

Course Code	Title		
23PGBTE103	Elective Paper – I (C) Research Methodology		
Semester: I	Credits: 4	CIA: 25 Marks	ESE: 75 Marks
Course Objective	To develop a research orientation among the students and to acquaint them with fundamentals of research methods. Specifically, introducing them to the basic concepts used in research and to scientific social research methods and their approach		
Course Category	Skill development and Employability		
Development Needs	Global		
Course Description	Basic concepts and methods of quantitative empirical research and to stimulate their interests to learn more about the research. At the end of the course, students will be equipped with basic and applied research methodology.		
Course Outcomes		Teaching Methods	Assessment Methods
CO1	Basic framework of research process	Video lessons	Assignment
CO2	Various research designs and technique	Review Article based lessons	Assignment
CO3	Various sources of information for literature review and data collection	Research articles based lessons	Seminar
CO4	Ethical dimensions of conducting applied research Appreciate the components of scholarly writing and evaluate its quality	Lectures / Hands - on training	Writing skill test
CO5	Procedure for writing research proposal and grant	Lectures / Online based teaching	Online Searching Test
Course Offered by	Biotechnology		
Course Content	Instruction Hours /Week : 4		
Unit	Description	Text Book	Chapter
I	<b>Objective and Steps in Research process:</b> Definition, objectives of research. Types and its significance. Steps in research process. Criteria for good research. Defining and formulating a research problem. Literature survey, Development of working hypothesis.	1	1, 2
<b>Instructional Hours</b>			<b>12</b>
<b>Suggested Learning Methods: Presentation and Video lectures of basic research process.</b>			
II	Research design: Definition and related concepts, Basic principles of experimental designs- Informal and formal experimental designs Sampling design: Steps in sample design, Non-probability sampling and Probability sampling -random sampling; Measurement and scaling techniques- Methods of data collection.	1	3, 4,5
<b>Instructional Hours</b>			<b>12</b>
<b>Suggested Learning Methods: Practice in field study, sample collection and preservation methods.</b>			
III	Sources of Data: Primary Data, Secondary Data; Procedure Questionnaire: Sampling Merits and Demerits - Experiments - Kinds - Procedure; Procedure Schedules: Sampling Merits and Demerits - Experiments - Kinds - Procedure; Control Observation: Merits - Demerits - Kinds - Procedure - Sampling Errors: Type-I Error, Type-II Error	1	6, 9
<b>Instructional Hours</b>			<b>12</b>
<b>Suggested Learning Methods: Data processing techniques by statistical tools and data interpretation methods through computer software.</b>			

IV	Research report writing: steps in report writing layout of the Research Report, Types of Reports, Styles of reporting. Editing and evaluation of final draft, evaluating the final draft; Editing and evaluation of final draft, evaluating the final draft		1 & 2	14, 10, 20									
<b>Instructional Hours</b>				<b>12</b>									
<b>Suggested Learning Methods: Hand-on training on writing skills such as, report and article writing.</b>													
V	<b>Research proposal/Grant:</b> Presentation of data - preparation of master's thesis for oral presentation; Presenting the research findings in open defence. Research proposal/Grant- definition, structure, budget allocation, specific aims, background and significance. Hierarchy of funding agencies in India and their operations.		2	20									
<b>Instructional Hours</b>				<b>12</b>									
<b>Suggested Learning Methods: Awareness on funding agencies and training to write the proposals.</b>													
<b>Total Hours</b>				<b>60</b>									
<b>Text Books</b>	1. Kothari, C.R., Research Methodology: Methods and Techniques, New Age International Publishers, 2 <sup>nd</sup> Edition, 2010. 2. Chawla Deepak & Sondhi Neena., Research Methodology: Concepts and Cases, Vikas Publishing House Pvt. Ltd. Delhi, 2011												
<b>Reference Books</b>	1. Gurumani, N., Research Methodology for Biological Science, MJP Publishers, Chennai, 2006. 2. Rt. Kumar, Research Methodology: A Step-by-Step Guide for Beginners, SAGE pub., 2010. 3. C. R. Kothari, Research Methodology: Methods and Techniques, New Age Intl., 1985												
<b>Web. URLs</b>	1. <a href="https://onlinelibrary.wiley.com/doi/book/10.1002/97811187630252">https://onlinelibrary.wiley.com/doi/book/10.1002/97811187630252</a> . 2. <a href="https://mtechlib.files.wordpress.com/">https://mtechlib.files.wordpress.com/</a>												
<b>Tools for Assignment (25 Marks)</b>													
<b>CIA I</b>	<b>CIA II</b>	<b>CIA III</b>	<b>Seminar</b>	<b>Viva voce</b>	<b>Case study</b>	<b>Total</b>							
<b>5</b>	<b>5</b>	<b>6</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>25</b>							
<b>Mapping</b>													
<b>CO\PO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	L	L	H	M	L	M	M	L	H	L	L	M	H
<b>CO2</b>	M	L	L	M	M	L	L	L	H	M	M	M	H
<b>CO3</b>	L	L	M	M	L	L	L	M	L	M	M	M	L
<b>CO4</b>	L	L	M	M	L	L	M	H	L	L	M	M	H
<b>CO5</b>	M	M	L	L	L	M	M	M	H	M	H	M	L
H-High; M-Medium; L-Low													
<b>Course designed by</b>							<b>Verified by Chairman</b>						
<b>Dr. P. Thirunavukkarasu</b>							<b>Dr. N. Saranya</b>						

