

Syllabi for UG/ PG Programmes

Syllabi for UG/ PG Programmes

Semester	Course Code	Title of the Paper	No. of Credits	Theory hours	Practical	Duration of ESE (Hours)	Evaluation Marks		Total Marks
							CFA	ESE	
II	25ARPC1201	Research Methods	4	4	-	3	40	60	100
VII	25ARPC4101	Research Methods	4	4	-	3	40	60	100
II	25ARPC1202	Applied Statistics	4	4	-	3	40	60	100
VIII	25ARPC4202	Applied Statistics	4	4	-	3	40	60	100
II	25APRC1203	Research Methods and Statistics	4	4	-	3	40	60	100
III	25APRC2103	Research Methods and Statistics	4	4	-	3	40	60	100
I	25APRC1104	Research Methods and IPR	4	4		3	40	60	100
III	25ARUB2102	Statistical Methods	3	1	1	3	40	60	100
IV	25ARUB2203	Introduction to Statistics	3	3	-	-	50	-	50

Course Title & Code	RESEARCH METHODS	25ARPC1201
Programme	M.A. Gandhian Thought and Peace Science/ M. Sc Home Science Extension and Communication/ M. Sc Textile and Fashion Design	Semester II
Cognitive Level	K-1 Understand the basics of research methods	
	K-2 Justify the choice of research methods	
	K-3 Identify the appropriate research design	
	K-4 Construct tools for data collection in research	
	K-5 Develop skills in preparing scientific research report	
UNIT	Content	No. of Hours
I	Research: Definition, Characteristics and Functions of Research. Scientific method. Positivism and post-positivistic approach. Types of research - Pure, Applied and Action Research, Qualitative and Quantitative Research. Research Skills. Research Ethics and Ethical Committee.	12
II	Steps in Research: Selection and Formulation of Research Problem, Statement of the Problem and Definition of concepts, Objectives. Review of Literature, Conceptual Framework, Reference Management Software. Types of Variables – Hypothesis: types, characteristics and functions.	13
III	Preparation of Research Design: Descriptive, Exploratory, Diagnostic, Historical and Experimental designs - types. Methods of Research: Multidisciplinary, Interdisciplinary and Transdisciplinary studies. Mixed methods. Participatory research.	13
IV	Sources and types of Data: Primary and Secondary. Tools for Data Collection- Interview, Observation, Schedule and Questionnaire. Sociometry, Psychological test and Projective techniques, Content analysis, Survey, Case study, Focus Group Discussion- Scaling Techniques- Pilot study and Pre-test, Reliability and Validity. Online research methods.	13
V	Research Report: Types and Format of Reports. Citation styles of Referencing. Bibliography, Webliography, Footnotes, Glossary, Index and Appendix. Applications of ICT in Research. Preparation of Research Proposal – Plagiarism and Artificial Intelligence, Impact factor for effective publications, Dissemination of research findings.	13

References	• Creswell, J. W., & Creswell, J. D. (2022). Research design: Qualitative, quantitative, and mixed methods approach (6th ed.). SAGE Publications. • Thomas, G. C. (2023). Research methodology and scientific writing. Ane Books Pvt. LTD. • Somekh, B., & Lewin, C. (2018). Theory and methods in social science research (3rd ed.). SAGE Publications. • Neuman, W. L., & Abbott, B. B. (2020). Research methods in social life (10th ed.). Pearson. • Kerlinger, F. N., & Lee, H. B. (2000). Foundations of behavioral research (4th ed.). Harcourt College Publishers.
Text Books	• Kothari, C. R., & Garg, G. (2019). Research methodology: Methods and techniques (4th rev. ed.). New Age International Publisher. • Ranjith Kumar, (2024), Research Methodology: A Step-By-Step Guide for Beginners, 4th edition, Singapore: Sage Publications Asia-Pacific Pvt., Ltd, • Simon, Schuster, (2008) Methods of Social Research, Kenneth Bailey, 4th Edition • Tony Brown and Liz Jones, (2001), Action Research and Postmodernism, Buckingham: Open University Press • Tony Greenfield and Sue Greener, (2016), Research Methods for Post Graduates, John Wiley and Sons Ltd, • Vijayalakshmi, G. and Sivapragasam, C, (2009), Research Methods: Tips and Techniques, Chennai: MJP Publishers,
Websites	• https://www.socialresearchmethods.net/ • https://ndl.iitkgp.ac.in/ • http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291099-1328/issues • http://shodhganga.inflibnet.ac.in/ • http://journals.sagepub.com/
Course Outcomes	On completion of the course, students should be able to CO1: Develop expertise and skills to undertake independent research CO2: Construct research tools CO3: Understand research skills and ethics-related issues CO4: Application of statistical tools from the application perspective CO5: Prepare research article and project report

