M. Phil.
STATISTICS
SYLLABUS - 2018

GUIDELINES FOR M.PHIL. PROGRAMME

1. Duration

The programme runs for one year of two semesters. The Semester- I is from August to February and the Semester- II runs from March to August, of the following year.

2. Course Work

Semester-I			Semester-II		
Course	Title	Cr	Course	Title	Cr
C1	Professional Skills for Teaching - Learning	4	C5	Dissertation (Topic selected should be relevant to the topic of the Guide Paper)	8
C2	Research Methodology	4			
C3	Core Course	4			
C4	Guide Paper	4			
Total		**16**	**Total**		**8**

A) Each Course should contain 5 units, covering the subject requirements of the courses offered. **Marks for CIA and SE are in the ratio 25: 75**.

CIA & SE	Tentatively on
Mid Semester Test	December 2nd week
End Semester Test	February 2nd week
Semester Examinations	February 4th week

A candidate shall be declared to have passed Course I, II, III and IV, if he / she secures not less than 40% of the marks in both CIA and the University Examination and 50% of the marks in the aggregate (i.e. continuous internal assessment and the written Examination taken together.

B) In course C1 on **'Professional Skills for Teaching– Learning'** the first three units are common to all the Departments of the College. The first three unit titles are **Soft Skills, E-teaching, E-learning, Elements of Technology of Teaching and Learning.** The remaining two units are department specific to make use of the above mentioned skills & techniques to teach the Core Course.

The C1 Course is (to be) designed to explore the various Teaching – Learning – Research Skills to be imbibed / cultivated to make the research scholars to be fit for the profession they are likely to acquire in the Education Sector.

Departments will be permitted to offer either paper 2 or paper 3 as Open Online Course to the M.Phil. students. The evaluation method will be the same for both C2 and C3 Courses.

C) **Evaluation:**

C.1:

For CIA and SE there will be a 2 hour test only from the first THREE units. The CIA components are Mid Semester Test (35), End Semester Test(35) and Assignment (15) and Practical Component(15). The total mark 100 will be converted into **25** marks.

C.2, C.3 & C.4:

The CIA components for C-2, C-3 and C-4 are Mid Semester Test (25), End Semester Test (25), Seminar (30), Objective Type test /Assignment (20). *(The marks of Mid semester test (75), End semester test (75) will be converted into 25 each.)*

The total mark 100 will be converted into 25 marks. The tests and Semester Examination are centrally conducted by COE for 3 hours.

a) Question papers for C1, C2 & C3 are set by External Examiners.

b) Question paper for C4 will be set and valued by the Research Advisor only.

c) The evaluation method will be the same for both C2 and C3 Courses.

3. Credits

	Courses	Title		Contact hours	Library hours	Total hours	Credit	CIA marks	SE marks	Total marks
Semester-I	C1	Professional Skills for Teaching-Learning	T	3	2	5	3	25	50	100
			P	2	2	4	1		25	
	C2	Research Methodology		5	4	9	4	25	75	100
	C3	Core Paper		5	5	10	4	25	75	100
	C4	Guide Paper		5	5	10	4	25	75	100
Total				**20**	**18**	**38**	**16**	**100**	**300**	**400**

		Internal	Cr	Mk	External	Cr	Mk
Semester-II	**C5**	Seminar & Review of Related Literature	1	15	Dissertation Evaluation	6	75
		Mid-term Review Presentation	1	15	Viva-voce	2	25
		Dissertation Work	4	50			
		Publication of Research Articles	1	10			
		Viva-voce	1	10			
		Total	**8**	**100**		**8**	**100**

4. Question Pattern

Course	Mid & End Semester Tests		
	SCIENCE		
C1	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	$7 \times 2 = 14$ $3 \times 7 = 21$
C2	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	$10 \times 3 = 30$ $5 \times 9 = 45$
C3	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	$10 \times 3 = 30$ $5 \times 9 = 45$
C4	Open Choice: Comprehensive Type	5/8	$5 \times 15 = 75$
	ARTS		
C1	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	$7 \times 2 = 14$ $3 \times 7 = 21$
C2	Open Choice: Comprehensive Type	5/8	$5 \times 15 = 75$
C3	Open Choice: Comprehensive Type	5/8	$5 \times 15 = 75$
C4	Open Choice: Comprehensive Type	5/8	$5 \times 15 = 75$