Course Code	Title		
23U3FSE604	Discipline Specific Elective -II (A) - <b>Fundamentals of Research</b>		
Semester: VI	Credits: 4	CIA : 25 Marks	ESE : 75 Marks
Course Objective	1. Understand the research terminology and research ethics. 2. Identify the components of a literature review process		
Course Category	Skill development		
Development Needs	Global		
Course Description	It helps to acquire knowledge about research development in food sector		
Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the basic knowledge of research process.	Lecture-based instruction	Seminar
CO 2	Classify ethical dilemmas faced by international and domestic researchers and the importance of scientific integrity in research.	Activity based Teaching	Group activity
CO 3	Apply Quantitative and Qualitative Research	Survey techniques	Seminar
CO 4	Examine the fundamental of sampling method	E-modules	Assignment
CO 5	Create the best practices of study design and proposal development	Experiment based teaching	Project
Offered by	Food Science and Nutrition		
Course Content	Instructional Hours / Week:4		
Unit	Description	Text Book	Chapters
I	<b>Foundations of Research:</b> Introduction to Research- Empiricism, deductive and inductive theory. Basic characteristics of scientific method- Research Process- Research Ethics and Integrity- Critical appraisal. Finding the right journal-Open access and fees-Predatory publishing-Manuscript writing-Review of literature.	1	3
Instructional Hours			12
<b>Suggested Learning Methods: Group activity, Research poster</b>			
II	Fundamental concepts of identification & formulation of research problem– Research Question – Hypothesis. Fundamentals of Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample	1,2	2
Instructional Hours			12
<b>Suggested Learning Methods: Group discussion, Peer learning</b>			
III	<b>Quantitative Research :</b> Introduction to Quantitative Research, Study Designs and Methods- Analysis and Interpretation of Quantitative Data- Critical Appraisal of Quantitative Research. <b>Qualitative Research:</b> Introduction to Qualitative Research, Study Designs and Methods-Analysis and Interpretation of Qualitative Data-Critical Appraisal of Qualitative Research.	1,2	2 & 5
Instructional Hours			12
<b>Suggested Learning Methods: Experimental learning, case studies</b>			

