

THE GANDHIGRAM RURAL INSTITUTE**(DEEMED TO BE UNIVERSITY)****CENTRE FOR APPLIED RESEARCH**

Course Code	Title of the Course	No. of Credits	Hours/ Week	Evaluation (% Marks)		Total Marks
				CFA	ESE	
21APRP0001	Research Methods	4	4	40	60	100
21APRP0002	Applied Statistics	4	4	40	60	100
21APRP0101	Research Methods and Statistics	4	4	40	60	100
21APRP0102	Research Methodology & IPR	4	4	40	60	100
21APRP0103	Bio – Statistics	4	4	40	60	100
21APRP0104	Business Research	4	4	40	60	100
21APRP0105	Quantitative Techniques	4	4	40	60	100
21APRU0001	Elements of Research Methods	3	4	40	60	100
21APRU0002	Allied Bio-Statistics – I	3+2	5	40	60	100
21APRU0003	Allied Bio-Statistics – II	3+2	5	40	60	100
21APRU0004	Statistical Methods	3	4	40	60	100
21APRU0005	Introduction to Statistics	2	4	20	30	50
21APRP0315	Business Research Methods	4	4	40	60	100
21APRP0105	Business Statistics	4	4	40	60	100

Course Code & Title	RESEARCH METHODS (21APRP0001)		
Class	M.A Development Administration /M.A Gandhian Thought and Peace Science/M.A Sociology / MA Rural Development Studies	Semester	II / VII
Cognitive Level	K-1 Understanding the basics of research methodology		
	K-2 Constructing tools for data collection in research		
	K-3 Developing skill in preparing scientific research report		
Course Objectives	<p>The Course aims to</p> <ul style="list-style-type: none"> • identify and formulate a problem for research. • prepare suitable research design to study the research problem to be formulated • choose appropriate methods of sampling, tools and techniques of data collection • process the data collected in the field and analyze it using appropriate statistical methods and • prepare research report in a professional manner. 		

UNIT	Content	No. of Hours
I	Research: Definition, Characteristics and Functions of Research. Scientific method. Types of research: Pure, Applied and Action Research, Qualitative and Quantitative studies. Research Skills and Ethics, Significance of Ethical Committee.	12
II	Steps in Research: Research Process, Selection and Formulation of Research Problem, Statement of the Problem and Definition of Terms, Objectives. Review of Literature, Data Base and Reference Management Software. Conceptual Framework, Types of Variables – Hypothesis: types, characteristics and functions.	13
III	Preparation of Research Design: Exploratory, Descriptive, Diagnostic and Experimental designs - types. Methods of Research: Multidisciplinary, Interdisciplinary and Transdisciplinary studies, Mixed methods. Participatory research: RRA, PRA and PLA.	13
IV	Sources and types of Data Collection: conduct of Interview, Observation, Schedule and Questionnaire. Sociometry, Psychological test and Projective techniques, Content analysis, Survey, Case study - Scaling Techniques – Online research methods – Pre- test, Test of reliability and validity.	13
V	Research Report: Format - types of reports – Citation styles, Reference Materials, Bibliography, Webliography, Footnotes, Glossary, Index and Appendix. Preparation of Research Proposal, Plagiarism – Impact factor - dissemination of research findings.	13
References	<ul style="list-style-type: none"> Alan Bryman, Social research Methods, Oxford Publication, 2018. Bandarkar and Wilkinson, <i>Methods and techniques of Social Research</i>, Bombay: Himalaya Publishing Co, 2010. Goode and Hatt, <i>Methods in Social Research</i>, New Delhi: McGraw Hill, 2002. Kothari.C.R, <i>Research Methodology</i>, New Delhi: Vishva Prakashan, 2001. Lawrence Neuman.W, Social Research Methods: Qualitative and Quantitative Approaches, Pearson publishers, Chennai, (7th Ed), 2014. 	

Text Books	<ul style="list-style-type: none"> • Ranjith Kumar, Research Methodology A Step-By-Step Guide for Beginners, Singapore: Sage Publications Aisa- Pacific Pvt., Ltd, 2014. • Simon, Schuster, Methods of Social Research, Kenneth Bailey, 4th Edition, 2008 • Tony Brown and Liz Jones, <i>Action Research and Postmodernism</i>, Buckingham: Open University Press, 2001 • Tony Greenfield and Sue Greener, Research Methods for Post Graduates, John Wiley and Sons Ltd, 2016. • Vijayalakshmi.G. and Sivapragasam.C, <i>Research Methods: Tips and Techniques</i>, Chennai: MJP Publishers, 2009.
Websites	<ul style="list-style-type: none"> • https://www.coursera.org/browse/physical-science-and-engineering/research-methods • https://docs.wixstatic.com/ugd/87dd0d_ff020fea747047d19cb81d60e371ffaa.pdf?index=true • https://www.ncrm.ac.uk/ • https://www.scribbr.com/category/methodology/ • https://www.liberty.edu/online/courses/CJUS745
Course Outcomes	<p>On completion of the course, students should be able to</p> <p>C01: Develop expertise and skills to undertake independent research</p> <p>C02: Construct research tools</p> <p>C03: Understand research skills and ethics related issues</p> <p>C04: Apply of statistical tools from application perspective</p> <p>C05: Prepare research article and project report</p>

Course Code & Title	APPLIED STATISTICS (21APRP0002)		
Class	M.A Development Administration /M.A Gandhian Thought and Peace Science/M.A Sociology / MA Rural Development Studies	Semester	II/VIII
Cognitive Level	K-1 Imparting the knowledge on applications of Statistics on various disciplines.		
	K-2 Understanding various methods of performing sampling, correlation and regression.		
	K-3 Learning how to estimate errors and perform testing.		
Course Objectives	The Course aims <ul style="list-style-type: none"> • be familiar with the basic concepts and terminology of statistics. • understand the importance and application of statistics in different disciplines • choose appropriate sampling procedure and decide sample size. • develop skill in reading and understanding the results from data analysis • able to demonstrate competence in analyzing statistical data using software. 		

UNIT	Content	No. of Hours
I	Introduction to Statistics: Origin, scope, limitations and misuses of Statistics – Stages of Statistics. Statistical Organizational set up in Central and State Governments. Recent trends in the application of Statistics – Types of Data base – Big data.	12
II	Sampling Techniques: Basic Concepts of Census and sampling method, characteristics of a good sample, sampling unit, sampling frame. Determination of sample size. Random sampling –Non-random sampling. Sampling and Non-sampling errors.	13
III	Data Collection and Classification: Sources and types of statistical data. Classification of data, Scoring and Coding, Tabulation and presentation of data – Frequency distribution. Diagrammatic presentation of data: one, two and three-dimensional diagrams – Graphical representation of data.	13
IV	Descriptive Statistics – Measures of central tendency: mean, median, mode. Measures of Dispersion: Mean deviation, Quartile deviation and Standard deviation– Coefficient of variation, Measures of Skewness (Pearson's and Bowley's) and Kurtosis, Measures of Association – Correlation and Regression analysis.	13
V	Statistical Inference: Sampling distribution and standard error, Parameter and Statistic. Testing of Hypothesis - Estimator and estimate. Parametric and non-parametric tests - Students 't' test and 'z' test, 'F' test, Chi-square test. Factor Analysis and Structural Equation modeling (SEM) – Uses and applications. Using software for statistical analysis.	13
References	<ul style="list-style-type: none"> • Agarwal, Y.P, Statistical Methods, New Delhi: Sultan Chand and Sons, 1996. • Gupta, S.P and Gupta.M.P, Business Statistics, New Delhi: Sultan Chand and Sons, (19th Ed), 2019. • Gupta, S.P., Statistical Methods, Sultan Chand Publishers, New Delhi, (13thEd), 2019. • Kothari.C.R, Quantitative Techniques, New Delhi: Vikas Publishing House, 1998. • W.G.Cochran, Sampling Techniques, Wiley Eastern Ltd, New Delhi, 1985. 	

