



POPE'S COLLEGE (AUTONOMOUS)
SAWYERPURAM-628 251, THOOTHUKUDI

AQAR 2020-2021

CRITERION III

3.4.1 The Institution ensures implementation of its Code of Ethics for Research uploaded in the website through the following:

- *Code of Ethics for Research, Research Advisory Committee and Ethics Committee constitution and list of members of these committees, software used for plagiarism check*




POPE'S COLLEGE (AUTONOMOUS)
(Accredited by NAAC-II Cycle with 'A' Grade)
SAWYERPURAM, THOOTHUKUDI

CODE OF ETHICS

College gives importance to follow ethical guidelines established by the college and along with UGC ([https://www.ugc.ac.in/pdf/news/7044741_UGC-letter-reg-Regulations-on-Plagiarism-\(1\).pdf](https://www.ugc.ac.in/pdf/news/7044741_UGC-letter-reg-Regulations-on-Plagiarism-(1).pdf)) and Manonmaniam Sundaranar University in carrying out the research. Plagiarism check is an important requirement for all research works

1. The research thesis dissertation and publications must be tested for plagiarism before submitting it to the University / College.
2. The thesis/dissertation shall be accepted if the percentage of plagiarism is less than 25%
3. The plagiarism software is available in the college library to check the research article proposal and project reports.
4. Compulsorily URKUND software or other accepted software should be followed to check Plagiarism and permissible range up to 25% for Results and Discussion part of the Thesis for the Science Subjects and Analysis and conclusion part for the Arts subjects
5. The college encourages research departments to conduct workshops in research methodology where ethics is an integral part.
6. Each student shall be instructed to furnish an undertaking indicating that the thesis is their original work and free of any plagiarism and shall submit a certificate regarding Plagiarism Check
7. Any violations in this regard should be taken for necessary disciplinary action.


PRINCIPAL
POPE'S COLLEGE
(Autonomous)
SAWYERPURAM-628251



POPE'S COLLEGE (AUTONOMOUS)
(Accredited by NAAC-II Cycle with 'A' Grade)
SAWYERPURAM, THOOTHUKUDI

Research Advisory Committee

S.No.	Name of the Faculty	Designation
1.	Dr.H.Immanuel	Principal
2.	Dr.B.Ravindran Dural Nayagam	Dean of Research & IOAC Co-ordinator
3.	Dr.J.Jeburaj Devadasan	Dean of Science
4.	Dr.R.Selvakumar	Dean of Arts
5.	Dr.P.Kutty Juskar Jeburaja	Dean Students Service
6.	Dr.H.Johnson Jeyakumar	Controller of Examinations
7.	Dr.K.Muthurasan	Librarian
8.	Dr.J.Jebasingh Kores	Assistant Professor of Physics


PRINCIPAL
PRINCIPAL
POPE'S COLLEGE
(Autonomous)
SAWYERPURAM-628251



POPE'S COLLEGE (AUTONOMOUS)
(Accredited by NAAC-II Cycle with 'A' Grade)
SAWYERPURAM, THOOTHUKUDI

List of PG Programmes offering Research Methodology by the Institution

S.No.	M.Phil., Chemistry	Research Methodology
1.	M.Phil., Physics	Research Methodology
2.	M.Phil., Economics	Research Methodology
3.	M.Phil., Commerce	Research Methodology
4.	M.Sc., Chemistry	Research Methodology
5.	M.Sc., Physics	Research Methodology
6.	M.Sc., Zoology	Research Methodology
7.	M.A Economics	Research Methodology
8.	M.Com.,	Research Methodology

PRINCIPAL
POPE'S COLLEGE
(Autonomous)
SAWYERPURAM-628251

PC/ 2017-18 / PG /Chemistry / Semester – III

Elective	Sub Code	Scientific - Research Methodology	Hrs./ Week	Credits:
3	17PCHE31		4	4

Unit – I: Literature Survey and scientific writing

Reviewing the literature, Primary and secondary literature: Journals, patents, Reviews, Chemical abstracts, treatises and monographs. Indexes and abstracts in science and technology
Preparation and presentation of report; dissertation and thesis writing. Scientific writing-research reports, thesis, journal articles and books. Types of publications-communications, articles, reviews, when to publish, where to publish, specific format required for submission. Documentation- referencing styles-bibliography.