Course	Semester Examination		
	SCIENCE		
C1	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	$7 \times 2 = 14$ $3 \times 12 = 36$
C2	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	$10 \times 3 = 30$ $5 \times 9 = 45$
C3	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	$10 \times 3 = 30$ $5 \times 9 = 45$
C4	Open Choice: Comprehensive Type	5/8	$5 \times 15 = 75$
	ARTS		
C1	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	$7 \times 2 = 14$ $3 \times 12 = 36$
C2	Open Choice: Comprehensive Type	5/8	$5 \times 15 = 75$
C3	Open Choice: Comprehensive Type	5/8	$5 \times 15 = 75$
C4	Open Choice: Comprehensive Type	5/8	$5 \times 15 = 75$

5. Dissertation

For carrying out the dissertation, it is mandatory to strictly adhering to the rules of the college as given below:

5.1 Requirement

Every student is expected to give two seminars one concerning Review of Related Literature within the four weeks from the beginning of the second semester and the other on Data Analysis/Result/Mid Term Review just before the submission of the final draft of the dissertation

5.2 Submission

Candidates shall submit the Dissertations to the Controller of Examinations **not earlier than five months but within six months** from the date of the start of theSemester –II. The above said time limit shall start from the 1st of the month which follows the month in which Semester - I examinations are conducted. If a candidate is not able to submit his/her Dissertation within the period stated above, he/she shall be given an extension time of **four** months in the first instance and another **four** months in the second instance with penalty fees. If a candidate does not submit his/her Dissertation even after the two extensions, his/her registration shall be treated as cancelled and he/she has to re-register

for the course subject to the discretion of the Principal. However the candidate need not write once again the theory papers if he/she has already passed these papers.

At the time of Submission of Dissertation, the guide concerned should forward the marks to the CoE through HOD in a sealed cover

5.3 Publications

All the M.Phil. Scholars should publish atleast one Research article in the reputed Journals before the submission of their dissertation. Publication of research article will be considered as CIA component. According to the type of Journals marks will be distributed to each article as follows.

UGC approved Journals	-	10 marks
Other Journals with ISSN number	-	8 marks
ReTeLL or Seminar /Conference Proceedings	-	6 marks

5.4 Requirement

For the valuation of dissertation it is mandatory to have passed in all the four courses. One external examiner and the Research Adviser shall value the Dissertation. The external examiner should be selected only from outside the college and shall be within the colleges affiliated to Bharathidasan University. In case of non-availability, the panel can include examiners from the other university/colleges in Tamil Nadu. The external examiner shall be selected from a panel of 3 experts suggested by the Research Adviser. However, the Controller of Examination may ask for another panel if he deems it necessary. Both the internal and external examiner will evaluate the Dissertation and allot the marks separately. However the *viva-voce* will be done by both of them. The average marks will be considered.

5.5 Curbing Plagiarism

According to The draft of University Grants Commission (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Education Institutions) Regulations, 2017. Before submitting the thesis every students should submit the draft and get the certificate from the college library which will be issued after the verification of plagiarism. The certificate should be enclosed along with the thesis.

Plagiarism would be quantified into following levels in ascending order of severity for the purpose of its definition:

Level-0: Similarities upto 10% Excluded
Level-1: Similarities above 10% to 40%
Level-2: Similarities above 40% to 60%
Level-3: Similarities above 60%

Penalties for Students Plagiarism Disciplinary Authority (PDA) of the HEI, based onrecommendations of the Academic Misconduct Panel (AMP), shall impose penalty considering the severity of the Plagiarism.

i. Level 0: Similarities upto 10% - Minor Similarities, no penalty.
ii. Level 1: Similarities above 10% to 40% - Such student shall be asked to submit a revised script within a stipulated time period not exceeding 6 months.
iii. Level 2: Similarities above 40% to 60% - Such student shall be debarred from submitting a revised script for a period of one year.
iv. Level 3: Similarities above 60% -Such student registration for that programme shall be cancelled.