Text Books	<ul style="list-style-type: none"> • Gupta, S.C. Fundamentals of Statistics, Mumbai: Himalaya Publishing House, 2018. • Goon, A. M., M.K. Gupta, and B. Dasgupta, Fundamentals of Statistics, Vol. II, World Press, Kolkata, 2016. • Gupta. S.C. and Kapoor. V.k, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, (12th Ed), 2020. • Parimal Mukopadhyay, Mathematical Statistics (Third Edition), Books and Allied Private Limited, Kolkata, 2006. • Siegel, Sidney, Non-Parametric Statistics for Behavioural Sciences, New Delhi: McGraw Hill, 2006.
Websites	<ul style="list-style-type: none"> • https://www.bl.uk/reshelp/findhelpsubject/socsci/topbib/quantmethods/quantitative.pdf • https://www.sciencedirect.com/topics/nursing-and-health-professions/statistical-tool • https://www.edx.org/course/biostatistics-0 • http://www.calculator.net/sample-size-calculator.html • https://www.statisticssolutions.com/spss-statistics-help
Course Outcomes	<p>On completion of the course, students should be able to do</p> <p>C01: Get exposed to the recent trends in the application of Statistics.</p> <p>C02: Obtain insight in sampling techniques.</p> <p>C03: Learn data collection and its visualization techniques.</p> <p>C04: Study the concepts in Descriptive Statistics.</p> <p>C05: Acquiring knowledge on errors and test method.</p>

Course Code & Title	RESEARCH METHODS AND STATISTICS (21APRP0101)		
Class	M.Sc – Geo-informatics/Food Science and Nutrition/ Home Science & Communication/M.Voc Diary Production and Technology/M.A Rural Development Studies	Semester	II
Cognitive Level	K-1 Understanding the basics of research methods and statistics		
	K-2 Constructing tools for data collection in research		
	K-3 Developing skill in preparing scientific research report		
Course Objectives	The Course aims to <ul style="list-style-type: none"> • identify and formulate a problem for research. • prepare suitable research design to study a research problem to be formulated • choose appropriate methods of sampling, tools and techniques of data collection • process the data collected in the field and to analyze using appropriate statistical methods • prepare research report in a professional manner. 		

UNIT	Content	No. of Hours
I	Research: objectives, functions, Characteristics of Scientific Research. Types of Research: Pure, Applied and Action Research. Steps in Research – Identifying and Selection of Research problem - review of literature, Conceptual framework, Variables – Hypothesis – formulation and types. Research skills and ethics – Ethical committee and Plagiarism	12
II	Research design: Explorative, Descriptive, Experimental, Case study and Survey. Methods of Research: Multidisciplinary, Interdisciplinary and Transdisciplinary studies. Mixed Methods, Participatory research: RRA, PRA and PLA. Online research methods, Pilot Study and Pre-test.	13
III	Tools for Data collection: Types and sources of data, Interview, Schedule, Questionnaire and Observation. Scaling Techniques – Test of validity and reliability - Research Report – Components, format and types of research report - Reference materials, quotations, bibliography, webliography, footnotes, glossary and appendix, dissemination of research findings.	13
IV	Descriptive Statistics: Measures of central tendency, dispersion, skewness and kurtosis – Correlation, Regression Analysis. Sampling techniques – random and non-random sampling. Statistical software and its uses.	13
V	Inferential Statistics: Basic concepts and Hypothesis testing and Estimation; Steps in hypothesis testing. Tests for Large and small samples – Z test, t-test and F-test, Chi-square test, Mann-Whitney test, and ANOVA.	13
References	<ul style="list-style-type: none"> • Gupta S.P and M.P.Gupta, <i>Business Statistics</i>, New Delhi: Sultan Chand and Sons, (19th Ed), 2019. • Gupta.S.C, <i>Fundamentals of Statistics</i>, Mumbai: Himalaya Publishing House, 2018. • Panneer Selvam, <i>Research Methodology</i>, New Delhi: PHI Learning Private Ltd, 2014. 	

	<ul style="list-style-type: none"> • Kothari.C.R, <i>Research Methodology</i>, New Delhi: Wishva Prakashan, 2019. • Tony Greenfield and Sue Greener, <i>Research Methods for Post Graduates</i>, John Wiley and Sons Ltd, 2016.
Text Books	<ul style="list-style-type: none"> • Cauvery.R. and Girija. M, <i>Research Methodology</i>, New Delhi: S.Chand and Company Ltd, 2010. • Gupta, S.P., <i>Statistical Methods</i>, New Delhi; Sultan Chand and Sons, 2012. • Nicholas Walliman, <i>Research Methods: The basics</i>. London; New York: Routledge, 2011. • Shajahan.S, <i>Research Methods for Management (Text and Cases)</i>, New Delh: Jaico Publishing House, 2006. • Vijayalakshmi.G. and Sivapragasam.C, <i>Research Methods: Tips and Techniques</i>, Chennai: MJP Publishers, 2009.
Websites	<ul style="list-style-type: none"> • https://www.ggu.edu/courses/syllabus.do?id=29059 • https://www.ncrm.ac.uk/ • https://www.scribbr.com/category/methodology/ • https://www.indiastat.com/ • https://online-learning.harvard.edu/subject/statistics • http://www.ddegjust.ac.in/studymaterial/mcom/mc-106.pdf
Course Outcomes	<p>On completion of the course, students should be able to</p> <p>CO1: formulate a research problem</p> <p>CO2: prepare suitable research design</p> <p>CO3: choose appropriate methods of sampling and tools for data collection</p> <p>CO4: process the data collected in the field and to analyze using appropriate statistical methods</p> <p>CO5: prepare research report in a professional manner.</p>

Course Code & Title	RESEARCH METHODOLOGY AND IPR (21APRP0102)		
Class	M.Tech Renewable Energy	Semester	I
Cognitive Level	K-1 Understanding various terminologies in Research Methods		
	K-2 Analysis of Statistical Data		
	K-3 Calculate the Probability		
Course Objectives	The Course aims to <ul style="list-style-type: none"> • identify and formulate a problem for research. • prepare suitable research design, choose appropriate tools and techniques of data collection • process the data collected and do analysis using appropriate statistical methods • write research report independently and professionally 		