UNIT –II: Errors in chemical analysis

Errors in chemical analysis – classification of errors Precision and accuracy– determination of accuracy of methods – improving accuracy of analysis – significant figures – mean, standard deviation – comparison of results : “t” test, “f” test, Q test and “chi” square test – rejection of results – presentation of data. Correlation, linear regression and analysis of variance.

UNIT –III: chromatographic technique

Gas chromatography-gas-liquid and gas solid chromatography-Sample injection system-carrier gas-Columns-Detectors for GC-thermal conductivity detector-flame ionization detector. Principle and operation of column, thin-layer and paper chromatography. Principle of ion-exchange –preparation and types of ion exchange resins-cation exchanger, anion exchangers- analytical applications.

UNIT –IV: Analytical Techniques

Electrogravimetry: principle, instrumentation and applications. Coulometry: constant current coulometry – coulometric titrations – applications – potentiostatic coulometry – Polarography: principle – experimental assembly – working – advantages and
Principles, instrumentation and application of SEM, TEM, AFM and XRD

UNIT-V: Computer Applications in Chemistry

Introduction – Significant developments in the history of computers – computer generations – Components of a computer –block diagram-CPU, ALU, control units, memory unit, Memory –classification of memory devices, Main memory –semiconductor memory devices (RAM, ROM) – Secondary memory devices – magnetic disks (hard and floppy). Peripheral devices – Input devices – keyboard keys and their uses-mouse; Output devices – VDU-printer and its classification; Hardware and software.
Programming – to compute the i) slope, intercept and correlation coefficient for the given set of data of straight line, ii) wavelength, frequency or energy for a wave, iii) lattice energy on the basis of Born Lande’s equation.

References:

1. Research Methodology: Methods and Techniques - C. R. Kothari, 2nd Edition, New Age International Publishers.
2. C. Mahadevan, Research Methatology, Sakuntala Publications, Nagercoil, 1st Edition, 2000.
3. B.T. Bottle, The use of Chemical literature, Butterworths, 1969.
4. A.J. Durston, Thesis and assignment writing.
5. D.A Skoog and M.West, Fundamentals of analytical chemistry.
6. J.D. Dick, Analytical Chemistry
7. D.A Skoog and M.West, Fundamentals of analytical chemistry
8. R.O Bullet, Preparing thesis and other manuscripts.
9. Instrumental methods of analysis 7th edition- Willard Merritt,Dean and settle

PC/ 2017-18 / PG / Commerce / Semester – III				
Core	Sub Code	RESEARCH METHODOLOGY	Hrs./ Week	Credits:
11	17PCOM33		5	4

UNIT: I

Introduction of Reseach Methodology – Meaning, Objectives - Types of research and its significance- Research process; Research Problem – Defining a research problem and techniques; Research Design – Meaning and need for research design, Features and Importance of research design - different types of research design

UNIT: II

Sampling – Sample Methods – meaning – definition – different types of sampling – merits – demerits – criteria for sample selection.

UNIT: III

Collection of data - collection of primary data – questionnaire - interview method - observation method- other methods of data collection - secondary data – sources – processing of Data -Analysis of Data – Editing – Coding – Tabulations.

UNIT: IV

Applications of statistical tools –SPSS Package – Introduction - Variable – Descriptive Statistics – Correlation - Regression – Chi-square – ANOVA – T-test - Non Parametric Tests - Chi-square tests-Sign tests - Kruskal-Wallis test- Mann Whitney U test.

UNIT: V

Report writing – Significance, types, Format of reports – Computers in research - computers and research.

