:-

S.No	Title of the Book	Author	Publishing Company	Year of Publication
1.	Engineering Mathematics	Gunavathi&Thi lkavathy	Emerald Publishers, 135,AnnaSalai,Chennai – 600002.	1984
2.	Calculus	N.P.Bali.	Krishna Prakasam Mandir,9,Shivajiroad,Meer ut(UP).	1994

Core Course – III: SAMPLING TECHNIQUES

Paper Code: M16UST03

UNIT – I

Concept of sampling and population: Need for sampling - Design, Organization and execution of sample survey - Principal steps in sample surveys - preparation of questionnaire and schedules - Pilot survey - Sampling and Non-sampling Errors -Limitations of sampling.

UNIT - II

Sampling from finite population- Simple Random Sampling with and without replacement - Unbiased estimate of mean and Variance - finite population correction -Estimation of standard error from a sample - Determinations of sample size - Simple Random Sampling for attributes.

UNIT - III

Stratified Random Sampling: Concept of stratifying factor - Unbiased estimate of the mean and variance of the estimated mean - Proportional and optimum allocation - Relative precision of stratified random sampling and simple random sampling.

UNIT – IV

Systematic sampling: Estimation of the mean and variance of the estimated mean - comparison of simple, stratified and systematic sampling.

$\mathbf{UNIT} - \mathbf{V}$

Regression Estimators: Linear regression estimate, Regression estimate with pre assigned 'b' and regression estimates computed from sample. CSO, NSSO and its functions - Other agencies undertaking sample surveys.

- 1. W.G.Cochran (1985), *Sampling Techniques*, Wiley Eastern Ltd, New Delhi.
- 2. S.C. Gupta and V.K.Kapoor (2007), *Fundamentals of Applied Statistics*, Sultan Chand & Sons, New Delhi.
- 3. Parimal Mukhopadhyay (2012), *Theory and methods of survey sampling*. 4th Edition (EEE) PHI Learning private limited, New Delhi.

MAJOR PRACTICAL – II: SAMPLING TECHNIQUES Paper Code: M16USTP02

UNIT – I

Simple random sampling - Drawing sample from the population with and without replacement - Estimation of population mean, total, variance and its S.E. - Stratified random sampling: Allocation, Estimation of mean and variance of the population mean -Variance of the estimator of mean under proportional and optimum allocations.

UNIT - II

Systematic sampling: Estimation of mean and its variance - Ratio and Regression methods of estimation based on simple random sampling.

UNIT - III

Fitting of curves by the least square method up to polynomial of degree two, ax^b, ae^{bx}, ab^x -Multiple correlation and partial correlation - Multiple regression of three variables.

$\mathbf{UNIT} - \mathbf{IV}$

Estimation of parameters of statistical model (Multinomial distribution, exponential, normal, binomial and Poisson distributions - Construction of confidence intervals for mean and variance.

$\mathbf{UNIT}-\mathbf{V}$

Method of maximum likelihood and method of moments - Fitting of Binomial, Poisson, Normal, Exponential distributions

Core Course - IV:DISTRIBUTION THEORY

Paper Code: M16UST04

UNIT – I

Univariate discrete distributions - their properties - Binomial, Poisson, Geometric, Hyper geometric and Negative binomial distributions -Limiting form of Binomial to Poisson distribution.

UNIT - II

Continuous Univariate distributions - Uniform - Normal - Exponential-Cauchy - Gamma - Beta distribution - their simple applications.

UNIT - III

Bivariate normal distributions - marginal and conditional distributions and their properties - Sampling distributions - Standard error.

$\mathbf{UNIT} - \mathbf{IV}$

Derivation of 't' distribution and its properties and its applications. Derivation and properties of 'F' distribution and its uses.

$\mathbf{UNIT} - \mathbf{V}$

Derivation and properties of chi-square distribution - Uses of chi-square - - Relationship between t, F and chi-square distributions.

- 1. S.C.Gupta and V.K.Kapoor, (2004), *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, New Delhi.
- 2. V.K. Rohatgi, (1985), An introduction to probability theory and mathematical statistics, Wiley Eastern Ltd., New Delhi.

Skill Based Elective Course: 1. Competitive Examination - I

Paper Code: M16USTS01

Unit I

Square Roots and Cube Roots – Averages; Problems on Numbers

Unit II

Problems on Ages- Percentages -Surds and Indices

Unit III

Profit and Loss

Unit IV

Simple interest-Compound interest

Unit V

Area – Volume

Text Books:

S.No	Name of the	Author	Ppublishing	Year Of
	Book		Company	Publication.
1.	Quantitative Aptitude For Competitative Examinations	R.S.Aggarwal	S.Chand Co Ltd ,152,Annasalai, Chennai.	2001

Core Course – V: THEORY OF ESTIMATION Paper Code: M16UST05

UNIT – I

Point Estimation - Parameter - Statistic - Estimate and Estimator - Properties of Estimators - Concept of Unbiasedness, Consistency, Efficiency and Sufficiency- Simple Applications.