Mapping of COs with POs

Course Outcome	Programme Outcome				
	1	2	3	4	5
1	3	3	2	2	3
2	3	2	3	3	3
3	3	3	3	3	3
4	3	3	3	3	2
5	3	3	2	3	3

0: No Correlation

2: Moderately Correlating

1: Weakly Correlating

3: Strongly Correlation

Course Title & Code	RESEARCH METHODS	25ARPC4101
Programme	B.A/ M.A Public Administration / M.A Sociology (Integrated)	Semester VII
Cognitive Level	K-1 Understand the basics of research methodology	
	K-2 Identify the appropriate research methods	
	K-3 Justify the choice of research design	
	K-4 Construct tools for data collection in research	
	K-5 Develop skills in preparing scientific research report	
UNIT	Content	No. of Hours
I	Research: Definition, Characteristics and Functions of Research. Scientific method. Positivism and post-positivistic approach. 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 concepts, Objectives. Review of Literature, Conceptual Framework, Reference Management Software. Types of Variables – Hypothesis: types, characteristics and functions.	13
III	Preparation of Research Design: Descriptive, Exploratory, Diagnostic, Historic 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, Focus Group Discussion-Scaling Techniques– Pre- test, Test of reliability and validity. Online research methods.	13
V	Research Report: Format - types of reports – Formats and Citation styles of Referencing. Bibliography, Webliography, Footnotes, Glossary, Index and Appendix. Preparation of Research Proposal – Plagiarism, Impact factor, Dissemination of research findings, Publication process, Applications of ICT in Research	13

References	• Creswell, J. W., & Creswell, J. D. (2022). Research design: Qualitative, quantitative, and mixed methods approach (6th ed.). SAGE Publications. • Thomas, G. C. (2023). Research methodology and scientific writing. Ane Books Pvt. LTD. • Somekh, B., & Lewin, C. (2018). Theory and methods in social science research (3rd ed.). SAGE Publications. • Neuman, W. L., & Abbott, B. B. (2020). Research methods in social life (10th ed.). Pearson. • Kerlinger, F. N., & Lee, H. B. (2000). Foundations of behavioral research (4th ed.). Harcourt College Publishers.
Text Books	• Kothari, C. R., & Garg, G. (2019), Research methodology: Methods and techniques (4th rev. ed.). New Age International Publisher. • Ranjith Kumar, (2024), Research Methodology: A Step-By-Step Guide for Beginners, 4th edition, Singapore: Sage Publications Asia-Pacific Pvt., Ltd. • Simon, Schuster, (2008), Methods of Social Research, Kenneth Bailey, 4th Edition. • Tony Brown and Liz Jones, (2001), Action Research and Postmodernism, Buckingham: Open University Press. • Tony Greenfield and Sue Greener, (2016), Research Methods for Post Graduates, John Wiley and Sons Ltd. • Vijayalakshmi, G. and Sivapragasam, C, (2009), Research Methods: Tips and Techniques, Chennai: MJP Publishers.
Websites	• https://www.socialresearchmethods.net/ • https://ndl.iitkgp.ac.in/ • http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291099-1328/issues • http://shodhganga.inflibnet.ac.in/ • http://journals.sagepub.com/
Course Outcomes	On completion of the course, students should be able to CO1: Develop expertise and skills to undertake independent research CO2: Construct research tools CO3: Understand research skills and ethics-related issues CO4: Application of statistical tools from the application perspective CO5: Prepare research article and project report