<b>IV</b>	Basic data analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages) –Mean, Median , Mode, Standard deviation, ANOVA. Mixed Methods Research Introduction to Mixed Methods Research, Study Designs and Methods- Analysis and Interpretation of Mixed Methods Data - Critical Appraisal of Mixed Methods Research								2	6			
<b>Instructional Hours</b>										<b>12</b>			
<b>Suggested Learning Methods: Assignment, Model preparation</b>													
<b>V</b>	<b>Patent</b> –definition, requirements, patent laws India, administrator, need for patent system, advantages, patent procedures <b>Related practical</b> Data analysis and presentation using Ms.Excel, SPSS and RSM Conducting Research Responsibly: Ethical issues related to publishing - IRB-Human subjects-Plagiarism								3	4			
<b>Instructional Hours</b>										<b>12</b>			
<b>Suggested Learning Methods: Experimental learning, Research proposals</b>													
<b>Total Hours</b>										<b>60</b>			
<b>Text Books</b>		<ol style="list-style-type: none"> <li>1. Creswell, J. W. Research design: Qualitative, quantitative and mixed methods approaches. 5th Ed. Thousand Oaks, CA: Sage, 2018.</li> <li>2. Kothari, C.R. Research Methodology: Methods and Techniques, New age International Publications, 4<sup>th</sup>Edition, 2018</li> <li>3. Turabian, K.L. 2007. A Manual for Writers of Research Papers, Theses, and Dissertations. University of Chicago Press. 7th ed</li> </ol>											
<b>Reference Books</b>		<ol style="list-style-type: none"> <li>1. Shanthy Sophia Bharathi, Computer Oriented Statistical Methods/ Probability and Statistics, Chanilatha Publications, Second Edition, 2000.</li> <li>2. Donald, H.Mc. Burney, Research Methods, Fifth Edition, Thomson and Wadsworth Publications, 2 002</li> </ol>											
<b>Journals</b>		<ol style="list-style-type: none"> <li>1. Journal of research statistics in social science</li> <li>2. The journal of fundamentals and comparative research.</li> </ol>											
<b>Tools for Assessment (25 Marks)</b>													
<b>CIAI</b>	<b>CIAII</b>	<b>CIA III</b>	<b>Seminar</b>	<b>Case studies</b>	<b>Mini Project</b>						<b>Total</b>		
5	5	6	3	3	3						25		
<b>Mapping</b>													
<b>CO \ PO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	M		M			M		M	M	M	L	H	H
<b>CO2</b>	M			H	M				M	L	L	H	M
<b>CO3</b>	M	M		H	M	M	M		L	M	M	M	H
<b>CO4</b>	L	H	M	M			H	M	L	H	H	H	H
<b>CO5</b>	M	M			M	M			M	L	L	H	L
<b>H-High; M-Medium; L-Low</b>													
<b>Course designed by</b>								<b>Verified by Chairman</b>					
Ms. Thilagavathy								Dr. A. Swarnalatha					

Course Code	Title		
23PGFNC310	Paper X – Research Methodology and Statistics		
Semester: III	Credits:4	CIA: 25 Marks	ESE: 75 Marks
Course Objective	1. Understand the principles and methods of research. 2. Apply statistical procedure analyze numerical data and draw inferences.		
Course Category	Skill development		
Development Needs	Global		
Course Description	It helps to acquire knowledge about research development in food sector		
Course Outcomes		Teaching Methods	Assessment Methods
CO1	Distinguish between research objectives and sampling methods	Lecture-based instruction	Seminar
CO2	Identify different data collection methods	Survey Techniques	Case studies
CO3	Use effective tools and techniques to analyze and present data	Survey Techniques	Seminar
CO4	Critically evaluate the research designs and apply appropriate statistical analysis	Activity based Teaching	Assignment
CO5	Analyse data statistically using ICT tools	Experiment based teaching	Project
Offered by	Department of Food Science and Nutrition		
Course Content	Instructional Hours/Week:5		
Unit	Description	Text Book	Chapters
I	<b>Research types and sampling methods:</b> Meaning of research, objectives of research, types of research and their application, selection and formulation of research problems, hypothesis, designing a research—different types, census and sample method, theoretical basis of sampling, sampling methods — random sampling methods and non-random sampling methods, size of sample, sampling and non sampling errors.	1	3
<b>Instructional Hours</b>			15
<b>Suggested Learning Methods: Group activity, Research poster</b>			
II	<b>Methods of Collecting Data:</b> Questionnaire, preparation of schedules, interview method, case study method, experimentation method, sources of secondary data, precautions while using secondary data. <b>Editing and Coding the Data Organization of Data</b> – Classification – meaning and objectives, types of classification, formation of discrete and continuous frequency distribution, tabulation – role, part of a table, general rules of tabulation, types of tables	1,2	15
<b>Instructional Hours</b>			
<b>Suggested Learning Methods: Group discussion, Peer learning</b>			15
III	<b>Representation of Data:</b> Diagrammatic and graphical representation – significance of diagrams and graphs – general rules for constructing diagrams – types of diagrams, graphs of time series, graphs of frequency distribution. <b>Interpretation and Report Writing</b> –Meaning of interpretation, technique, precautions, format of research report, types, steps	1,2	

	and stages, mechanism and style, precautions and essentials for good report, foot notes and bibliographical citations.		
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<b>Instructional Hours</b>			<b>15</b>
<b>Suggested Learning Methods:</b> Experimental learning, case studies			