UNIT	Content	No. of Hours
I	Scientific Research – methods of acquiring knowledge - Inductive and Deductive Reasoning, scientific method and its applications. New Developments in IPR: Administration of Patent System - Traditional Knowledge Case Studies. Plagiarism. Research Process: Selection of Research problem, Review of literature, Formulation of Hypothesis, Nature and Types of Variable.	12
II	Research Design: Purpose, preparation and Types of research design – Historical, Descriptive, and Experimental. Field survey and evaluation research. Qualitative and Quantitative Studies – Mixed Methods. Multi-disciplinary, Interdisciplinary and Transdisciplinary Research.	13
III	Tools and techniques of data collection – Observation, interview, Inquiry Forms, Psychological tests, Projective techniques, rating scales, Likert and Thurstone, Guttman type scales, Focus Group discussion, and PRA. Validity and reliability. Structure and qualities of a Research Report; Dissemination of research findings, Evaluation of Research Report.	13
IV	Data Analysis: Data Bases. Categorization, Presentation of data - Diagrams and Frequency distributions – Central measures – Arithmetic mean, Median, Mode. Dispersion measures – Range, Quartile Deviation, Mean Deviation, Standard Deviation and Coefficient of variation – Skewness – Normal distribution – Kurtosis. Correlation – Rank Correlation. Regression analysis.	13
V	Sampling: Probability and non-probability sampling techniques, sampling and non-sampling errors. Testing of Hypothesis: Basic concepts and steps; Statistical Tests – z test, t-test, Chi-square test, ANOVA. Factor analysis and Discriminate analysis. Introduction to Structural Equation Modeling (SEM).	13

References	<ul style="list-style-type: none"> • Gupta.S.C, <i>Fundamentals of Statistics</i>, Mumbai: Himalaya Publishing House, 2018. • Kothari.C.R, <i>Research Methodology</i>, New Delhi: Wishva Prakashan, 2019. • Panneer Selvam, <i>Research Methodology</i>, New Delhi: PHI Learning Private Ltd, 2014. • Tony Greenfield and Sue Greener, <i>Research Methods for Post Graduates</i>, John Wiley and Sons Ltd, 2016. • W.G.Cochran, <i>Sampling Techniques</i>, Wiley Eastern Ltd, New Delhi, 1985.
Text Books	<ul style="list-style-type: none"> • Cauvery.R. and Girija. M, <i>Research Methodology</i>, New Delhi: S.Chand and Company Ltd, 2010. • Gupta, S.P, <i>Statistical Methods</i>, New Delhi; Sultan Chand and Sons, 2012. • Nicholas Walliman, <i>Research Methods: The basics</i>. London; New York: Routledge, 2011. • Venkatachalapathy, S.G., Premraj, H., <i>Statistical Methods</i>, Chennai: Margham publications, 2015. • Vijayalakshmi.G. and Sivapragasam.C, <i>Research Methods: Tips and Techniques</i>, Chennai: MJP Publishers, 2009.
Websites	<ul style="list-style-type: none"> • https://www.ggu.edu/courses/syllabus.do?id=29059 • https://www.ncrm.ac.uk/ • https://www.scribbr.com/category/methodology/ • https://online-learning.harvard.edu/subject/statistics • http://www.ddegjust.ac.in/studymaterial/mcom/mc-106.pdf • https://www.statisticssolutions.com/spss-statistics-help
Course Outcomes	<p>On completion of the course, students should be able to do</p> <p>CO1: Develop expertise and skills to undertake independent research in the renewable energy area</p> <p>CO2: Development research questionnaire</p> <p>CO3: Understand IPR related issues</p> <p>CO4: Apply of statistical tools for the renewable energy system performance</p> <p>CO5: Write research article and prepare project report</p>

Course Code & Title	BIO-STATISTICS (21APRP0103)		
Class	M.Sc MICROBIOLOGY/BOTANY/ZOOLOGY	Semester	II
Cognitive Level	K-1 Understanding basic concepts in Bio-Statistics		
	K-2 Comprehending statistical measures in the biological data analysis		
	K-3 Ability to interpret the statistical inference		
Course Objectives	The Course aims to <ul style="list-style-type: none"> • be familiar with statistics and its applications in biology • solve problems quantitatively using appropriate statistical measures • create and interpret visual representations of quantitative information • understand and critically assess data collection and its representation • Enhance the understanding of various rates, ratios and odds ratio. 		

UNIT	Content	No. of Hours
I	Introduction to Biostatistics: Development of Biostatistics and its applications - Sources of biological data - Secondary and Primary sources - Classification and tabulation of data - frequency distribution - Diagrammatic and Graphical representation of statistical data.	12
II	Sampling Techniques: Meaning - Advantages, concept of parameter and statistics, sample size, sampling error, sampling frame. Types of samples – Probability sampling – simple, systematic, stratified, cluster, multi-stage sampling. Non-probability sampling – Purposive, Convenience, Judgment and snowball techniques.	13
III	Descriptive Statistics: Measures of central tendency - Mean, Median, Mode - Measures of Dispersion: –Range, Quartile Deviation, Mean Deviation, and Standard Deviation. Absolute and relative measures of dispersion. Skewness and kurtosis measures.	13
IV	Correlation and Regression Analysis: Definition, uses, types of correlation, Regression Lines – Properties of regression lines and coefficients; Introduction to probability and its applications – Theoretical Distributions – Binomial, Poisson, and Normal distributions; Properties, uses and applications.	13
V	Inferential Statistics and Biological Measures: Hypothesis testing and Tests of significance - Test of attributes, small and large sample tests - Analysis of variance – one-way and two-way classifications; Measurement of risk, odds ratio and Bioassay and dose responses.	13
References	<ul style="list-style-type: none"> • Gupta. C.B, An Introduction to Statistical Methods, New Delhi: Vikas Publishers, (23rd Ed), 2004. • Gupta. S.P, Statistical Methods, New Delhi: Sultan Chand, 2017. • Hogg. R.T. and A.T. Craig. A.T, Introduction to mathematical Statistics, (7thEd), 2012. • Rangaswamy, A Textbook of Agricultural Statistics, (3rd Ed), New Age International Publishers, New Delhi, 2020. • Rohatgi, V. K. and A. K. md. Ehsanes Saleh(2009) An Introduction to Probability Theory and Mathematical Statistics, 2nd Edition, Wiley Eastern Limited, New Delhi. 	

Text Books	<ul style="list-style-type: none"> • Qazi Shoeb Ahmad, Viseme Ismail, Biostatistics, University Science press, new Delhi, (1st Edition), 2008. • Sampath Kumar V.S; Bio-Statistics, Manomaniam Sundaranar University Publication, Tirunelveli, 1997. • Verma B.L, Shukla G.D and Srivastava.R.N, Biostatistics – Perspectives in Health Care; Research and Practice, New Delhi: CBS Publishers & Distributors, 1993. • Veer Bala Rastogi, Biostatistics, Medtech publication, (3rd revised Edition), 2017. • W.G.Cochran, Sampling Techniques, Wiley Eastern Ltd, New Delhi, (1985).
Websites	<ul style="list-style-type: none"> • https://www.biostat.washington.edu/about/biostatistics • http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_BiostatisticsBasics • https://www.edx.org/course/biostatistics-0
Course Outcomes	<p>On completion of the course, students should be able to do</p> <p>C01: Get acquainted with basic concepts of statistics and its relevance with the core subject.</p> <p>C02: Visualization of biological data using diagrams, charts and graphs.</p> <p>C03: Analyze the different sample characteristics using descriptive statistics.</p> <p>C04: Observe and interpret the relationship between various biological parameters.</p> <p>C05: Calculate and interpret regression estimates made on biological data.</p>

Course Code & Title	BUSINESS RESEARCH (21APRP0104)		
Class	MBA Management Programme	Semester	II
Cognitive Level	K-1 Understanding the basics of business research		
	K-2 Acquiring the skills for data collection		
	K-3 Developing the ability to prepare a research report		
Course Objectives	The Course aims to <ul style="list-style-type: none"> • Define research problem in business and identify research gaps • Formulate and execution of research design • Prepare and administer tools and techniques of data collection • Acquire skill in preparation and presentation of research report. 		