Mapping of COs with POs

Course Outcome	Programme Outcome				
	1	2	3	4	5
1	3	3	3	3	2
2	2	3	3	3	3
3	3	3	2	3	3
4	3	3	3	2	3
5	3	3	2	3	3

0: No Correlation

2: Moderately Correlating

1: Weakly Correlating

3: Strongly Correlating

Course Title & Code	APPLIED STATISTICS	25ARPC1202
Programme	M.A Gandhian Thought and Peace Science/ M.Sc. Home Science Extension and Communication/ M.Sc. Textiles and Fashion Design/	Semester II
Cognitive Level	K-1 Impart the knowledge on applications of Statistics in various disciplines.	
	K-2 Understand various methods of performing sampling, correlation and regression.	
	K-3 Learn how to estimate errors and perform testing.	
	K-4 Identify a suitable statistical measure for describing data	
	K-5 Analyse a research problem using appropriate statistical tools.	
UNIT	Content	No. of Hours
I	Introduction to Statistics: Origin, scope, limitations and misuses of Statistics – Stages of Statistics. Recent trends in the application of Statistics. Statistical Organisational Set-up in Central and State Governments.	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. presentation of data: Diagrammatic and Graphical representation of data.	13
IV	Descriptive Statistics – Measures of central tendency: mean, median, mode. Measures of Dispersion: Range, Mean deviation, Quartile deviation, Variance and Standard deviation– Coefficient of variation, Measures of Skewness and Kurtosis, Measures of Association – Correlation and Regression analysis.	13
V	Inferential Statistics: Testing of Hypothesis - Sampling distribution and Standard Error, Type I Error and Type II Error. Parametric and non-parametric tests - 'z' test, Students 't' test, 'F' test, Chi-square test and ANOVA. Factor Analysis and Structural Equation Modelling (SEM) – Applications of Software for Statistical Analysis.	13

References	- Donna L. Mohr, William J. Wilson & Rudolf J. Freund (2021), Statistical Methods, 4th edition, Academic Press Inc, Cambridge, United States. - Allen Craig, Robert V Hogg, & Joseph W. McKean (2021), Introduction to Mathematical Statistics, 8th edition, Pearson Education India, Noida. - Nicholas T. Longford (2022), Statistics for Making Decisions, 1st edition, CRC Press, Chapman and Hall, New Delhi. - Parimal Mukhopadhyay (2012), Mathematical Statistics, Books & Allied Pvt. Ltd., Kolkata, West Bengal. - Joseph F Hair, Barry J. Babin, Role E. Anderson & William C. Black (2018), Multivariate Data Analysis, 8th edition, Cengage India Private Limited, India.
Text Books	S. C. Gupta & V. K. Kapoor (2020), Fundamentals of Mathematical Statistics, 12th edition, Sultan Chand & Sons, New Delhi. S. C. Gupta & V. K. Kapoor (2007), Fundamentals of Applied Statistics, 4th edition, Sultan Chand & Sons, New Delhi. - Dr. S. P. Gupta (2021), Statistical Methods, 46th edition, Sultan Chand & Sons, New Delhi. R. S. N. Pillai & Bagavathi (2016), Statistics: Theory and Practice, 8th edition, S. Chand and Company Limited, New Delhi. B. L. Agarwal (2023), Basic Statistics, 8th edition, New Age International Private Limited, New Delhi.
Websites	https://www.coursera.org/specializations/social-science https://www.w3schools.com/statistics/ https://online.stat.psu.edu/statprogram/reviews/statistical-concepts https://www.khanacademy.org/math/statistics-probability https://instr.iastate.libguides.com/oer/stats
CourseOutcomes	On completion of the course, students should be able to do C01: Get exposed to the recent trends in the application of Statistics. C02: Obtain insight into sampling techniques. C03: Learn data collection and its visualisation techniques. C04: Study the concepts in Descriptive Statistics. C05: Acquiring knowledge on errors and test methods.