Note: 100% Theory

Reference Books:

1. C.R. Kothari – Research Methodology – Methods and Techniques. New International (P) Ltd., Publishers – 2005
2. Donald R. Cooper, Business Research Methods, Tata McGraw Hill
3. Anderson et –al –Thesis and assignment – writing
4. Deepak Chawla & Neena Sondhi, Research Methodology: Concepts and Cases – Vihas Publishing House,

PC/ 2017-18 / M.Phil /Commerce / Semester – I				
Core	Sub Code	Research Methodology	Hrs./ Week	Credits:
1	17MCOM11		5	5

UNIT – I

Introduction to research: Meaning, Objectives, Types and motive of research – Research Approaches – Significance of Research – Research and Scientific Methods – Research Process – Research problem – Meaning, source and need – Criteria of good Research Problem.

UNIT – II

Research design – Meaning, Need, Features, Concepts and types of research design. Sampling design – Steps, Criteria Characteristics and types of sample designs – Scaling techniques – Measurement Scales – Scaling errors – Important Scaling Techniques.

UNIT – III

Data Collection – Methods of collecting primary data and secondary data – Searching the internet for data. Data Analysis and interpretation – Editing – Coding – Tabulation – Diagrams – Graphs – Electronic Data processing. Report Writing – Steps in Report Writing – Format of the Research Report – Mechanics of report writing – Reference – Use of quotation – Bibliography –

Appendix – Essentials of a good Report.

UNIT – IV

Statistics in research – simple, Partial and Multiple correlations – Simple and Multiple regression – Association of attributes – Index numbers – Time series. Hypothesis testing – Meaning – Concepts – Procedure for Hypothesis testing – Tests of hypothesis – Parametric tests – Testing of significance, Mean, Proportions, Variances and correlation Coefficients - Anova – Chi-square test for association and goodness of fit - Important Non – Parametric tests of hypothesis.

UNIT – V

Research on Multi Variety statistical Technique – Factor analysis – Cluster analysis – Multiple discriminate analyses – Canonical correlation analysis. Application of SPSS Package in Business and social Research.

60% Theory 40% Problem

Reference Books:

1. Kothari, C.R. “Research Methodology – Methods and Techniques”, Second Edition, New Age, International Publishers, new Delhi.
2. Shajahan, S., “Research Methods for Management”, Jaico Publishing House, Mumbai.
3. Krishnasamy, O.R., Ranganatham, M., “Research Methodology”, Himalaya Publishing House, New Delhi.

Gupta, S. P., “Statistical Methods”, Sultan Chand & S

PC/ 2017-18 /M.Phil (Economics) / Semester – I
CORE Sub Code
Research Methodology
Hrs./Week Credits:
1 17MECM11 8 8

Unit I

Economic Research- Significance of Economic Research–Theory and Fact- Scientific Methods- Types of Research-Formulation of Research Problem- Research Design- Formulation of Hypothesis- Nature and Source of Hypothesis in Economics- Sources of Data-Methods of Data Collection-Sampling Design– Presentation of Data.

Unit II

Methodology of Econometric Research : Simple Correlation- Linear Simple and Multiple regression-ANOVA - Multi-collinearity- Autocorrelation- Heteroscedasticity- Time Series Analysis–Analysis of inequality-Gini Co-efficient.

Unit III

Time-series: Trend – Seasonality - Cyclicity and Stationarity.

Unit IV

Testing of Hypothesis– Types of Errors – Parametric and Non-parametric tests: — t Test – z Test – F Test– Chi-square Test.

Unit V

Thesis and Report Writing– Different stages in writing Report–Layout of the Research Report Types–Precautions for writing Research Reports– Ethical issues in Research- Problems of Inference in Non-experimental Sciences.