UNIT	Content	No. of Hours
I	Scientific Research: Principles – characteristics and functions of research, scientific method-steps in research. Types of research: Pure, Applied and Action Research, Qualitative and Quantitative studies – Research ethics and skills.	12
II	Research process: Formulation of Research problem, Criterion for selection of a topic, Definition of terms and Objective; Review of literature - Variables - Hypothesis: characteristics and functions.	13
III	Research Design: Exploratory, Descriptive and Experimental designs - Market Surveys- Case Study - Intervention and Interdisciplinary Studies. Mixed Methods.	13
IV	Data Collection: Sources of data – Tools and techniques for data collection- Interview, Observation, Questionnaire, Schedule – online research methods - Psychological Test - Pre-test -Scaling Techniques- Reliability.	13
V	Research Report: Characteristics and format - types of reports - Software for reference management- Plagiarism. Dissemination of research findings - Utility for policies and programmes.	13
References	<ul style="list-style-type: none"> David Gray, (2017), Doing Research in Business world, SAGE Publications Ltd, New Delhi. John.W.Creswell, (1994), Research Design Qualitative and quantitative Approaches, Sage Publication, Buckingham, William M.K., (2001), Research Methods, Atomic Publishing, New Delhi. Young, P.V., (2003), Scientific Social Surveys and Research, Practice Hall, New Delhi Krishnaswami O.R. and M.Ranganatham, Methodology of Research in Social Sciences, Mumbai: Himalaya Publishing House, 2010. 	
Text Books	<ul style="list-style-type: none"> Kothari, C.R and Garg, Gaurav, “Research Methodology: Methods and Techniques”, 4th ed. New Age International Publishers, 2019. R. Panneerselvam, “Research Methodology,” Prentice- Hall India (P) Ltd., New Delhi, 2013. 	

	<ul style="list-style-type: none"> • Bhandarkar, P.L., and Wilkinson, T.S., “Methodology and Techniques of Social Research”, 24th ed. Himalaya Publishing House, 2017 • Krishnaswamy O R and Ranganatham M. (2019 ed.) METHODOLOGY OF RESEARCH IN SOCIAL SCIENCES, Himalaya Publication, India • Hatt K Paul and Goode J William, (2016), METHODS IN SOCIAL RESEARCH, Asia Law House.
Websites	<ul style="list-style-type: none"> • https://www.sociosite.net/databases.php • https://socialresearchmethods.net/ • https://www.researchgate.net/publication/319207471_handbook_of_research_methodology • http://www.unrisd.org/ • http://shodhganga.inflibnet.ac.in/bitstream/10603/3727/12/12_chapter%202.pdf
Course Outcomes	<p>On completion of the course, students should be able to</p> <p>C01: Expertise in the skills for doing business research</p> <p>C02: Prepare questioners and schedules</p> <p>C03: Familiarize the research ethics</p> <p>C04: Apply of statistical tools from application perspective</p> <p>C05: Prepare business research article and business project report</p>

Course Code & Title	QUANTITATIVE TECHNIQUES FOR MANAGEMENT (21APRP0105)		
Class	MBA MANAGEMENT	Semester	I
Cognitive Level	K-1 Getting to know about data, data types and calculation of various measures.		
	K-2 Imparting the knowledge of performing analysis on various tests of hypothesis.		
	K-3 Learning how to use some selective tools for testing of hypothesis for non-parametric data based on sample size and number of samples.		
Course Objectives	The Course aims to <ul style="list-style-type: none"> • Gain knowledge in data collection and presentation. • Understand the basics of statistical techniques for business management. • Understand the concept of probability and its distributions in the context of decisionmaking. • Gainskills in the application of statistical techniques in business related data analysis. 		

UNIT	Content	No. of Hours
I	Quantitative techniques for Decision Making: Data Driven Decision in Management – Concepts. Data: Types, sources, and methods of collecting data. Big Data Analytics – Scope and its importance to a business. Business Analytics: Meaning and applications in managerial decision making.	12
II	Descriptive Analysis: Measures of Central Tendency – Mean, Median and Mode, Geometric Mean, and Harmonic Mean; Measures of Variation – Range, Mean Deviation, Quartile Deviation, Standard Deviation and Co-efficient of Variation – Skewness and Kurtosis – its uses in management.	13
III	Probability Theory: Basic concepts and importance of Probability – Axioms of Probability – Addition and Multiplication Theorems and simple problems; Probability Distributions and Applications – Binomial, Poisson and Normal Distributions.	13
IV	Sampling Techniques: Concepts of Census and Sampling– Probability and Non-probability techniques. Basic concepts and steps in hypothesis testing – Sampling distribution – Standard Error – Type I and Type II errors – Significant level, Tests of significance – large and small sample tests- Chi-square test and Analysis of variance (ANOVA) – one way and two-way classifications.	13
V	Forecasting Methods for Management: Concept of Correlation Analysis – Types of Correlation and its applications in managerial decision making; Concept of Regression Analysis – Types of Regression and problems – Coefficient of determination. Time Series Analysis – Trend Analysis.	13
References	<ul style="list-style-type: none"> • Gupta, S.P. (2014), Statistical Methods, (13thEd), Sultan Chand Publishers, New Delhi • Gerald Keller, (2014), Statistics for Management and Economics, (10thEd), Cengagelearning. • Levin, Rubin, (2013) Statistics for Management, (13th Ed) Pearson Education, New Delhi. 	

	<ul style="list-style-type: none"> • Paul Newbold, William L. Carlson, Betty M. Thorne, (2020), Statistics for Business and Economics, (9th Ed), Pearson Publishing. • Srivastava, T, Rago. S, (2012) Statistics for Management, Tata McGraw Hill, New Delhi.
Text Books	<ul style="list-style-type: none"> • Anderson, Sweeney Williams, (2015) Quantitative Methods for Business, (13thEd), Cengagelearning. • David Gray, (2019), Doing Research in the Business World, (2nd Ed), Sage Publishing. • David Gray, (2019), Doing Research in the Business World, (2nd Ed), Sage Publishing. • Rohatgi, V. K.and A. K. md.EhsanesSaleh(2009) An Introduction to Probability Theory and Mathematical Statistics, 2nd Edition, Wiley Eastern Limited, New Delhi. • R.V. Hogg and A.T. Craig, (2012), Introduction to mathematical Statistics,(7thEd).
Websites	<ul style="list-style-type: none"> • https://www.bl.uk/reshelp/findhelpsubject/socsci/topbib/quantmethods/quantitative.pdf • https://www.sciencedirect.com/topics/nursing-and-health-professions/statistical-tool • https://www.researchgate.net/publication/308133810 Basic statistical tools in research and data analysis • https://www.surveysystem.com/sscalc.htm • http://www.calculator.net/sample-size-calculator.html • https://www.statisticssolutions.com/spss-statistics-help
Course Outcomes	<p>On completion of the course, students should be able to do</p> <p>C01: Learn about data related concepts and big data and its scope in managerial decisions</p> <p>C02: Get acquainted with Descriptive Analysis of data like Measures of Central Tendency and other methods.</p> <p>C03: Acquire insight on the concepts and importance of Probability theory.</p> <p>C04: Know various sampling techniques, errors and tests in Statistics.</p> <p>C05: Understand the application of probability distributions for managerial decisions</p>