Mapping of COs with POs

Course Outcome	Programme Outcome				
	1	2	3	4	5
1	3	2	3	3	3
2	3	3	3	2	3
3	2	3	3	3	3
4	3	3	3	3	2
5	3	3	2	3	3

0: No Correlation

2: Moderately Correlating

1: Weakly Correlating

3: Strongly Correlating

Course Title & Code	APPLIED STATISTICS	25ARPC4202
Programme	B.A/M.A Public Administration /M.A Sociology (Integrated)	Semester VIII
Cognitive Level	K-1 Impart the knowledge on applications of Statistics in various disciplines.	
	K-2 Understand various methods of performing sampling, correlation and regression.	
	K-3 Learn how to estimate errors and perform testing.	
	K-4 Identify a suitable statistical measure for describing data	
	K-5 Analyse a research problem using appropriate statistical tools.	
UNIT	Content	No. of Hours
I	Introduction to Statistics: Origin, scope, limitations and misuses of Statistics – Stages of Statistics. Recent trends in the application of Statistics. Statistical Organisational is set up in central and state governments.	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. presentation of data: Diagrammatic and Graphical representation of data.	13
IV	Descriptive Statistics – Measures of central tendency: mean, median, mode. Measures of Dispersion: Range, Mean deviation, Quartile deviation, Variance and Standard deviation– Coefficient of variation, Measures of Skewness and Kurtosis, Measures of Association – Correlation and Regression analysis.	13
V	Statistical Inference: Testing of Hypothesis - Sampling Distribution and Standard Error.Parametric and non-parametric tests - 'z' test, Student's 't' test, 'F' test, Chi-square test and ANOVA. Factor Analysis and Structural Equation Modelling (SEM) – Uses and applications. Using software for statistical analysis.	13

References	- Donna L. Mohr, William J. Wilson & Rudolf J. Freund (2021), Statistical Methods, 4th edition, Academic Press Inc, Cambridge, United States. - Allen Craig, Robert V Hogg, & Joseph W. McKean (2021), Introduction to Mathematical Statistics, 8th edition, Pearson Education India, Noida. - Nicholas T. Longford (2022), Statistics for Making Decisions, 1st edition, CRC Press, Chapman and Hall, New Delhi. - Parimal Mukhopadhyay (2012), Mathematical Statistics, Books & Allied Pvt. Ltd., Kolkata, West Bengal. - Joseph F Hair, Barry J. Babin, Role E. Anderson & William C. Black (2018), Multivariate Data Analysis, 8th edition, Cengage India Private Limited, India.
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Websites	https://www.coursera.org/specializations/social-science https://www.w3schools.com/statistics/ https://online.stat.psu.edu/statprogram/reviews/statistical-concepts https://www.khanacademy.org/math/statistics-probability https://instr.iastate.libguides.com/oer/stats
Course Outcomes	On completion of the course, students should be able to do C01: Get exposed to the recent trends in the application of Statistics. C02: Obtain insight into sampling techniques. C03: Learn data collection and its visualization techniques. C04: Study the concepts in Descriptive Statistics. C05: Acquiring knowledge on errors and test methods.

Mapping of COs with POs

Course Outcome	Programme Outcome				
	1	2	3	4	5
1	3	3	2	3	2
2	3	2	3	3	3
3	3	3	3	3	3
4	2	3	3	2	3
5	3	3	3	3	3