5.6 Viva-Voce

An open Viva-Voce examination shall be conducted by both the external examiner and the supervisor **and shall be attended by members of Department Research Committee members, all faculty members of the departments, other research scholars and other interested experts / researchers** and evaluated jointly by the Examiner and the Supervisor. The valuation of M.Phil. Dissertations and the viva-voce examination shall be carried out on the same day at the place of the Research Supervisor (viva is to be conducted only if the student passes in the valuation of the dissertation). The mark should be sent to the Controller of Examinations by the Research supervisor. A candidate shall be declared to have passed Part-II Examination if he secures not less than **55%** of the marks both in internal and external.

6. Classification of Final Results

i. The classification of final results shall be based on the CGPA, as indicated in Table 2.
ii. For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as "Outstanding". Similarly, the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99, and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective Programmes as "Excellent", "Very Good", "Good", and "Above Average" respectively..
iii. Absence from an examination shall not be taken as an attempt.

Table-1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
Below 50	NA	RA

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Results
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
Below 5.00	RA	Re-Appearance

6.1 Credit based weighted Mark System is to be adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

6.2 Candidates who have failed in the courses may take the supplementary exams conducted by the CoE immediately. Even then, if they could not complete the course(s), they will be given two more chances only to appear for those courses along with the next batch scholars. The maximum duration for the completion of the M.Phil.Programme is 2 Years.

7. **Attendance**: Daily attendance for 90 working days should be enforced for the students. Periodical report of a student to the guide concerned should be recorded in the register kept by the guide.

8. **The Scholar must obtain 80% of attendance per semester in order to appear for the Semester Examinations/*Viva-Voce.***

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M. Phil. STATISTICS

Programme Outcomes (POs)

1. Scholars are to be adopted with a new paradigm of self-learning in the form of review of earlier knowledge acquired.
2. Scholars are brought to light from the previous investigation completed to the newer thrusts of knowledge and implementation in research.
3. Scholars are trained to design, implement and evaluate secured information (hard and soft) systems with assured quality and efficiency.
4. Scholars are to be oriented towards becoming globally competent.

Programme Specific Outcomes (PSOs)

1. Critical and Analytical Thinking Skills
2. Problem Skills
3. Communication and Presentation Skills
4. Teamwork Skills
5. Knowledge
6. Information Technology/Techniques
7. Ethics and Social Responsibility
8. Leadership Skills
9. Research Orientation
10. Employability Enhancement

Course Pattern

Sem.	Code	Title of the paper
I	18MST101	Course-1: Professional Skills for Teaching-Learning
	18MST102	Course-2: Research Methodology
	18MST103	Course-3: Advanced Statistical Quality Control
	18MST104A	Course-4: Advanced Applied Multivariate Analysis
	18MST104B	Course-4: Advanced Design of Experiments
	18MST104C	Course-4: Advanced Stochastic Processes
II	18MST205	Course-5: Dissertation

18MST101

Paper-I
PROFESSIONAL SKILLS FOR TEACHING-LEARNING

Course Outcomes:
1. Empower scholars with soft skills
2. Introduce the techniques and dynamics of teaching
3. Facilitate e-learning/e-teaching with the ICT tools
4. Know the material resources for classroom teaching
5. Introduce soft skill for class room teaching
6. To improve the cognitive skills for research

Unit-I: Soft Skills
a. Introduction to soft skills, soft skills vs hard skills, types of soft skills
b. Communicative skills – basics in communication, structure of written and oral sentences, verbal, non-verbal, body language, JOHARI Window, intrapersonal and interpersonal communications, activities in effective communication
c. Behavioural skills – leadership skills, time management, creativity and lateral thinking
d. Interview skills – resume writing, different types of interviews, etiquettes in interviews, mock interviews
e. Team building and group discussion – progressive stages of team building, parameters of GD (special reference to attending, listening, responding skills), mock group GDs

Unit-II: Techniques and dynamics of teaching-learning
a. Emerging trends in educational psychology – meaning, scope and methods
b. Learning different theories of learning, approaches to learning (classical conditioning – Ivan Pavlov, operant conditioning – b f skinner); kinds of learning, factors affecting learning
c. Motivation: intrinsic and extrinsic motivation, development of memory and intelligence