Basic Readings List:

- C.R. Kothari –Research Methodology, methods and Techniques– Willy Eastern Ltd., 1988.
- Koutsoyiannis– Theory of Econometrics- An Introductory Exposition of Econometrics Methods-MacmillanLtd., 1987.
- M.Cohen and E. Nagal – An introduction to logic and scientific method, New York, 1962.
- William J. Goode & Paul K Hatt – Methods in Social Research, 1972.
- Pauling V. Young – Scientific Social Survey’s and Research, Practice Hall –(Dorsey Press), New York.
- Wonnacott and Wonnacott – Econometrics.
- Seltiz et al: - Research Methods in Social Sciences.
- Mark, Blouk Economic Methodology.

PC/ 2019-20 / PG / Economics / Semester – II

Core Sub Code

RESEARCH METHODOLOGY

Hrs./Week Credits:

8 19PECM24 4 4.

Unit I

Foundation of Research -The Scientific Approach – Aims of Social Sciences – Scientific Revolution –

Role of Methodology – Research Process – Conceptual Foundation of Research – Economic Theory

and Method – Axiomatic, Mathematical and Historical Methods – Theory, Models and Empirical Research – Basic Elements in Research – Identification of a Research Problem –Objectives of research-motivation in research-types of research-criteria of a good research-defining a research problem-selecting a problem-review of literature

Unit II

Research design-need for research design-different types of designs-experimental design-Sampling

design-census and sample survey –steps in sampling design-criteria for selecting a sampling procedure-characteristics of a good sampling design- how select a random sample- Hypothesis formulation and testing – Research Process

Unit III

Important Scaling Techniques - Measurement and scaling techniques-Measurement in researchsources

of error in measurement tests-scaling.

Unit IV

Principles and Process in Data Collection – Primary Data vs Secondary Data – Case Study Method –

Survey Research — Preparation of Structure Interview Schedule – Construction of Questionnaire –

Pilot Study – Classification and Tabulation – Diagrammatic Representation – Secondary Data – Sourcing of data - Processing and analysis of data and interpretation

Unit V

Report writing-significance of report writing-different steps in writing report-layout of research report-mechanics of writing a research report - referencing systems – research - Policy Making - Advocacy - Activism - influencing policy making - through debates – newsletters - networking with

policy makers - Advocacy and Activism- Skills needed for Advocacy and Activism- Presentation of

Research findings-presentation skills –use of published research for policy making and advocacy.

Reference

- 1.C.R. Kothari, Research Methodology, Wiley Eastern Limited
- 2.C.T. Kurien, A Guide to Research, Sage Publishers.
3. ChavaNachimias and David Nachimias, Research Methods in the Social Services.
4. Herbert Wesberg and brew D. Bower, An Introduction to Survey Research and Data Analysis, W.H. Freeman and Company

M.A.(English) / Semester -III Core -12 Research Methodology**Unit – I**

Research and Writing Plagiarism and Academic Integrity

Unit – II

The Mechanics of Writing

Unit – III

The Format of the Research Paper Abbreviations

Unit – IV

Documentation: Preparing the list of Works Cited

Unit – V Novel

Documentation: Citing Sources in the text

Reference: MLA Hand Book for Writers of Research Papers – 7th Edition

PC/ 2017-18 / PG / Physics / Semester – III

Elective	Sub Code	Research Methodology	Hrs./Week	Credits:
3	17PPHE31		6	5

Unit I Fundamentals of research:

Definitions and characteristics of research - Research process and steps in it - Areas of research –Research methods vs Methodology -Characteristics of scientific method - Motivation and objectives - Bias and Prejudice in research - Types of research – Descriptive vs. Analytical, Applied vsFundamental, Quantitative vs Qualitative and Conceptual vs Empirical.

Unit II Formulation of research:

Defining and formulating the research problem -Selecting the problem - Necessity of defining the problem - Importance of literature reviewin defining a problem – Literature review – Primary, secondaryand tertiary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literaturereview – Identifying gap areas from literature review.