0: No Correlation

2: Moderately Correlating

1: Weakly Correlating

3: Strongly Correlating

Course Title & Code	RESEARCH METHODS AND STATISTICS	25ARPC1203
Programme	M.Sc Food Science and Nutrition/ M.A Rural Development Studies	Semester II
Cognitive Level	K-1 Understand the basics of research methods and statistics	
	K-2 Construct tools for data collection in research	
	K-3 Develop skills in preparing scientific research report	
	K-4 Identify a suitable statistical measure for describing data	
	K-5 Analyse a research problem using appropriate statistical tools.	
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.	12
II	Research design: Explorative, Descriptive, Experimental, Case study and Survey. Methods of Research: Multidisciplinary, Interdisciplinary and Transdisciplinary studies. Mixed Methods, Participatory research. Online research methods and Applications of ICT in Research. Pilot Study and Pre-test.	13
III	Tools for Data collection: Types and sources of data, Interview, Schedule, Questionnaire and Observation. Measurement and Scaling Techniques – Validity and Reliability - Research Report – Components, format and types of research report –Citation and Referencing styles, Dissemination of findings. Research and Publication Ethics. Plagiarism and Artificial Intelligence.	13
IV	Descriptive Statistics: Measures of central tendency and Measures of dispersion – Absolute Measures and Relative Measures, skewness and Kurtosis – Correlation – Karl-Pearson and Rank Correlation, Simple Regression. Sampling techniques – Probability and Non-Probability sampling. Statistical error in sampling.	13
V	Inferential Statistics: Basic concepts and steps in Hypothesis testing, Level of Significance, Confidence Interval, Type I & II Error. Tests for Large and small samples. Parametric and Non-parametric tests. Statistical software and its applications.	13

References	• Creswell, J. W., & Creswell, J. D. (2022). Research design: Qualitative, quantitative, and mixed methods approach (6th ed.). SAGE Publications. • Thomas, G. C. (2023). Research methodology and scientific writing. Ane Books Pvt. LTD. • Somekh, B., & Lewin, C. (2018). Theory and methods in social science research (3rd ed.). SAGE Publications. • Donna L. Mohr, William J. Wilson & Rudolf J. Freund (2021), Statistical Methods, 4th edition, Academic Press Inc, Cambridge, United States. • Allen Craig, Robert V Hogg, & Joseph W. McKean (2021), Introduction to Mathematical Statistics, 8th edition, Pearson Education India, Noida. • Nicholas T. Longford (2022), Statistics for Making Decisions, 1st edition, CRC Press, Chapman and Hall, New Delhi.
Text Books	• Kothari, C. R., & Garg, G. (2019). Research methodology: Methods and techniques (4th rev. ed.). New Age International Publisher. • Ranjith Kumar, (2024), Research Methodology: A Step-By-Step Guide for Beginners, 4th edition, Singapore: Sage Publications Asia-Pacific Pvt., Ltd. • Simon, Schuster, (2008), Methods of Social Research, Kenneth Bailey, 4th Edition. • S. C. Gupta & V. K. Kapoor (2020), Fundamentals of Mathematical Statistics, 1^{2th} edition, Sultan Chand & Sons, New Delhi. • Dr. S. P. Gupta (2021), Statistical Methods, 46th ed., Sultan Chand & Sons, New Delhi.
Websites	• https://ndl.iitkgp.ac.in/ • http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291099-1328/issues • http://shodhganga.inflibnet.ac.in/ • https://www.coursera.org/specializations/social-science • https://www.w3schools.com/statistics/
Course Outcomes	On completion of the course, students should be able to C01: Formulate a research problem C02: Prepare a suitable research design C03: Choose appropriate methods of sampling and tools for data collection C04: Process the data collected and analyse using appropriate statistical methods C05: Prepare a research report in a professional manner.