Course code & Title	ELEMENTS OF RESEARCH METHODS (21APRU0001)		
Class	B.Com Cooperation	Semester	V
Cognitive Level	K-1 Understanding the concept of Research Methods		
	K-2 Knowing the tools for data collection and analysis of statistical data		
	K-3 Comprehending the skill of report writing.		
Course Objectives	The Course aims to <ul style="list-style-type: none"> • understand the basics, methods and procedures of research, and acquire knowledge in data analysis • identify and formulate a problem for research • choose the appropriate tools and techniques of data collection • prepare a suitable research design to carryout research • learn different methods of sampling and • write research report to suit their purpose 		

UNIT	Content	No. of Hours
I	Research: Definition, objectives, characteristics and types of research – Scientific method, Steps in research – Identification and Selection of problem for research – Sources of review of literature – Hypothesis: concept, characteristics and types.	9
II	Preparation of Research Design: Need and components of research design, Methods of research – Explorative, Descriptive, Experimental studies. Case study, Survey and Participatory research. Transdisciplinary Research.	9
III	Types and Sources of data: Tools for Data Collection – Observation, Interview, Schedule, and Questionnaire. Pilot study and Pre-test. Plagiarism – Use of Reference materials. Research Report – Types, Format and Characteristics of a research report.	10
IV	Sampling Techniques: Census vs Sampling methods. Probability and Non- Probability methods, Processing of Data – scoring, coding, classification and tabulation of data, diagrammatic, and graphical presentation.	10
V	Quantitative Data Analysis: Measures of central tendency - mean, median and mode; Measures of dispersion – Range, Variance, Standard Deviation - Correlation and regression analysis, and Uses of Software in data analysis.	10
References	<ul style="list-style-type: none"> Gosh.B.N, <i>Scientific Methods and Social Research</i>, New Delhi: Sterling Publishers, 1997. Gupta.S.C, <i>Fundamentals of Statistics</i>, Mumbai: Himalaya Publishing House, 2018. Hans Raj, <i>Theory and Practice in Social Research</i>, Delhi: Surjeet Publications, 2002. Kothari.C.R, <i>Research Methodology</i>, New Delhi: Vishva Prakashan, (4th Ed) 2019. Vino Chandra.S.S, An and Hareendran.S, <i>Research Methodology</i>, Pearson, (1st Ed), 2017. 	
Text Book	<ul style="list-style-type: none"> Anol Bhatta cherjee, <i>Social Science Research: Principles, Methods</i>, 	

	<p>and Practices, University of South Africa: Global Text project Publisher, 2012.</p> <ul style="list-style-type: none"> • Krishnaswami.O.R. and M.Ranganatham, Methodology of Research in Social Sciences, Mumbai: Himalaya Publishing House, 2010. • Sadhu.A.N. and Singh.A, Research Methodology in Social Sciences, Mumbai: Himalaya Publishing House, 2005. • Thomas William A., Research Methods Quantitative, Qualitative & Mixed Methods, Authors Press, New Delhi 2021. • Vijayalakshmi.G. and Sivapragasam.C, Research Methods: Tips and Techniques, Chennai: MJP Publishers, 2009. 	
Website	<ul style="list-style-type: none"> • https://www.researchprospect.com/research-methodology/ • https://www.bl.uk/reshelp/findhelptsubject/socsci/topbib/quantmethods/quantitative.pdf • https://www.researchgate.net/publication/308133810 Basic statistical tools in research and data analysis • http://www.calculator.net/sample-size-calculator.html • https://www.statisticssolutions.com/spss-statistics-help 	
Course Outcomes	<p>On completion of the course, students should be able to</p> <p>CO1: know the basic of research methods and statistics</p> <p>CO2: identify and formulate a problem for research</p> <p>CO3: choose the appropriate tools and techniques of data collection</p> <p>CO4: learn different methods of sampling and</p> <p>CO5: write research report to suit their purpose</p>	

Course Code & Title	21APRU0002 ALLIED BIO-STATISTICS – I	No. of Credits: 4 (3 + 1)	3 hours
Programme	B.Sc Microbiology	Semester - III	Max. Marks: 100
Cognitive Level	K-1 Understanding the terminologies and basic concepts in Bio-Statistics		
	K-2 Developing Skills in computation of basic statistical measures in the biological data analysis and Evaluation		
	K-3 Interpretation of results that are obtained after applying statistical methods		
Course Objectives	<ul style="list-style-type: none">To understand the basic concepts and terms and its relevance in biology.To develop computation skills in statistics and analyze data using relevant statistical methods.		
UNIT	CONTENT		NO. OF HOURS
I	Introduction to Biostatistics – definition – Types of data – Collection of data – Sources of data in Biological Science – Limitation and uses of statistics.		6
II	Classification of data - Tabulation of data – Diagrammatic and Graphic representation of data and uses.		16
III	Measures of Central Tendency - Mean, Median, Mode – Merits and Demerits.		8
IV	Measures of Variation - Range, Mean deviation, Quartile deviation, Standard deviation, Co-efficient of variation – Merits and Demerits.		12
V	Measures of skewness – Definition, Types; Karl Pearson’s coefficient of skewness – Bowley’s Co-efficient of Skewness; Measures of Kurtosis – Definitions, Types and Measures; Simple problems.		12
PRACTICAL	1. Graphical presentation of data – Diagrams, Frequency curves and polygons.		4
	2. Measures of Central values – Mean, median and mode.		6
	3. Measures of dispersion – Range, standard deviation and coefficient of variation.		6
	4. Correlation & Regression analysis – Computation of correlation coefficient and determination of regression equations.		4
REFERENCES	Text Books: <ul style="list-style-type: none">Daniel WW,(1987). Biostatistics, John Wiley and Sons, New YorkGupta. S.C. and Kapoor. V.k, Fundamentals of Mathematical Statistics, Sultan		

	<p>Chand & Sons, (12th Ed), 2020.</p> <ul style="list-style-type: none"> • Sampath Kumar V.S; Bio-Statistics, Manomaniam Sundaranar University Publication, Tirunelveli, 1997. • Verma B.L, Shukla G.D and Srivastava.R.N, <i>Biostatistics – Perspectives in Health Care</i>; Research and Practice, New Delhi: CBS Publishers & Distributors, 1993. • Veer Bala Rastogi, Bio-statistics, Medtech publication, (3rd revised Edition), 2017.
REFERENCE BOOKS	<ul style="list-style-type: none"> • Gupta. C.B, An Introduction to Statistical Methods, New Delhi: Vikas Publishers, 2004. • Gupta. S.P, <i>Statistical Methods</i>, New Delhi: Sultan Chand& Sons, 2014. • R.V. Hogg and A.T. Craig, Introduction to mathematical Statistics, (7thEd), 2012. • Rangaswamy, A Textbook of Agricultural Statistics, (3rd Ed), New Age International Publishers, New Delhi, 2020. • Rohatgi, V. K. and md. Ehsanes Saleh, A.K, An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Limited, New Delhi, (2nd Ed), 2009
WEBSITE	<ul style="list-style-type: none"> • https://www.biostat.washington.edu/about/biostatistics • http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_BiostatisticsBasics • https://www.edx.org/course/biostatistics-0
COURSE OUTCOMES	<p>On completion of the course, students will be able to do the following:</p> <p>CO1: Learn the basic concepts of statistics and its relevance with core subject.</p> <p>CO2: Visualize biological data using Tables, diagrams and charts.</p> <p>CO3: Present the characteristics of sample using descriptive statistics.</p> <p>CO4: Highlight the relationship between various biological parameters.</p> <p>CO5: Calculate regression estimates and perform analysis and interpretation of biological data.</p>