Unit-III: e-Learning and e-Teaching
An overview of MS Office 2007, MS WORDS-2007, MS EXCELL-2007-MS Powerpoint-2007, concepts in e-resources and e-design: world wide web concepts – making use of web resources – website creation concepts – creating web page editions – creating web graphics – creating web audio files

Unit-IV: Teaching Practice-I: Statistical Theory *Suggested Topics*
Descriptive statistics – Probability theory, Distribution theory - Statistical Inference - Sampling theory - Design of experiments - Applied statistics – Engineering statistics - Bio Statistics

Unit-V: Teaching Practice-II: Statistical Packages *Suggested Topics*
SPSS - R-Programming - Descriptive statistics – Frequencies tables – Compare means – Correlation and regressions – Non Parametric methods – Graphics – ANOVA – Any two advanced models.

For unit IV and V – Preparation of lesson plan – Preparation of Assignments – Setting Objective type questions – Preparation of Teaching Aids – Hands on experience – Teaching for UG Classes using different teaching methods such as chalk and talk method, PowerPoint
– LCD – OHP – Numeric Puzzles etc.

References
Unit-I:
1. JASS (2013). Winners in the making. Introduction to Soft Skills. St. Joseph's College, Trichy
2. Murphy, Raymond. (1998). Essential English Grammer. 2nd ed. Cambridge University Press
3. Trishna (2004). Knowledge system how to do well in GDs and interviews. Reprographic and printing services, Secunderabad

Unit-II:
1. Covey, Stephen. (2004). 7 habits of highly effective people, free press.
2. Driscoll, M P (1994). Psychology of Learning for Instruction, Needham, Ma: Allyn and Bacon.
3. Gardner, Howard (1983; 1993). Frames of mind: the theory of multiple intelligences, New York; Basic Books.

Unit-III:
1. Joyce cox, curtisfrye etc (2007), step by 2007 microsoft office system, Prentice Hall of India Pvt Ltd, New Delhi.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	Code	Title of the Paper		Hours	Credits
I	18MST101	PROFESSIONAL SKILLS FOR TEACHING-LEARNING		9	3

Course Outcomes (COs)	Programme Outcomes (POs)				Programme Specific Outcomes (PSOs)										Mean Score of COs
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	
CO1	5	5	3	4	5	4	3	4	4	3	4	5	5	3	3.7
CO2	4	4	3	4	4	4	4	4	3	4	3	4	4	4	3.7
CO3	3	4	4	5	3	5	5	5	4	5	4	5	5	4	4.1
CO4	4	4	5	5	3	4	3	4	5	4	4	5	5	4	4.2
CO5	5	5	3	5	3	4	5	5	3	4	4	3	3	5	4.0
CO6	4	4	3	5	4	5	3	4	4	4	4	5	5	3	4.0
												Overall Mean Score for COs			3.9

Result: The Score for this Course is 3.9 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$$

$$\text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

18MST102

Paper-II
RESEARCH METHODOLOGY (OOC)

Course outcomes

1. Revisiting of important basic concepts of statistics along with Research methodology.
2. Use Statistical Packages and interpretations of the results
3. Analyze how to write the proposal for research projects
4. Understand the methods to collect the error free data.
5. Learn the nature of the matrix for multivariate analysis
6. Develop the multivariate technique skills for innovate research projects.

Unit-I

Definitions of Research and Methodology – 7 stages in research – Types of research – Research design planning. Formulation of research problem – Data Collection : Experimental methods of collecting data – Reducing experimental error through CRD, RBD, LSD, incomplete experiments (concept only). Survey Methods: Primary Source and Secondary Source – Methods of collection of primary data – Interview method, Telephone Survey, ICT based survey local correspondents – Enumeration and Questionnaire method. Questionnaire development process: Points to remember, evaluating the questions – measurement and sealing – reliability and validity of measurements – pretest.

Sampling process and selection: Probability sampling SRS, Stratified, systematic and multistage sampling (No derivations). Non Probability sampling Judgment Sampling, Quota sampling, Convenience sampling, Sample size determination (only concepts)

Unit-II

Interpretation: Mistakes commonly committed in interpreting data.