<b>IV</b>	Measures of Central Tendency: Mean, median, mode, the irrelative advantages and disadvantages. Measures of dispersion — mean deviation, standard deviation, quartile deviation. Co-efficient of variation, percentile and percentile ranks. Association of attributes, contingency tables, correlation, coefficient of correlation and its interpretation, rank correlation, regression equations and predictions.	2	6
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<b>Instructional Hours</b>			<b>15</b>
<b>Suggested Learning Methods:</b> Assignment, Model preparation			

<b>V</b>	<b>Probability</b> – Rules of probability and its applications. Distribution – normal, binomial, their properties, importance of these distributions in statistical studies. Tests of significance– large and small samples, t, chi-square test. Analysis of variance– one-way and two-way classification <b>Related practical Data analysis and presentation using Ms.Excel, SPSS and RSM</b>	1,3	6 & 5
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<b>Instructional Hours</b>			<b>15</b>
<b>Suggested Learning Methods:</b> Experiential learning and research proposal			

<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Kothari,C.R.Research Methodology: Methods and Techniques, New age International Publications,4<sup>th</sup>Edition,2018.</li> <li>2. Gupta,S.F.,Statistical Methods, Sultana Chand and Sons,31Revises Edition,2002</li> <li>Ramakrishnan,P.,Biostatistics,SaraPublication,2001.</li> </ol>
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<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Shanthi Sophia Bharathi, Computer Oriented Statistical Methods/ Probability and Statistics, Chanilatha Publications, Second Edition, 2000.</li> <li>2. Donald,H.Mc.Burney, Research Methods, Fifth Edition, Thomson and Wads worth Publications,2002</li> </ol>
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<b>Journals</b>	<ol style="list-style-type: none"> <li>1. Journal of research statistics in social science</li> <li>2. The journal of fundamentals and comparative research.</li> <li>3. The Journal of social science research</li> </ol>
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<b>Tools for Assessment (25 Marks)</b>						
CIA I	CIA II	CIA III	Seminar	Performance in practical	Mini Project	Total
5	5	6	3	3	3	25

<b>Mapping</b>													
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L			L			M	H	L	L	
CO2	M	M	L	L					H	H	M	L	L
CO3	H	H	H		M				H	H	L	L	L
CO4	H	H	H		H	H			H	H	L	L	H
CO5	H	H	H	L	H				H	H	M	M	H

H-High;M-Medium;L-Low

<b>Course designed by</b>	<b>Verified by</b>
Dr. A. Swarnalatha	Dr. A. Swarnalatha

Course Code	Title		
23PGMBC311	Paper – XI : Biostatistics and Research Methodology		
Semester : III	Credits : 4	CIA : 25 Marks	ESE: 75 Marks
Course Objective	This course give knowledge about designing the research project and various statistical applications in Research		
Course Category	Skill Development		
Development Needs	Global		
Course Description	It provides a overview of Statistical methods for analyzing corrected data produced by longitudinal measures take over time		
Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Describing the method of data collection, presentation and memorizing different Measures of Central Tendency and Measures of Dispersion	Group learning/ Lectures.	Seminar
CO 2	Identify the applications of Correlation and Regression co efficient.	Peer Teaching/ Lectures	Unit Test
CO 3	Distinguishing different Statistical situations using Sampling Techniques	Lectures/ Tutorial	Seminar
CO 4	Executing one way and two way analysis using analysis of Variance and Experimental Design.	Video Lectures / Lectures	Assignment
CO 5	Critically evaluate the Research Designs.	Group learning / Lectures	Quiz
Offered by	Mathematics		
Course Content		Instructional Hours / Week : 5	
Unit	Description	Text Book	Chapters
I	<b>Basic Concepts of Biostatistics:</b> Scope of Biostatistics – Collection, Classification and Tabulation of Data. Diagrammatic and Graphical representation	1	1,3,5,6
	<b>Measures of Central Tendency:</b> Arithmetic mean, Median, Mode. Measure of Dispersion: Range, Quartile Deviation, Standard Deviation and Co efficient of Variation.	1	7 – 8
Instructional Hours			15
<b>Suggested Learning Methods: Seminar</b>			
II	Correlation: Definition – Scatter diagram – Karl Pearson’s correlation co – efficient – Properties - Rank correlation co – efficient –Properties. Regression: Introduction – Construction of regression equations – Properties of regression.	1	10
Instructional Hours			15
<b>Suggested Learning Methods: Problem Solving Practise</b>			
III	<b>Sampling Techniques:</b> Introduction – Methods of Sampling- Sampling and Non-Sampling errors.	3	2
	<b>Testing of Hypothesis:</b> Test of significance for large sample –Difference between two means – Test of significance for Small sample — Chi Square test – Goodness of fit- F-test.	1	Vol II:3,4
Instructional Hours			15