Unit III Research design:

Basic Principles- Need of research design – Features of good design – Important concepts relating to researchdesign – Observation and Facts, Laws and Theories, Prediction and explanation, Induction, Deduction and Development of Models. Developing a research plan - Exploration, Description, Diagnosis and Experimentation. Determining experimental and sample designs.

Unit IV Execution and reporting research:

Observation and Collection of theoretical & experimental data - Methods of data collection – Comparison of Data - Generalization and Interpretation. Structure and components of scientific reports -Types of report – Technical reports and thesis –Different steps in thepreparation – Layout, structure and Language of thesis – Illustrations, figures and tables- Quotation and footnotes – Bibliography and referencing.

Unit V Research ethics and publication of results:

Environmental impacts - Ethical issues -Plagiarism – Research Journals – Impact Factor – Citation Index – Reporting to Journals - Commercialization – Copy right – royalty -

Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights
– Reproduction of published material - Reproducibility and accountability.

Books for Study:

1. C.K., Research Methodology, 2nd Edn – Methods and Techniques, New Age International, New Delhi, 2004.
2. An introduction to Research Methodology- Garg, B.L., Kothari Karadia, R., Agarwal, F. and Agarwal, RBSA Publishers. U.K, 2002.
3. Research Methodology, vol – 2- Sinha, S.C. and Dhiman, A.K., EssEss Publications, New Delhi, 2002.
4. Research Methods: the concise knowledge base- Trochim, W.M.K., Atomic Dog Publishing, OH US, 2005.
5. Law relating to patents, Trademarks, Copyright Designs and Geographical Indications- Wadehra, B.L., Universal Law Publishing, New Delhi, 2000.

Books for Reference:

1. Research Methodology - S. Rajasekar, P. Philominathan and V. Chinnathambi,
2. Research Methods: A Process of Inquiry- Anthony, M., Graziano, A.M. and Raulin, M.L., Allyn and Bacon, Boston, US, 2009.
3. How to Write and Publish a Scientific Paper- Day, R.A., Cambridge University Press. U.K, 1992.
4. Practical Research: Planning and Design, 10th Edition- Leedy, P.D. and Ormrod, J.E., Pearson New International Edn, USA, 2014.

PC/ 2017-18 / M.Phil /Physics / Semester – I

Core	Sub Code	Research Methodology And Professional Skills	Hrs./ Week	Credits:
1	17MPHM11		5	5

Objectives:

1. To develop the knowledge about the method of research and methodology
2. To expose the student with X-ray, thermal, microscopic, electrical and spectroscopic methods of characterization.

3. To enable them to understand the nature of growth and development, learning, motivation and its various educational implications.

Unit 1: Research Methodology

Methods of Research and Methodology of Research – Types of Research – Selection of Research Topic and Problem – Literature survey – Reference collection – Internet and its applications – email - Inlibnet – Accessing the current status – Mode of Approach – Actual Investigation – Results and Conclusion – Presenting and paper in a Scientific Seminar/conference – Art of writing a Research Paper – Layout of M.Phil dissertation

Unit 2: X-Ray and Electron Microscopy

Principles and instrumentation for Powder diffraction - Powder diffractometer - interpretation of diffraction patterns - indexing - phase identification - residual stress analysis - Particle size, texture studies. SEM, EDAX, TEM: working principle and Instrumentation – sample preparation – data collection, processing and analysis

Unit 3: Spectroscopic Methods and Thermal Analysis

Principles and instrumentation for UV-Vis-IR, FTIR spectroscopy, Raman spectroscopy, ESR, NMR, XPS, AES and SIMS-proton induced X-ray Emission spectroscopy (PIXE) – Rutherford Back Scattering (RBS) analysis-application. Introduction – thermogravimetric analysis (TGA) – instrumentation – determination of weight loss and decomposition products – differential thermal analysis (DTA)- cooling curves.