Mapping of COs with POs

Course Outcome	Programme Outcome				
	1	2	3	4	5
1	3	2	3	3	3
2	3	3	3	2	3
3	3	2	3	3	3
4	3	3	3	3	3
5	3	3	2	3	2

0: No Correlation

2: Moderately Correlating

1: Weakly Correlating

3: Strongly Correlating

Course Title & Code	RESEARCH METHODS AND STATISTICS	25ARPC2103
Programme	M.Sc Geoinformatics	Semester III
Cognitive Level	K-1 Understand the basics of research methods and statistics	
	K-2 Construct tools for data collection in research	
	K-3 Develop skills in preparing scientific research report	
	K-4 Identify a suitable statistical measure for describing data	
	K-5 Analyse a research problem using appropriate statistical tools.	
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.	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. Measurement and Scaling Techniques – Test of validity and reliability - Research Report –format and types of Reference materials and appendix, dissemination of research findings. Research and Publication Ethics. Plagiarism and Artificial Intelligence.	13
IV	Descriptive Statistics: Measures of central tendency – Mean, Median, Mode. Measures of dispersion – Absolute Measures and Relative Measures, skewness– Correlation – Karl-Pearson and Rank Correlation, Regression – Simple Regression. Sampling techniques – Probability and Non-Probability sampling, sampling error.	13
V	Inferential Statistics: Basic concepts and Hypothesis testing, Level of Significance, Confidence Interval, Type I & II Error, Steps in hypothesis testing. Tests for Large and small samples. Parametric and Non-parametric tests. Statistical software and its uses.	13

References	• Creswell, J. W., & Creswell, J. D. (2022). Research design: Qualitative, quantitative, and mixed methods approach (6th ed.). SAGE Publications. • Thomas, G. C. (2023). Research methodology and scientific writing. Ane Books Pvt. Ltd. • Somekh, B., & Lewin, C. (2018). Theory and methods in social science research (3rd ed.). SAGE Publications. • Donna L. Mohr, William J. Wilson & Rudolf J. Freund (2021), Statistical Methods, 4th edition, Academic Press Inc, Cambridge, United States. • Allen Craig, Robert V Hogg, & Joseph W. McKean (2021), Introduction to Mathematical Statistics, 8th edition, Pearson Education India, Noida.
Text Books	• Kothari, C. R., & Garg, G. (2019). Research methodology: Methods and techniques (4th rev. ed.). New Age International Publisher. • Ranjith Kumar, (2024), Research Methodology: A Step-By-Step Guide for Beginners, 4th edition, Singapore: Sage Publications Asia-Pacific Pvt., Ltd. • Simon, Schuster, (2008), Methods of Social Research, Kenneth Bailey, 4th Edition. • S. C. Gupta & V. K. Kapoor (2020), Fundamentals of Mathematical Statistics, 12th edition, Sultan Chand & Sons, New Delhi. • Dr. S. P. Gupta (2021), Statistical Methods, 46th ed., Sultan Chand & Sons, New Delhi.
Websites	• https://ndl.iitkgp.ac.in/ • http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291099-1328/issues • http://shodhganga.inflibnet.ac.in/ • https://www.coursera.org/specializations/social-science • https://www.w3schools.com/statistics/
Course Outcomes	On completion of the course, students should be able to CO1: Formulate a research problem CO2: Prepare a suitable research design CO3: Choose appropriate methods of sampling and tools for data collection CO4: Process the data collected in the field and analyse using appropriate statistical methods CO5: Professionally prepare a research report.

Mapping of COs with POs

Course Outcome	Programme Outcome				
	1	2	3	4	5
1	3	2	3	3	3
2	2	3	3	3	2
3	3	3	3	3	3
4	3	3	3	2	3
5	3	2	3	3	3

0: No Correlation

2: Moderately Correlating

1: Weakly Correlating

3: Strongly Correlating

Course Title & Code	RESEARCH METHODOLOGY AND IPR	25ARPC1104
Programme	M.Tech Renewable Energy	Semester I
Cognitive Level	K-1 Formulate a problem for research and prepare a suitable research design	
	K-2 Understand the recent developments of IPR	
	K-3 Prepare the scientific research report	
	K-4 Process the data and analyse it using appropriate statistical tools	
	K-5 Analyse a research problem using appropriate statistical tools.	
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 Variables.	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, Scaling: Types and Techniques, Psychological tests, Projective techniques, 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	Descriptive Statistics: Concepts, Scope – Limitations and Misuses. Classification, Tabulation and Visualization of Data. Measures of Central Tendency and Measures of Dispersion. Measures of Skewness and Kurtosis. Correlation and Regression analysis.	13
V	Sampling: Probability and non-probability sampling techniques. Testing of Hypothesis: concepts and steps; Parametric and Non-Parametric Tests – z test, t-test, Chi-square test, ANOVA. Concepts of Factor analysis and Discriminant analysis. Structural Equation Modelling (SEM).	13