Suggested Learning Methods: Group Learning method														
IV	Analysis of Variance: One way and Two way Classifications.								2	12				
	Experimental Design – Introduction – Basic Concepts and Principles – Completely Randomized Design (CRD) – Randomized Complete Block Design (RCBD)								3	10				
<b>Instructional Hours</b>												<b>15</b>		
Suggested Learning Methods: <a href="https://youtu.be/0NwA9xxxtHw">https://youtu.be/0NwA9xxxtHw</a>														
V	Research Methodology – Types of Research- Significance of Research. Research Process - Research Problem – Selection of Research Problem – Research Design.								2	1 – 3				
	<b>Instructional Hours</b>												<b>15</b>	
Suggested Learning Methods: Problem Solving Practice														
<b>Total Hours</b>												<b>75</b>		
Text Books	1. Gupta.S.P. <b>Statistical Methods</b> . Sulthan Chand and Sons. <b>2017</b> . <b>Unit I:</b> Chapter 1,3,5,6,7,8 Page No :1-15;39-61;91-126;127-166;177-221;275-280,286-304 <b>Unit II:</b> Chapter 10,11; Page No – 390-397,398-401,414-423, 451- 458 <b>Unit III:</b> Volume II – Chapter 3,4; Page No- 925-931,934,935, 953-1004 2. Kothari. <b>Research Methodology: Methods and Techniques</b> . New Age International Publishers. New Delhi. 2004. <b>Unit IV</b> – Chapter 12 – Page no – 256 - 275 <b>Unit V</b> – Chapter – 1- 3 – Page no – 2 – 7,10 – 20, 24 – 26, 31 - 55 3. Irfan Ali Khan and Atiya Khanum, <b>Fundamentals of Biostatistics</b> , Ukaaz publications, Second Revised Edition, 2004. <b>Unit III:</b> Chapter 2- Page No – 1-16 <b>Unit IV :</b> Chapter 10 – page no – 393 – 396, 402 - 420													
	Reference Books	1. Sokal, R.R. and Rohlf, F.J. <b>An Introduction to Biostatistics</b> . W.H. Freeman and Company.1987. 2. Dr. P.N. Arora and Dr. P.K. Malhan, <b>Bio Statistics</b> , Himalaya Publishing House, Revised Edition, 2006												
		Web. URLs	1. <a href="https://nptel.ac.in/courses/102106051">https://nptel.ac.in/courses/102106051</a> 2. <a href="https://in.coursera.org/lecture/six-sigma-analyze-advanced/intro-to-design-of-experiments-o3bgB">https://in.coursera.org/lecture/six-sigma-analyze-advanced/intro-to-design-of-experiments-o3bgB</a>											
Tools for Assessment (25 Marks)														
CIA I	CIA II	Model	Seminar	Class Participation				Periodical Quizzes	Total					
5	5	6	3	3				3	25					
Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	H	H	L	M	M	M	L	H	H	H	L	L	H	
CO2	M	H	M	L	H	H	M	H	H	H	H	L	H	
CO3	M	H	H	L	H	H	M	H	H	H	H	H	H	
CO4	H	L	H	M	M	M	M	M	L	M	M	L	H	
CO5	H	H	M	L	H	H	L	H	H	M	L	H	H	
H-High; M-Medium; L-Low														
Course designed by									Verified by Chairman					
Ms. M. Dhanalakshmi									Dr. T. Chandra Pushpam					