Course Code & Title	21APRU0003 ALLIED BIO-STATISTICS - II	No. of Credits: 4 (3 + 1)	3 hours
Class	B.Sc Microbiology	Semester – IV	Max. Marks: 100
Cognitive Level	K-1 Obtaining Knowledge on application of Statistics and its scope in Biosciences		
	K-2 Developing insight in computing statistical measures in the biological data analysis		
	K-3 Evaluating and Interpreting the statistical results		
Course Objectives	<ul style="list-style-type: none"> To understand the basic concepts and terms and its relevance in biology. To develop computation skills in statistics and analyze data using relevant statistical methods. 		
UNIT	CONTENT		NO. OF HOURS
I	Probability – Basic concept, Definition; Addition and Multiplication Theorems (without proof). Simple Problems.		6
II	Sampling – Definition, basic concepts; types of Sampling – sample versus census, types of population, probability sampling and non-probability sampling, use of random number tables and lottery method for selection of random samples; Determination of sample size.		6
III	Sampling distribution - Standard error – Type I error and type II error - Test of Significance - Alternative Hypothesis, Null hypothesis – Large sample tests with regard to Mean, Differences of Means, Proportions and difference of Proportions.		8
IV	Test of Significance - Small Sample Test with regard to Mean, Difference of Means and Variances – Paired t test - Chi – square test – Procedures and simple problems.		12
V	Analysis of variance (ANOVA) – Basic concepts and examples – explanation. ANOVA for one way and two way classifications – Procedures and simple problems.		12
PRACTICAL	1. Test of significance –Large sample tests and Test of significance for attributes.		6
	2. Test of significance – Small sample tests		4
	3. Chi-square test – Independence of attributes (for 2 X 2 contingency table)		4
	4. Analysis of variance – One-way and Two-way classifications.		6

REFERENCES	<ul style="list-style-type: none"> • Qazi Shueb Ahmad, Viseme Ismail, Biostatistics, University Science press, new Delhi, (1st Edition), 2008. • Rohatgi, V. K. and Md. Ehsanes Saleh. A.K, An Introduction to Probability Theory and Mathematical Statistics, 2nd Edition, Wiley Eastern Limited, New Delhi, 2009. • Siegel, Sideny, Non-Parametric Statistics for Behavioral Sciences, New Delhi: MCGraw Hill, 2006. • Verma B.L, Shukla G.D and Srivastava.R.N, Biostatistics – Perspectives in Health Care; Research and Practice, New Delhi: CBS Publishers & Distributors, 1993. • Veer Bala Rastogi, Biostatistics, Medtech publication, (3rd revised Edition), 2017.
TEXT BOOKS	<ul style="list-style-type: none"> • Gupta. C.B, An Introduction to Statistical Methods, New Delhi: Vikas Publishers, (23rd Ed), 2004. • Gupta. S.P, Statistical Methods, New Delhi: Sultan Chand, 2017. • Goon, A.M., M. K. Gupta and B. Das Gupta, Fundamentals of Statistics- Vol. II., World Press, Ltd, Kolkata. 2016. • Hogg. R.T. and A.T. Craig. A.T, Introduction to mathematical Statistics, (7thEd), 2012. • Rangaswamy, A Textbook of Agricultural Statistics, (3rd Ed), New Age International Publishers, New Delhi, 2020.
WEBSITE:	<ul style="list-style-type: none"> • https://www.biostat.washington.edu/about/biostatistics • https://www.biostat.washington.edu/about/biostatistics • https://www.agrimoon.com/wp-content/uploads/Statistics.pdf • https://www.coursera.org/courses?query=biostatistics
COURSE OUTCOMES	<p>On completion of the course, students will be able to do the following:</p> <p>C01: Knowing the terminologies and primitive concepts of statistics and its scope in the domain subject.</p> <p>C02: Describe various techniques of probability and sampling.</p> <p>C03: Know the different method of Visualizing the biological experimental results in an impressive presentation.</p> <p>C04: Interpret output from the various estimation and hypothesis testing procedures covered in the course.</p> <p>C05: Evaluate Performance by making various estimates and carrying out analysis on biological data.</p>

Course Code & Title	STATISTICAL METHODS (21APRU0004)		
Class	B.Sc Agriculture	Semester	III
Cognitive Level	K-1 Be acquainted with the knowledge of Applications of statistics in Agriculture.		
	K-2 Understand the significance of statistical measures.		
	K-3 Describe Agriculture data and quantitative information.		
Course Objectives	The Course aims <ul style="list-style-type: none"> • be familiar with statistics and its applications in biology • solve problems quantitatively using appropriate statistical measures • create and interpret visual representations of quantitative information • understand and critically assess data collection and its representation • understand various rates, ratios and odds ratio 		

UNIT	Content	No. of Hours
I	Introduction to Statistics: Meaning, Functions, and its applications in Agriculture. Sources and types of data. Frequency and cumulative frequency distribution. Graphical and diagrammatic representation of data.	12
II	Sampling Methods: Sampling versus Census. Sampling size, Sample frame. Sampling techniques – Probability and Non-probability sampling. Sampling and Non-sampling errors.	13
III	Descriptive Statistics: Measures of Central tendency – mean, median, mode. Measures of Dispersion – range, quartile deviation, mean deviation, standard deviation and co-efficient of variation.	13
IV	Correlation and Regression: Meaning and Definition of Correlation, Scatter Diagram, Karl Pearson's Coefficient of Correlation, Spearman's rank Correlation and uses of correlation. Meaning and Definition of Regression.	13
V	Inferential Statistics: Introduction to Test of hypothesis, Basic steps – parameter and statistic. Parametric and non-parametric tests – Student's 't' test and 'z' test, 'F' test, Chi-square test – ANOVA. Design of experiments.	13
PRACTICAL	5. Graphical Representation of Data – Diagrams, Frequency curves and polygons. 6. Measures of Central Tendency – Means, median and mode. 7. Measures of dispersion – Range, standard deviation and coefficient of variation 8. Measures of skewness & kurtosis and Moments. 9. Correlation & Regression analysis – Computation of correlation coefficient and determination of regression equations. 10. Test of significance – Small and Large sample tests and Test of significance attributes. 11. Chi-square test – Independence of attributes for 2x2 contingency table. 12. Analysis of variance One-way classification.	