Report writing: Outline of a research project - Title page - Table of contents - Preface - Introduction - Objectives - Methodologies - Findings - Limitations - Conclusions and Recommendations - Appendices - Guidelines for writing the research projects.

Oral presentation: Deciding on the content - Visual aids - The presentation - Handling questions - Writing a research project to a funding agency.

Unit-III

Introduction to Linear equations - Quadratic forms - Canonical reduction - Generalized inverse and its properties - Moore Penrose inverse.

Unit-IV

Statistical Test: Basic statistical test - Using normal, t, c^2 and F distributions - Non-parametric tests - Multiple regression - ARIMA Models (concepts only) - Implementation of the above tests using Statistical Package.

Unit-V

Multivariate Analysis: Logistic regression - Factor analysis - Cluster analysis - Discriminant analysis - Concepts and applications only - implementation of the above techniques using Statistical Package.

Web URLs for Reference:

Unit I   : http://www.sjctni.edu/department/ST/RM/unit1.jsp
Unit II : http://www.sjctni.edu/department/ST/RM/unit2.jsp
Unit III : http://www.sjctni.edu/department/ST/RM/unit3.jsp
Unit IV : http://www.sjctni.edu/department/ST/RM/unit4.jsp
Unit V : http://www.sjctni.edu/department/ST/RM/unit5.jsp

Books for Study:

1. Tripathy, P.C., "A Textbook of Research Methodologies in Social Sciences", Sultan Chand, 2005.
2. Johnson, R.A. and Wichern, D.W., "Applied Multivariate Statistical Analysis" PHI, 2003.
3. Damodar N. Gujarati, "Basic Econometrics", Third Edition, McGraw Hill, 1995.
4. Kothari,C.R. "Research Methodology Methods and Techniques", New Age International, 2004.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

| Semester I | Code 18MST102 | Title of the Paper RESEARCH METHODOLOGY | | | | | | | | | | | | | | | | | Hours 9 | Credits 3 |

Course Outcomes (COs)	Programme Outcomes (POs)				Programme Specific Outcomes (PSOs)										Mean Score of COs
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	
CO1	2	4	3	4	5	4	3	3	4	5	3	4	5	3	3.7
CO2	4	4	3	4	4	4	3	4	4	3	4	3	4	4	3.7
CO3	2	3	5	5	3	4	5	3	5	5	4	4	5	4	4.0
CO4	2	3	4	5	4	3	2	5	3	5	4	4	3	5	3.7
CO5	5	3	5	3	4	3	5	4	3	5	4	4	5	5	4.1
CO6	4	3	4	3	4	3	3	2	4	5	3	4	2	3	3.5
Overall Mean Score for COs															3.8

Result: The Score for this Course is 3.8 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs $= \dfrac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$

Mean Overall Score for COs $= \dfrac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$

18MST103

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Paper-III
ADVANCED STATISTICAL QUALITY CONTROL

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Course outcomes
1. Learn the basics of Statistical Quality Control for research.
2. Understand the applications of different control charts.
3. Explore the critical situations for using control charts.
4. Illustrate the importance of Statistical process control.
5. Learn the different sampling plans.
6. Understand the importance of Statistical process control in Engineering and technology.

Unit 1

Cumulative - Sum Control Chart – Basic Principles – Tabular Or Algorithmic Cusum For Monitoring Process Mean – Recommendations For Cusum Design – The Standardized Cusum – Rational Subgroups – One Sided Cusum – A Cusum Monitoring Process Variability – Cusum For Other Sample Statistics – The V- Mask Procedure – The Exponentially Weighted Moving Average Control Chart for monitoring the Process Mean – Design of an EWMA Control Chart – Extensions of the EWMA – The Moving Average Control Char.

Unit 2

X and R Charts for Short Production Runs – Attribute Control Charts for Short Production Runs – Modified Control Limits for the X Chart – Acceptance Control Charts – Group Control Charts for Multiple Stream Processes – Multivariate Quality Control - S P C With Correlate Data – Interfacing Statistical Process Control and Engineering Process Control – Economic Design of Control Charts – An Economic Model of the X Control Chart.