UNIT - II

Minimum Variance Unbiased Estimator (MVUE) - Uniqueness property of MVUE - Cramer - Rao inequality - Regularity conditions – Minimum Variance Bound Estimator (MVBE).

UNIT - III

Sufficient statistic - Statement of Neyman - Factorization theorem - Concept of Blackwellisation - Statement and proof of Rao - Blackwell theorem.

UNIT – IV

Methods of estimation - Maximum likelihood estimator (MLE. and their properties – Simple problems on MLE - Method of moments - Simple illustrations - Methods of minimum chi-square and modified minimum chi-square.

$\mathbf{UNIT} - \mathbf{V}$

Interval estimation - Distinction between point estimation and interval estimation - Confidence interval and confidence Coefficients - Construction of confidence intervals for mean, difference of means and variance.

- 1. Rohatgi, V.K. (1988), An introduction to probability Theory and Mathematical *Statistics*, Wiley Eastern Ltd., New Delhi.
- 2. Lehmann, E.L. (1986), *Theory of point estimation* (Student edition).
- 3. Hogg, R.V. and Craig, A.T. (1978), *Introduction to Mathematical Statistics*, Fourth Edition, Collier Macmillian Publishers.
- 4. Mood,A.M., Graybill, F. a., and Bies, D.C.(974), *Introduction to the Theory of Statistics*, Third Edition, McGrow Hill.
- 5. Rao, C.R.(1973), *Linear Statistical Inference and its Applications*, Revised Edition, Wiley Eastern Ltd., New Delhi.

Skill Based Elective Course: 1. Competitive Examination - II			
Paper Code:	M16USTS02		
Unit I			
	Simplification, Ratio & proportion.		
Unit II			
	Partnership, chain rule		
Unit III			
	Time and Work, Time and Distance.		
Unit IV			
	Stocks & Shares, permutations and combinations.		
Unit V			

True Discount ,Banker's Discount.

Text Books:

S.No	Name of the	Author	Ppublishing	Year Of
	Book		Company	Publication.
1.	Quantitative	R.S.Aggarwal	S.Chand Co Ltd	2001
	Aptitude For		,152,Annasalai,	
	Competitative		Chennai.	
	Examinations			

Core Course VI: TESTING OF HYPOTHESIS Paper Code: M16UST06 UNIT-I

Statistical Hypothesis- Simple and Composite hypothesis –Critical Region – Types of errors-Level of Significance – size and power of the test- Most powerful (MP) test- Neymann - Pearson lemma-UMP test –Simple Problems.

UNIT-II

Testing of significance –Large Sample and small sample tests-Normal test for Mean, Variance, Proportion and Coefficient of correlation- Small sample tests based on t,F for testing mean and variance –Paired t-test.

UNIT-III

Likelihood Ratio (LR) test-Procedure –Properties –Simple Applications.Chi-Square test for variance, Goodness of fit and independence of attributes.

UNIT-IV

Analysis of variance (ANOVA)- Statistical Analysis of One Way –Two Way-Classifications.

UNIT-V

Sequential analysis –Need for Sequential rules - Wald's sequential Probability Ratio Test (SPRT) –Average Sample Number (ASN) and Operating Characteristic (OC) functions – Simple illustrations.

- 1. Rohatgi, V.K (1988), An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi.
- 2. Lehmann, F.L (1986), Testing of Statistical Hypothesis (Student Edition)
- 3. Hogg, R.V and Craig, A.T (1978), Introduction to Mathematical Statistics, Fourth Edition, Colliar Mac. Millan Publishers
- 4. Mood A.M., Graybill, F.F and Boes D.C (1974), Introduction to Theory of statistics, Third Edition, McGraw Hill.
- 5. Rao C.R (1973) Linear Statistical Inference and its Applications , Revised Edition, Wiley Eastern Ltd., New Delhi.

Core Course – VII: DESIGN OF EXPERIMENTS Paper Code: M16UST07 UNIT-I

Basic Principles of Experimental Design – Experimental Errors –Replication Randomization and Local Control –Uniformity Trails – Transformation of data and its need.