References	<ul style="list-style-type: none"> • Gurumani, N., An Introduction to Bio-Statistics, Chennai, MJP Publication, 2004. • Gupta, S.C. and V.K. Kapoor (2020) Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi. • Goon, A.M., M.K. Gupta and B. Das Gupta (2016) Fundamentals of Statistics- Vol. II, World Press Ltd, Kolkata. • Rangaswamy, A Textbook of Agricultural Statistics, (3rd Ed), New Age International Publishers, New Delhi, 2020. • Sampath Kumar V.S; Biostatistics, Manomaniam Sundaranar University Publication, Tirunelveli, 1997.
Text Books	<ul style="list-style-type: none"> • Gupta, S.P. Statistical Methods, Sultan and Chand Publishers, New Delhi, 2014. • Gupta, C.B. An Introduction to Statistical Methods, Vikas Publishers, New Delhi, (23rd Ed), 2004. • Rohatgi, V. K. and A. K. md. Ehsanes Saleh, An Introduction to Probability Theory and Mathematical Statistics, 2nd Edition, Wiley Eastern Limited, New Delhi, 2009. • Sampath, S. Sampling Theory and Methods (Second Edition), Narosa Publishing House, New Delhi, 2006. • Vijayalakshmi G and Sivapragasam C. Research Methods: Tips and Techniques, MJP Publishers Chennai, 2009.
Websites	<ul style="list-style-type: none"> • http://mospi.nic.in/agriculture-statistics • https://iasri.icar.gov.in/ • https://www.agrimoon.com/wp-content/uploads/Statistics.pdf • http://sphweb.bumc.bu.edu/otlt/MPH Modules/BS/BS704 BiostatisticsBasics • https://ecourses.icar.gov.in/
Course Outcomes	<p>On completion of the course, students should be able to do</p> <p>C01: Get familiar with basic concepts and terms</p> <p>C02: Learn the problem solving techniques using appropriate statistical measures</p> <p>C03: Visualize and present the interpreted statistical data.</p> <p>C04: Make valid decisions applying statistical methods.</p> <p>C05: Obtain knowledge on various parametric and non-parametric methods.</p>

Course Code & Title	INTRODUCTION TO STATISTICS (21APRU0005)		
Class	B.Voc DAIRY PRODUCT AND TECHNOLOGY	Semester	II
Cognitive Level	K-1 Understand the origin, significance, and scope of Statistics.		
	K-2 Know the significance of presenting data in the form of tables and diagrams.		
	K-3 Learn computational aspects of basic statistical measures.		
Course Objectives	The Course aims <ul style="list-style-type: none"> • To enable students to be familiar with basic concepts and terms and the uses of statistics in quality control • To develop skills among the students to carryout analysis using appropriate statistical tools 		

UNIT	Content	No. of Hours
I	Introduction to Statistics – Collection, Classification and Tabulation of data – Frequency distribution – Graphical and Diagrammatic representation of data and uses of diagrams, graphs.	12
II	Descriptive Statistics – Measures of Central Tendency; Measures of Dispersion - Range, Standard Deviation, Co-efficient of variation – Simple problems.	13
III	Population and samples – Selection of sample – Random samples – Standard error – Type I Error and Type II Error – Test of Hypothesis - Basic concepts: Types of tests; F-test and Chi-square test of significance.	13
IV	Correlation - Definition, Types of Correlation – Karl Pearson's correlation coefficients, Spearman's Rank Correlation coefficients. Regression - Concept, Definitions – Simple regression equations – fitting of regression equation, Simple Problems.	13
V	Quality control charts – Introduction, process control, control charts, and control limits and specification limits, product control – Types of control charts: \bar{X} and R chart – P, c and np chart – Simple problems.	13
References	<ul style="list-style-type: none"> Krishnanswamy, O.R, Methodology of Research in Social science, Himalaya Publishing House, Bombay, 2002. Verma B.L, Shukla G.D and Srivastava.R.N, Biostatistics – Perspectives in Health Care; Research and Practice, New Delhi: CBS Publishers & Distributors, 1993. Veer Bala Rastogi, Biostatistics, Medtech publication, (3rd revised Edition), 2017. Qazi Shoeb Ahmad, Viseme Ismail, Biostatistics, University Science press, new Delhi, (1st Edition), 2008. Siegel, Sideny, Non-Parametric Statistics for Behavioral Sciences, New Delhi: MCGraw Hill, 2006. 	
Text Books	<ul style="list-style-type: none"> Gupta. C.B, An Introduction to Statistical Methods, New Delhi: Vikas Publishers, (23rd Ed), 2004. Gupta. S.P, Statistical Methods, New Delhi: Sultan Chand, 2017. Goon, A.M., M. K. Gupta and B. Das Gupta, Fundamentals of Statistics- Vol. II., 	

	<p>World Press, Ltd, Kolkata. 2016.</p> <ul style="list-style-type: none"> • Hogg. R.T. and A.T. Craig. A.T, Introduction to mathematical Statistics, (7thEd), 2012. • Rangaswamy, A Textbook of Agricultural Statistics, (3rd Ed), New Age International Publishers, New Delhi, 2020.
Websites	<ul style="list-style-type: none"> • https://www.biostat.washington.edu/about/biostatistics • https://www.agrimoon.com/wp-content/uploads/Statistics.pdf • https://fac.ksu.edu.sa/sites/default/files/stat-book_introduction_to_statistics.pdf
Course Outcomes	<p>On completion of the course, students should be able to do</p> <p>C01: Solve problems using appropriate statistical measures</p> <p>C02: Create and interpret visual representation of statistical data</p> <p>C03: Acquire knowledge on different types of error and tests</p> <p>C04: Learn about correlation and Regression and their applications</p> <p>C05: Prepare different quality control charts such as \bar{X}, R, P, np and c chart.</p>

Course Code & Title	INTRODUCTION TO STATISTICS (21APRU0005)		
Class	B.Voc DAIRY PRODUCT AND TECHNOLOGY	Semester	II
Cognitive Level	K-1 Understand the origin, significance, and scope of Statistics.		
	K-2 Know the significance of presenting data in the form of tables and diagrams.		
	K-3 Learn computational aspects of basic statistical measures.		
Course Objectives	The Course aims <ul style="list-style-type: none"> • To enable students to be familiar with basic concepts and terms and the uses of statistics in quality control • To develop skills among the students to carryout analysis using appropriate statistical tools 		

UNIT	Content	No. of Hours
I	Introduction to Statistics – Collection, Classification and Tabulation of data – Frequency distribution – Graphical and Diagrammatic representation of data and uses of diagrams, graphs.	12
II	Descriptive Statistics – Measures of Central Tendency; Measures of Dispersion - Range, Standard Deviation, Co-efficient of variation – Simple problems.	13
III	Population and samples – Selection of sample – Random samples – Standard error – Type I Error and Type II Error – Test of Hypothesis - Basic concepts: Types of tests; F-test and Chi-square test of significance.	13
IV	Correlation - Definition, Types of Correlation – Karl Pearson's correlation coefficients, Spearman's Rank Correlation coefficients. Regression - Concept, Definitions – Simple regression equations – fitting of regression equation, Simple Problems.	13
V	Quality control charts – Introduction, process control, control charts, and control limits and specification limits, product control – Types of control charts: \bar{X} and R chart – P, c and np chart – Simple problems.	13
References	<ul style="list-style-type: none"> Krishnanswamy,O.R, Methodology of Research in Social science, Himalaya Publishing House, Bombay, 2002. Verma B.L, Shukla G.D and Srivastava.R.N, Biostatistics – Perspectives in Health Care; Research and Practice, New Delhi: CBS Publishers & Distributors, 1993. Veer Bala Rastogi, Biostatistics, Medtech publication, (3rd revised Edition), 2017. Qazi Shoeb Ahmad, Viseme Ismail, Biostatistics, University Science press, new Delhi, (1st Edition), 2008. Siegel, Sideny, Non-Parametric Statistics for Behavioral Sciences, New Delhi: MCGraw Hill, 2006. 	
Text Books	<ul style="list-style-type: none"> Gupta. C.B, An Introduction to Statistical Methods, New Delhi: Vikas Publishers, (23rd Ed), 2004. Gupta. S.P, Statistical Methods, New Delhi: Sultan Chand, 2017. Goon, A.M., M. K. Gupta and B. Das Gupta, Fundamentals of Statistics- Vol. II., 	