Unit 3

Process Capability Analysis – Using a Histogram or a Probability Plot – Process Capability Ratios – Process Capability Analysis Using a Control Chart – Process Capability Analysis Using Designed of Experiment – Gauge and Measurement System Capability Studies Setting Specification Limits on Discrete Components – Estimating the Natural Tolerance Limits of a Process.

Unit 4

Basic Concepts of Acceptance Sampling-Attributes Sampling Plans Single, Double, Multiple and item by item Sequential Sampling Plans, Dodge and Romig LTPD and AOQL Tables, ABC Standard, Philip's System, Golub's Minimization Approach, Sampling Plans for Isolated Lots MAPD Plans, MAAOQ Plans, Incentive Index Plans.

Unit 5

Variable Sampling Plans - Known and Unknown – Sigma Plans, MIL-STD-414. Special purpose plans-Chain sampling plans-Skip-lot plans – Administration of Sampling Inspection Plan.

Books and References:
1. Montgomery D.C.: Introduction to Statistical Quality Control, John Willey and Sons 3rd Edition, 1996.
2. Grant E.L and Leavenworth R.S, Statistical Quality Control, McGraw Hill, New York, 1980.
3. Schilling, E.G, Acceptance Sampling in Quality Control, Marcel Deckar Inc, New York, 1989.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18MST103				Title of the Paper ADVANCED STATISTICAL QUALITY CONTROL														Hours 10	Credits 5
Course Outcomes (COs)	Programme Outcomes (POs)				Programme Specific Outcomes (PSOs)															Mean Score of COs
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10						
CO1	3	3	3	4	5	4	3	3	4	3	3	4	5	3						3.64
CO2	5	5	3	4	4	5	4	4	4	4	4	3	4	4						3.92
CO3	3	3	2	2	2	5	4	5	3	5	5	4	5	4						3.78
CO4	4	4	5	5	2	4	4	3	5	3	4	4	5	4						4.14
CO5	3	3	3	3	3	4	4	5	3	5	4	4	3	5						3.85
CO6	5	3	5	4	4	5	5	5	3	5	5	4	5	4						4.14
Overall Mean Score for COs																				3.90

Result: The Score for this Course is 3.9 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs = $\dfrac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$ Mean Overall Score for COs = $\dfrac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$

18

18MST104A

Paper-III
ADVANCED APPLIED MULTIVARIATE ANALYSIS

Course outcomes
1. Explain the importance of Principle component analysis.
2. Use data reduction techniques.
3. Understand the method of multidimensional scaling.
4. Know the clustering techniques for data collection.
5. Examine the nature of the Discriminant analysis.
6. Understand the differentiation between Latent class modeling and Restricted Latent class models.

Unit-I
Introduction to Multivariate analysis - Data Reduction - Principle component analysis - Determination of number of principle components to be retained - Component scores.

Unit-II
Introduction to Factor Analysis - Communalities - Comparison of extraction procedures - Rotation of factors - Factor scores - Introduction to multidimensional scaling - Proximities and data collection - Relationship with other data reduction procedures.

Unit-III
Introduction to Cluster Analysis - Similarity measures - Clustering techniques - Hierarchical and partitioning methods - Graphical methods - Pseudograms - Guidelines.

Unit-IV
Introduction to canonical correlation analysis - Interpretation of canonical correlation results - Issues in interpretation.
Introduction to Discriminant analysis - Two group problem - Variable contribution - Violation of assumptions Logistic discrimination - Error rate estimation.

Unit-V
Linear Structural relations (LISREL) : Introduction – path analysis – testing Causal model. LISREL : Notation, concepts and examples. Evaluating LISREL solutions. Caveats concluding remark.
Latent Structure Analysis : The logic behind latent Structure Analysis - Latent class modeling – Restricted Latent class models – multiple –Indicator,

19

Multiple – cause models Simultaneous Latent class Analysis – Concluding remarks.

Books for Study

1. Dillon, W.R. and Goldstein, M., "Multivariate Analysis Methods and Applications", John Wiley & Sons, 1984.
2. Hair, J.F., Anderson, R.E. Jr., and Tatham, R.L., "Multivariate Data Analysis with Readings", Macmillan Publications, New York, 1987.
3. Johnson, R.A. and Wichern, D.W., "Applied Multivariate Statistical Analysis", PHI, 2003.
4. Singh and Parashar and Singh, H.P., "Econometrics", S. Chand and Sons.