UNIT-II

Multiple Comparison Methods –LSD test –SNK test-Duncan's multiple range test – Tukey (HSD) test –Basic designs –Completely Randomized Design (CRD) and its Analysis.

UNIT-III

Randomized Block Design (RBD) and their analysis- Missing plot technique for RBD (one and two missing values) – Latin Square Design (LSD) and its analysis- Missing plot technique.

UNIT-IV

Factorial Experiments- Concept of Main effects and Interactions effects ,2²,2³, Analysis of Experiments-Principle of Confounding (Concept Only)

UNIT-V

Analysis of 3^2 Factorial Experiments –Need and analysis of Split –Plot design (two factors only) -Main plot treatments with RBD layout.

- 1. S.C Gupta & V.K Kapoor (2007) ,Fundamentas of Applied Statistics , Sultan Chand & Sons , New Delhi.
- 2. A.M . Goon M.K .Gupta and B.Das Gupta (1994) , Fundamentals of Statistics V-II, The world press Ltd., Culcutta.
- 3. M.N Das and N.cGiri (1998) Design and Analysis of experiments, Wiley Eastern Ltd, New Delhi.

MAJOR PRACTICAL – III: ESTIMATION THEORY Paper Code: M16USTP03

UNIT – I

Fitting of Binomial, Poisson and Normal distribution.

UNIT - II

Fitting of curves by the least square method up to polynomial of degree two, ax^b ae^{bx} and ab^x

UNIT – III

Multiple correlation and Partial correlation – Multiple Regression equation of three

variables.

$\mathbf{UNIT} - \mathbf{IV}$

Estimation of parameters of statistical model (Multinomial distribution, exponential, normal, binomial and poisson distribution)- construction of confidence intervals for mean and variance.

$\mathbf{UNIT} - \mathbf{V}$

Method of maximum likelihood and method of moments -fitting of binomial, poisson,

Normal ,Exponential distributions.

PRACTICAL – IV: SPSS (PRACTICAL) Paper Code: M16USTP04

Using SPSS Package

Introduction – Data Entry – The Data View Spreadsheet – The Variable View Spreadsheet – Description of Data – Methods of Analysis.

UNIT-I

Diagrammatic Representation – Bar – Multiple Bar – Line – Histogram – Percentage bar – Sub divided bar diagram.

UNIT-II

Frequency distribution – Arithmetic Mean – Median – Mode – G.M – H.M

UNIT-III

Range – Quartile Deviation – Standard Deviation

UNIT-IV

Correlation - Regression

UNIT-V

T – test – Chi square test - ANOVA

REFERENCE BOOKS

1. A hand book of statistical analysis using SPSS – Sabine landau and Brian S.Everitt SPSS for social statistics and Research methods – Willam E. Wagner

Core Elective – I: STOCHASTIC PROCESS Paper Code: M16USTE01

UNIT-I

Basic Concepts –Definition and Examples of Stochastic Process- classification of General Stochastic Processes into Discrete and Continuous time-Discrete and Continuous State Spaces- Types of Stochastic Processes- Elementary problems.

UNIT-II

Markov chains-Definition and Examples of Markov Chain –Transition Probability Matrix- Classification of States- Recurrence –Simple Problems.

UNIT-III

Basic limit theorem of markov chain (Statement only) – Stationary Probability Distribution- Applications

UNIT-IV

Continuous Time Markov Chain – Pure Birth Process and Poisson Process – Birth and Death Process- Problems.

UNIT-V

Branching Process-Definition and examples of Discrete time Branching Process-Probability Generating function- Mean and Variance- Probability of Extinction –Simple problems.

REFERENCE

- 1. Karlin .S and Taylor H.M (1975) A first course in Stochastic Preocesses ,Academic press.
- 2. Hoel, P.M.G., Port S.C and Stone ,C.J (1991) Introduction to Stochastic Processes, Universal Book Stall.
- 3. Parzen, E.(1962) Stochastic Processes, Holden-Day.
- 4. Cinlar .B (1975) Introduction to Stochastic Processes, Prentice Hall.
- 5. Adke S.R and ManjunathS.M(1984) An Introduction to Finite Markov Processes, Wiley Eastern.
- 6. Medhi .J (1996) Stochastic Processes, New Age International (p) Ltd.

Core Elective - II: ACTURIAL STATISTICS Paper Code: M16USTE04 UNIT-I

Effective Rate of Interest i-Nominal Rate of interest $i^{(m)}$ – Force of Interest a- Relation between different Rates of Interest –Expression for a by use of calculus- Present values – Effective Rate of discount d –Nominal Rate of Discount d^(m).