References	• Creswell, J. W., & Creswell, J. D. (2022). Research design: Qualitative, quantitative, and mixed methods approach (6th ed.). SAGE Publications. • Thomas, G. C. (2023). Research methodology and scientific writing. Ane Books Pvt. Ltd. • Somekh, B., & Lewin, C. (2018). Theory and methods in social science research (3rd ed.). SAGE Publications. • Donna L. Mohr, William J. Wilson & Rudolf J. Freund (2021), Statistical Methods, 4th edition, Academic Press Inc, Cambridge, United States. • Allen Craig, Robert V Hogg, & Joseph W. McKean (2021), Introduction to Mathematical Statistics, 8th edition, Pearson Education India, Noida.
Text Books	• Kothari, C. R., & Garg, G. (2019). Research methodology: Methods and techniques (4th rev. ed.). New Age International Publisher. • Ranjith Kumar, (2024), Research Methodology: A Step-By-Step Guide for Beginners, 4th edition, Singapore: Sage Publications Asia-Pacific Pvt., Ltd. • Simon, Schuster, Methods of Social Research, Kenneth Bailey, 4th Edition, 2008 • S. C. Gupta & V. K. Kapoor (2020), Fundamentals of Mathematical Statistics, 12th edition, Sultan Chand & Sons, New Delhi. • Dr. S. P. Gupta (2021), Statistical Methods, 46th edition, Sultan Chand & Sons, New Delhi.
Websites	• https://ndl.iitkgp.ac.in/ • http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291099-1328/issues • http://shodhganga.inflibnet.ac.in/ • https://www.coursera.org/specializations/social-science • https://www.w3schools.com/statistics/
Course Outcomes	On completion of the course, students should be able to do CO1: Develop expertise and skills to undertake independent research in the renewable energy area CO2: Development research questionnaire CO3: Understand IPR-related issues CO4: Application of statistical tools for the renewable energy system performance CO5: Write a research article and prepare a project report

Mapping of COs with POs

Course Outcome	Programme Outcome				
	1	2	3	4	5
1	3	2	3	3	3
2	3	3	3	3	3
3	3	3	2	3	3
4	3	2	3	3	2
5	3	3	3	2	3

0: No Correlation

2: Moderately Correlating

1: Weakly Correlating

3: Strongly Correlating

Course Title & Code	STATISTICAL METHODS	25ARUB2102
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.	
UNIT	Content	No. of Hours
I	Introduction to Statistics: Meaning, Functions, and its applications in Agriculture. Sources and types of data. 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.	13
III	Descriptive Statistics: Measures of Central tendency – mean, median, mode. Measures of Dispersion - range, Co - eff. of Range, 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. Simple 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 and ANOVA. Design of experiments.	13
PRACTICAL	1. Graphical Representation of Data – Diagrams, Frequency curves and polygons. 2. Measures of Central Tendency – Means, median and mode. 3. Measures of dispersion – Range, standard deviation and coefficient of variation 4. Correlation & Regression analysis – Computation of correlation coefficient and determination of regression equations. 5. Test of significance – Small and Large sample tests and Test of significance attributes. 6. Chi-square test – Independence of attributes for 2x2 contingency table. 7. Analysis of variance One-way classification.	