Unit 4: Electrical Methods and Dielectric Characterisation

Two probe and four probe methods- van der Pauw method – Hall probe and measurement – scattering mechanism – C-V characteristics – Schottky barrier capacitance – impurity concentration – electrochemical C-V profiling – limitations. Dielectric properties Simple electrical theory – DC conduction mechanisms – high and low field conduction -temperature dependence - AC conduction mechanisms - relaxation peaks - frequency dependent phenomena.

Unit 5: Methods of Teaching Physics

Motivation: Growth and goal of physics – impact of research on teaching and learning – Cognitive model for instruction: Five foothold principles – Instructional methods derived from cognitive models – Models of the class room: traditional instructor-centered environment – The active engagement student-centered environment – Lecture based methods: Traditional lecture – Interactive lecture demonstration – Just-in-time teaching.

Text Books:

1. A Hand Book of Methodology of Research – P. Rajammal and P. Devadoss, R.M.M Vidya Press, 1976.
2. M. William and D. Steve, Instrumental Methods of Analysis, CBS Publishers, New Delhi, 1986.
3. Edward F. Redish, Teaching Physics with the physics suite, John Wiley & Sons, US, 2003

Reference Books:

1. Garg, B.L., Kothari Karadia, R., Agarwal, F. and Agarwal, An introduction to Research Methodology, RBSA Publishers.U.K, 2002.
2. Stradling, R.A; Klipstain, P.C; Growth and Characterization of semiconductors, Adam Hilger, Bristol,1990.
3. Belk, J.A; Electron microscopy and microanalysis of crystalline materials, Applied Science Publishers, London, 1979.
4. Lawrence E.Murr, Electron and Ion microscopy and Microanalysis principles and Applications, Marcel Dekker Inc., New York, 1991
5. D.Kealey & P.J.Haines, Analytical Chemistry, Viva Books Private Limited, New Delhi, 2002.

PC/ 2017-18 / PG /Part - III/ M.Sc. Zoology / Semester – III

Core	Sub Code	Research Methodology	Hrs./ Week	Credits:
E - 3	17PZOE31		6	5

Objectives : The purpose of research is to discover answers and questions through the application of scientific procedures. The main aim of research is to find out the truth which is hidden and which has not been discovered as yet. Research study has its own purpose and objectives.

Unit I : Research design and Methodology: Research – Characteristics – types of research – steps in research – objectives of research – research report formatting and typing – laboratory safety – intellectual property rights.

Unit II : Literature collection, types of research sources, documentation, Basics of bibliography, citation, different bibliography style, report writing, Dissertation, report and paper writing.

Unit III : Computer application and research, Research analysis, Research sorting, Validation of data, Statistical analysis of data using software, Expression of data, tables and graphs, power point presentation.

Unit IV : Microscopy – Principles – types of light microscopes - phase contrast – fluorescence – micrometry. Electron microscopes and types - Centrifuge & pH meter

Unit V : Chromatography – Paper – thin layer – column – gas liquid chromatography – Electrophoresis – Paper – gel, PAGE, RIE-(rocket immune electrophoresis) – spectrophotometer- spectrofluorometer -ESR- NMR Spectrophotometer-Flame emission photometry.

Practical

1. Collection of reviews
2. Methods of bibliographic writing and technique
3. Centrifuge – techniques, types.
4. Phase contrast microscope – Principle
5. Micrometry – measurement of cells.
6. pH meter – principle, measurement of pH in water and soil sample
7. Chromatography principle – paper, thin layer chromatography
8. Separation of aminoacid mixture using paper chromatography
9. Spotters: Spectrophotometer.

Reference Books

1. Gurumai, N., 2006. Research Methodology for Biological Sciences, MJR Publishers, Chennai.
2. Rana, S.V.S., Biotechniques, Rastogi Publications, Meerut.
3. Vijayalakshmi, G. and Sivapragasam, C., 2008.MJP Publishers, Chennai.
4. Wilson, K. and Walker, J., Practical Biochemistry, Cambridge Publications.
5. Palanivelu, R., Analytical Biochemistry and separation techniques. Tulsi Book Centre, Town Hall Road, Maduai.