UNIT-II

Annuities- Immediate Annuity –Annuity Due- Perpetuity- Accumulation and present values of Annuities- Increasing and Decreasing Annuities –Annuities and interest rates -with different frequencies Continuous Annuities.

UNIT-III

Analysis of Annuity Payments- Capital and Interest -elements included in the Annuity Payments- Loan Outstanding after t Payments- Purchase price of Annuities- Annuities involving income tax- Purchase price of an Annuity net of tax.

UNIT-IV

Stochastic Interest rates – Independent annual interest rates – The Definition of S_n –Mean and Variance of S_n – Definition of A_n - Mean and variance of A_n – Simple Problems.

UNIT-V

Probabilities of living and dying –The force of Mortality i_x – Estimation of i_x – Uniform Distribution of deaths – Select and Ultimate Rates.

- 1. Donald D.W.A (1975) Compound Interest and Annuities certain Heinemann, London.
- 2. Frank Ayres, J.R (1983) Theory and Problems of Mathematics of finance, Schaum's outline series, McGraw Hill Books Company, Singapore.
- 3. McCutcheon J.J and Scott (1989) Mathematics of Finance, Heinemann, London.
- 4. Neill.A (1977) Life Contingencies, Heinemann, London.

SBEC – IV: INDIAN OFFICIAL STATISTICS Paper Code: M16USTS04 UNIT-I

Statistical organization - **Population Statistics – Agricultural Statistics**- Indices of Agricultural Production- Miscellaneous Agricultural Statistics.

UNIT-II

Industrial statistics – ASI - Indices of Industrial Production and profits.

UNIT-III

Price statistics – Price index numbers - Labour Bureau- Index number of Retail prices – Indices of Security prices.

UNIT-IV

Wage statistics – trade statistics- Financial satatistics- National income statistics.

UNIT-V

National Sample Surveys –Activities and publications of CSO –and the Department of Statistics- Government of Tamil Nadu- National Income compilation.

- 1. Gupta SP, Statistical Methods, Sultan Chand & Sons.
- 2. Saluja MR, Indian Official Statistical System, Publication Of Indian Econometric Society.
- 3. Central Statistical Organisation, Guide to Official Statistics, 1979 Ed, Department of statistics, Ministry of Planning, India.

Core Course – VIII: STATISTICAL QUALITY CONTROL Paper Code: M16UST08 UNIT-I

Basic concepts of quality - Meaning of quality - Quality of design - Quality of conformance - Specification of quality concepts of S.Q.C. - Causes of variation.

UNIT-II

Process control - Control chart - Basis of control chart - uses - Rational subgroups - Control charts for variables (*X*, R and S - Charts)

UNIT-III

Control charts for Attributes (P, np, c for fixed and varying sample sizes) comparison of control charts for variable and attributes - Applications of theory of runs in quality control.

UNIT-IV

Product control - Acceptance sampling - Sampling inspection by attributes -Producer's and consumer's risk, AQL, LTPD, IQL - Single, Double sampling plan procedure, OC, AOQ, AOQL, ASN and ATI curves

UNIT-V

Sequential sampling plan procedure - estimation of parameters - OC, AOQ, ASN curves, multiple sampling, comparison between single, double and multiple sampling

- 1. M.Mahajan (2001), Statistical quality control, Dhanpat Rai& co (p) Ltd., Delhi.
- S.C.Gupta, V.K.Kapoor, (2007), Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
- **3.** A.J.Duncan, (1974), Quality control and industrial statistics, Irwin inc.Homewook
- **4.** E.L.Grant and R.S.Leavenworth (1991), Statistical Quality Control, Mc-Graw-Hill, New york.
Core Course – IX: APPLIED STATISTICS Paper Code: M16UST09

UNIT-I

Concept of time series - Source of time series data - Component of time series - Additive and Multiplicative models - Resolving the components of time series - Trend - Methods of measuring trend - Semi average method - Method of moving average - Method of least squares.

UNIT-II

Seasonal variation - Seasonal index - Methods of measuring seasonal index - Simple average method - Ratio to moving average - Ratio to trend method - Link relatives method - Cyclical variation - Measurement of cyclical variation - Auto correlation analysis .

Basis of Index Numbers - Definition -uses - Problems in the construction - Different types of Index Numbers - Simple Index Numbers - Weighted Index Numbers -Laspeyre's Index Numbers - Paasche''s Index Numbers - Fisher's Index Numbers -Marshall & Edge worth Index Numbers – Dorbish &Bowley's Index Numbers

UNIT-IV

Optimum tests of Index Numbers - Time reversal test - Factor Reversal Test - Circular Test - Chain base Index Number - Conversion of FBI into CBI and Vice versa -Uses of Index Numbers - Wholesale price Index Numbers (Concept only)

UNIT-V

Cost of living Index Numbers - Methods of construction - Aggregate method - Family budget method - splicing and deflating - Base shifting - Uses of cost of living Index Numbers.