18MST104B

Paper-III
ADVANCED DESIGN OF EXPERIMENTS

Course outcomes

1. Analyze the difference between the Latin square designs.
2. Learn the construction of orthogonal arrays.
3. Illustrate the Confounding techniques.
4. Understand the Importance of factorial experiments.
5. Examine the difference between BIBD and PBIBD.
6. Learn the nature of Second and third order rotatable designs.

Unit-I

Construction of Orthogonal Latin Square Designs - Analysis of designs based on mutually orthogonal Latin Squares - Construction of Orthogonal Arrays.

Unit-II

Construction and analysis of confounded symmetrical and asymmetrical factorial designs, Construction and analysis of fractionally replicated factorial experiments.

Unit-III

Construction and analysis of quasi-factorial experiments - Lattice designs - Simple Lattice - Construction and analysis of BIBD, PBIBD and weighing designs.

Unit-IV

Second and third order rotatable designs - Central composite rotatable designs - Blocking in response surface designs.

Unit-V

Continuous optimal designs - Basic properties of the information matrix - Equivalence of D-optimal and minimax designs - Basic properties of these designs - Computational methods for construction of D-optimal designs.

Books for Study

1. Das, M.N. and Giri, N.C., "Design and Analysis of Experiments", New Age International Publishers, 1986.
2. Federer, W.T., "Experimental Design: Theory and Applications", Macmillan Co., New York, 1963.

3. Aloke Dey, T., "Fractional Factorial Designs".
4. Kempthorne, C., "Design and Analysis of Experiments", Wiley Eastern, 1965.
5. Raghava Rao, D., "Construction and Combinatorial Problems in Design of Experiments".
6. William G. Cochran, Experimental Design, Wiley (ISBN: 9780471545675)
7. K.A. Gomez, Statistical Procedure for Agricultural Research, Wiley (ISBN: 9780471870920)

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Paper-III
ADVANCED STOCHASTIC PROCESSES

Course Outcomes
1. Examine the applications of Markov processes in innovative research.
2. Understand the importance of Birth and Death processes.
3. Know the renewal process in industry.
4. Learn the Branching process techniques.
5. Illustrate the importance of kolmogorov equations in research.
6. Examine the nature of the Brownian motion.

Unit-I

Specification of Stochastic Processes-Markov processes : Stationary Processes - Poisson Process - Generalizations –Birth and Death Processes - Martingales - Erlang Process.

Unit-II

Renewal processes in discrete and continuous time - Renewal equation - Stopping time - Wald's equation - Renewal theorems - Delayed and Equilibrium renewal processes - Residual and excess life times - Renewal reward process - Alternating renewal process - Regenerative stochastic process.

Unit-III

Branching processes: Definition – Examples – Discrete Branching Process – Generating Function of the Process – The probability of extinction – Fundamental theorem of Branching processes – Total population size – Cumulant Generating function – Continuous parameter Branching process (Markov Branching Process) – Age dependent branching process.

Unit-IV

Brownian motion - Wiener process - Diffusion and Kolmogorov equations – First passage time distribution for Wiener process - Ornstein - Uhlenbeck rocess.

Unit-V

Covariance function – Continuity, Differentiability, Integrals of Second Order Processes in the mean square sense – Stationary processes – Herglotz theorem – Bochner's theorem –Spectral Representation of a wide sense stationary process – Spectral Representation Theorem – Karhuen – Loeve expansion of a second order process.

Textbook

1. Medhi J., "Stochastic Processes", New Age International (P) Ltd., New Delhi, Third Edition, 2009.
2. Narayan Bhat U. and Gregory K. Miller, "Elements of Applied Stochastic Processes", Wiley-Inter science, Third Edition, 2002.
3. Karlin S. and Taylor H.M., "A First Course in Stochastic Processes", Academic Press, New York, Second Edition, 1975.
4. Cox D.R. and Miller H.D., "The theory of Stochastic Process", Methuen, London,1965.
5. Ross S. M. ,"Stochastic Processes", Wiley, New York, Second Edition, 1996.