References	- Gupta, S.C. and V.K. Kapoor (2020) Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi. - Rangaswamy, (2020), A Textbook of Agricultural Statistics, (3rd Ed), New Age International Publishers, New Delhi. - Goon, A.M., M.K. Gupta and B. Das Gupta (2016) Fundamentals of Statistics- Vol. II, World Press Ltd, Kolkata. - Gurumani, (2004), N., An Introduction to Bio-Statistics, Chennai, MJP Publication. - Sampath Kumar V.S, (1997); Biostatistics, ManomaniamSundaranar University Publication, Tirunelveli.
Text Books	- Gupta, S.P., (2014), Statistical Methods, Sultan and Chand Publishers, New Delhi. - 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. - Vijayalakshmi G and Sivapragasam C. (2009), Research Methods: Tips and Techniques, MJP Publishers Chennai. - Sampath, S. (2006), Sampling Theory and Methods (Second Edition), Narosa Publishing House, New Delhi. - Gupta, C.B, (2004), An Introduction to Statistical Methods, Vikas Publishers, New Delhi, (23rd Ed).
Websites	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	On completion of the course, students should be able to do CO1: Get familiar with basic concepts and terms CO2: Learn the problem-solving techniques using appropriate statistical measures CO3: Visualise and present the interpreted statistical data. CO4: Make valid decisions applying statistical methods. CO5: Obtain knowledge on various parametric and non-parametric methods.

Mapping of COs with POs

Course Outcome	Programme Outcome				
	1	2	3	4	5
1	3	3	3	2	3
2	2	3	3	3	3
3	3	2	3	3	3
4	3	3	3	2	3
5	3	3	2	3	3

0: No Correlation

2: Moderately Correlating

1: Weakly Correlating

3: Strongly Correlating

(NON-OBE PATTERN)

Course Title & Code	INTRODUCTION TO STATISTICS	25ARUB2203
Class	B.Voc. Dairy Production and Technology	Semester IV
UNIT	Content	No. of Hours
I	Introduction to Statistics: Data: Primary and Secondary - Classification and Tabulation –Graphical and Diagrammatic representation and uses.	6
II	Descriptive Statistics – Measures of Central Tendency: Mean, Median, and Mode - Merits and Demerits.	7
III	Measures of Dispersion: Range, Standard Deviation and its coefficients – Merits and Demerits.	7
IV	Correlation: Definition, Types and Applications – Karl Pearson's correlation coefficients and Spearman's Rank Correlation.	6
V	Quality control: Introduction, process and product control, control charts, control and specification limits– Types of control charts: $\bar{X}$ and R chart.	6
References	• Donna L. Mohr, William J. Wilson & Rudolf J. Freund (2021), Statistical Methods, 4th edition, Academic Press Inc, Cambridge, United States. • Allen Craig, Robert V Hogg, & Joseph W. McKean (2021), Introduction to Mathematical Statistics, 8th edition, Pearson Education India, Noida. • Nicholas T. Longford (2022), Statistics for Making Decisions, 1st edition, CRC Press, Chapman and Hall, New Delhi. • Parimal Mukhopadhyay (2012), Mathematical Statistics, Books & Allied Pvt. Ltd., Kolkata, West Bengal. • B. L. Agarwal (2023), Basic Statistics, 8th edition, New Age International Private Limited, New Delhi.	
Text Books	• S. C. Gupta & V. K. Kapoor (2020), Fundamentals of Mathematical Statistics, 12th edition, Sultan Chand & Sons, New Delhi. • S. C. Gupta & V. K. Kapoor (2007), Fundamentals of Applied Statistics, 4th edition, Sultan Chand & Sons, New Delhi. • Dr. S. P. Gupta (2021), Statistical Methods, 46th edition, Sultan Chand & Sons, New Delhi. • R. S. N. Pillai & Bagavathi (2016), Statistics: Theory and Practice, 8th edition, S. Chand and Company Limited, New Delhi. • Douglas C. Montgomery (2020), Introduction to Statistical Quality Control, 8th edition, John Wiley & Sons	
Websites	• https://www.coursera.org/specializations/social-science • https://www.w3schools.com/statistics/ • https://online.stat.psu.edu/statprogram/reviews/statistical-concepts • https://www.khanacademy.org/math/statistics-probability • https://instr.iastate.libguides.com/oer/stats	