- **1.** A.M.Goon M.K.Gupta and B.Das Gupta (1994), Fundamentals of Statistics V-II, The world press Ltd., Culcutta.
- 2. Croxton : Applied General Statistics.
- S.C.Gupta, V.K.Kapoor, (2007):Fundamentals of Applied Statistics, Sultan Chand &Sons, New Delhi

MAJOR PRACTICAL – V: (APPLIED STATISTICS) Paper Code: M16USTP05

UNIT-I

Construction of control charts for variables: \overline{X} , R and S charts. Control charts for attributes of fixed and varying sample size - p, np and C charts.

UNIT-II

Acceptance sampling plan for attributes: single sampling plan - OC, AOQ, ASN and ATI curves; Double sampling plan - OC, AOQ, ASN and ATI curves.

UNIT-III

Estimation of trend by moving averages, least square methods - First degree and second degree polynomials - Computation of quarterly and monthly trends.

UNIT-IV

Estimation of seasonal indices by simple average method - Ratio-to-trend, Ratio to moving Average and link relative methods.

UNIT-V

Weighted Index Numbers - Laspeyre^s - Paasche^s - Fisher^s–Marshall & Edge worth -Dorbish&Bowley^s methods - Optimum tests of Index Numbers - Time reversal test - Factor Reversal Test

Core Elective – III: NUMERICAL ANALYSIS Paper Code: M16USTE07

UNIT-I

Solution of Algebraic and transcendental equations - Method of successive bisection - Method of Regula-Falsi - The Secant method - Newton - Raphson iterative method.

UNIT-II

Finite Differences: Definition and properties of Forward Difference Operator, Backward Difference Operator and Shift Operator - Relations between them - nth differences of polynomials - Difference Equations.

UNIT-III

Interpolation with equal and unequal intervals: Newton - Gregory forward Interpolation and Backward Interpolation formula for equal intervals - Lagrange Interpolation formula for unequal intervals.

UNIT-IV

Numerical Differentiation: Numerical Differentiation based on Newton^s Forward and Backward Interpolation formulas - Computation of Second order derivatives numerically.

UNIT-V

Numerical Integration: General quadrature for equidistant ordinate - Trapeziodalrule - Simpson 1/3 and 3/8 rules- Weddle^s rule - Simple applications.

- 1. G.ShankerRao, Numerical Analysis (New Age International Publications)
- 2. S.S.Sastry, (2010), Introductory Methods of Numerical Analysis (Prentice Hall).
- 3. K.E. aitkinson, An introduction to Numerical Analysis (John Wiley and sons)
- 4. V.Rajaraman, Computer Orinted Numerical Methods (Prentice Hall).
- 5. P.Scheild, (1968), Numerical Analysis (Schaum Series).

SBEC – V: STATISTICAL FORECASTING Paper Code: M16USTS05

UNIT-I

Concept of partial correlation - simple application

UNIT-II

Concept of multiple correlation - simple illustration

UNIT-III

Regression coefficients and its properties

UNIT-IV

Concept of multiple regression - simple problem

UNIT-V

Fitting of multiple regression lines and estimations (three variables only)

- 1. S.C.Gupta and V.K.Kapoor (2004): Fundamentals of Mathematics Statistics, Sultan Chand and Sons, New Delhi.
- J.N.Kapoor and H.C.Sexana (1989) : Mathematical Statistics, sultan Chand and sons, New Delhi.

SBEC – VI: REGRESSION ANALYSIS Paper Code : M16USTS06

UNIT-I

Concept of correlation and its types - methods of correlation - Rank Correlation - equal and unequal rank.

UNIT-II

Concept of regression - Liner regression - Regression line - Regression Coefficient - properties of regression coefficient.

UNIT-III

Curve fitting- Methods of Least Square- Straight line and Parabola.

UNIT-IV

Curve fitting: Power Curve, Exponential Curves.

UNIT-V

Growth Curve fittings - Gompertz and Logistic Curves.

- 1. Fundamentals of Mathematical Statistics, (2000)-S.C. Gupta and V.K. Kapoor.
- 2. Mathematical Statistics -J.N. Kapoor and H.C. Saxena (1989).
- 3. Introduction to mathematical Statistics R.V. Hogg and A.T. Craig (1989).