	<p>World Press, Ltd, Kolkata. 2016.</p> <ul style="list-style-type: none"> • Hogg. R.T. and A.T. Craig. A.T, Introduction to mathematical Statistics, (7thEd), 2012. • Rangaswamy, A Textbook of Agricultural Statistics, (3rd Ed), New Age International Publishers, New Delhi, 2020.
Websites	<ul style="list-style-type: none"> • https://www.biostat.washington.edu/about/biostatistics • https://www.agrimoon.com/wp-content/uploads/Statistics.pdf • https://fac.ksu.edu.sa/sites/default/files/stat-book_introduction_to_statistics.pdf
Course Outcomes	<p>On completion of the course, students should be able to do</p> <p>C01: Solve problems using appropriate statistical measures</p> <p>C02: Create and interpret visual representation of statistical data</p> <p>C03: Acquire knowledge on different types of error and tests</p> <p>C04: Learn about correlation and Regression and their applications</p> <p>C05: Prepare different quality control charts such as \bar{X}, R, P, np and c chart.</p>

Course Code & Title	BUSINESS RESEARCH METHODS (21APRP0315)		
Class	M.Com Cooperation	Semester	III
Cognitive Level	K-1 Familiarizing the different business research methods and techniques.		
	K-2 Acquiring skills in preparation of research tools.		
	K-3 Preparing the research reports and disseminate the research findings.		
Course Objectives	The Course aims to <ul style="list-style-type: none"> • Define problems related business • Identify research gaps in the business world • Prepare suitable research designs for hypothesis testing • Develop appropriate tools and techniques for data collection • Write scientific research proposals and reports 		

UNIT	Content	No. of Hours
I	Scientific Research: Principles – characteristics and functions of research, scientific method-steps in research. Types of research: Pure, Applied and Action Research, Qualitative and Quantitative studies. - Research aptitude and research skills -Research ethics.	12
II	Research process: Formulation of Research problem, Criterion for selection of a topic, statement of the problem and definition of terms, objectives, review of literature -Variables: independent and dependent - Hypotheses: characteristics and functions – preparation of research design.	13
III	Methods of Research Design: Exploratory, descriptive and experimental designs –surveys - case study - intervention and interdisciplinary studies.	13
IV	Data Collection: sources, acquisition and interpretation of data – Data base: conduct of Interview, participant and non-participant observation, inquiry forms - Rating and attitude scales -psychological test: projective techniques – sociometry- pre -test reliability and validity.	13
V	Research Report: Thesis writing, its characteristics and format - types of reports - Reference materials, quotations, bibliography, footnotes, glossary and appendix. Documentation of research findings and utility for policies - programmes and innovation.	13
References	<ul style="list-style-type: none"> • Buckingham (2001), William M.K., Research Methods, New Delhi: Atomic Publishing. • Sajahan. S (2010), Research Methods for Management, Jaico Publishing House, New Delhi • Young, P.V. (2003), Scientific Social Surveys and Research, Prantice Hall, New Delhi. • Cooper and Schindler, (2013), Business Research Methods, Tata Mc Graw Hill. • Lawrence Neuman, (2014), Social Research Methods: Quantitative and Qualitative Approaches, Pearson. 	
Text Books	<ul style="list-style-type: none"> • Kothari, C.R and Garg, Gaurav, (2019), Research Methodology: Methods and Techniques, 4th ed. New Age International Publishers. • R. Panneerselvam, (2013), Research Methodology Prentice- Hall India (P) Ltd., New Delhi. • Bhandarkar, P.L., and Wilkinson, T.S., (2017), Methodology and Techniques of 	

	<p>Social Research, 24th ed. Himalaya Publishing House.</p> <ul style="list-style-type: none"> • Krishnaswamy O R and Ranganatham M. (2019) Methodology of Research In Social Sciences, Himalaya Publication, India. • Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin (2013). Business Research Methods. Cengage Learning limited.
Websites	<ul style="list-style-type: none"> • https://research-methodology.net • https://methods.sagepub.com/ • https://www.apa.org/research/tools • https://edge.sagepub.com/easterbysmith6e/student-resources • https://onlinelibrary.wiley.com/
Course Outcomes	<p>On completion of the course, students should be able to do</p> <p>C01: Define problems related business and identify gaps in conducting business research</p> <p>C02: Plan appropriated research design to solve a managerial problem.</p> <p>C03: Collect primary as well as secondary data through suitable methods.</p> <p>C04: Prepare research proposals.</p> <p>C05: Prepare and present a research report</p>

Course Code & Title	BUSINESS STATISTICS (21APRP0105)		
Class	M.Com Cooperation	Semester	I
Cognitive Level	K-1 understanding the concept of descriptive and inferential statistics.		
	K-2 Realizing the importance of probability and its distribution		
	K-3 Familiarizing with the techniques of sampling.		
Course Objectives	The Course aims to <ul style="list-style-type: none"> • Understand and use the descriptive statistics in decision making • Use the applications of probability in the managerial decisions • Understand the problem of inference when working with the sampling results • Apply appropriate statistical tools for hypothesis testing • Analyze the time series data for business forecasting 		

UNIT	Content	No. of Hours
I	Basic of Statistics: Definition, Scope, functions and limitation, Statistical organization and set up in India and Tamil Nadu.	12
II	Probability and Probability Distributions: Basic concepts of Probability- Discrete Probability Distribution – Continuous Probability Distributions – Decision Theory.	13
III	Sampling and Sampling Distributions: Sampling Methods – Sampling Distributions-Testing of Hypotheses – Parametric and non-parametric tests- Statistical analysis using statistical software.	
IV	Data Analysis: Collection of Data – Presentation of Data – Measures of Central Tendency – Measures of Variation and Skewness.	
V	Forecasting Methods – Business Forecasting – Correlation Analysis: Applications for decision making – Regression Analysis – Time Series Analysis.	
References	<ul style="list-style-type: none"> Gerald Keller, (2014). Statistics for Management and Economics, 10th Edition, Congage Learning. Sonia Taylor (2007). Business Statistics: for Non-Mathematician, Palgrave Macmillan, Macmillan India Limited Chennai. Srivastava, T, Rago. S, (2012). Statistics for Management, Tata McGraw Hill Thomas J. Quirk (2016). Excel 2016 for Business Statistics, a guide solve practical problems, Springer (India) Private Limited, New Delhi Kumbhojkar G. V. (2017) Business Statistics, Phadke Prakashan 	
Text Books	<ul style="list-style-type: none"> Gupta, S.P. (2014). Statistical Methods, 13th Edition Sultan Chand Publishers. Gupta S.C (2019), Fundamentals of Statistics, Himalaya Publication house. Levin, Rubin, (2013). Statics for Management, 13th Editions, Pearson Education Sharma, J. I (2014). Fundamentals of Business Statistics, Vikas Publication, New Delhi Desai S. S. (2017) Business Statistics, Jay-Gauri. 	
Websites	<ul style="list-style-type: none"> https://www.statista.com/ https://www.statistics.com/introductory-statistics/ https://www.khanacademy.org/math/statistics-probability/ https://statistics-made-easy.com/ 	

Course Outcomes	<p>On completion of the course, students should be able to do</p> <p>C01: Get exposed to the recent trends in the application of Statistics.</p> <p>C02: Obtain insight in sampling techniques.</p> <p>C03: Learn data collection and its visualization techniques.</p> <p>C04: Study the concepts in Descriptive Statistics.</p> <p>C05: Acquiring knowledge on errors and test method.</p>
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