



## **Holy Cross College (Autonomous) Nagercoil – 629 004**

**Affiliated to Manonmaniam Sundaranar University, Tirunelveli  
Nationally Accredited with A+ Grade (CGPA 3.35) by NAAC IV Cycle  
An ISO 9001:2015 Certified Institution**

**SSR  
2019-2020  
to  
2023-2024**

**3.4.1. The Institution ensures implementation of its stated Code of Ethics for research**



## **RESEARCH METHODOLOGY - SYLLABUS**



## DEPARTMENT OF PHYSICS

### Semester I C2: Research Methodology Sub. Code: MPP182

No. of hours per week		Credit	Total no. of hours	Marks
Contact	Library			
5	3	4	75	100

#### Objective

1. To understand the essential knowledge and skills needed for Physics research.
2. To apply their skills to develop new materials and devices.

#### Unit I: Research Methodology

Research and its importance – Research methods and research methodology – Types of research – Identification of a research problem – Literature survey – Reference collection.

Mode of approach : research design – Possible approaches – Actual investigation – Results and conclusions – Presenting a scientific seminar – oral report – The art of writing a research paper and thesis – Outline of a report – Layout of a report – Writing a research paper for publication in a journal.

#### Unit II: Mathematical Physics

Special functions – Laguerre Differential equation and Laguerre Polynomials - Generating function, Rodrigue's formula - Recurrence relations. Green's function – Green's function for Poisson's equation - Quantum mechanical scattering problem – Numerical Analysis: Finite differences – Interpolation and extrapolation – Numerical differentiation – Integration

#### Unit III: Photonics

Postulates of ray optics and wave optics - Holography - Principles of electro optics– Photonic Crystals Basics concepts - Features of photonic crystals - Methods of fabrication - Nonlinear photonic crystals - Photonic crystal fibers - Photonic crystals and optical communications -Photonic crystal sensors.

#### Unit IV: Astrophysics

Spectral classification of stars - Boltzmann's formula – Saha 's equation of thermal ionization – Harvard system of spectral classification – Theory of sunspots – Solar flares – Stellar temperatures - Classification of variable stars – erupting and exploding stars – Distribution of novae in our galaxy – Cosmology – red shift and the expansion of universe – Big bang – Dark matter and dark energy – Elementary particles and their interactions – Van Allen Belt – Evolution of stars.

#### Unit V: Recent Trends in Thin Film Technology

Thin Film optics – theory – optical constants of thin films – filters – Anti reflection coatings. Thin film solar cells: Role and progress and production of thin film solar cells- photovoltaic parameters. Thin film silicon (Polycrystalline) solar cells. Current status of bulk silicon solar cells – fabrication technology photovoltaic performance – Emerging solar cells: GaAs and CuInSe.



### Reference Books

- Rajasekar, S. & Philominathan. P. Chinnathambi V. (2003). *Research Methodology*. (1<sup>st</sup> ed.) New Delhi: Prentice-Hall of India private Ltd.
- Satya Prakash. (2005). *Mathematical Physics*. (4<sup>th</sup> ed). New Delhi: S. Chand & Company Pvt. Ltd.
- Sastry, S.S. (2009). *Introductory Methods of Numerical Analysis*. (3<sup>rd</sup> ed). India: Prentice Hall Pvt. Ltd.
- Bahaa, E. A & Saleh. (2003). *Fundamentals of photonics*. (2<sup>nd</sup> ed). Germany: John Wiley & Sons publications.
- Saleh B.E.A & Teich, M.C. (1991). *Fundamentals of Photonics*. (1<sup>st</sup> ed). Germany: John Wiley & Sons publications.
- Prasad, P.N. (2003). *Nanophotonics*. (1<sup>st</sup> ed). Germany: Wiley & Sons publications.
- Baidyanath Basu. (1997). *An Introduction to Astrophysics*. (5<sup>th</sup> ed). New Delhi: Prentice Hall of India.
- ArtherBeiser & ShobhitMahajan., RaiChoudhury. S. (2012). *Concepts of Mordern Physics*. (6<sup>th</sup> ed.) New Delhi: Tata McGraw Hill Pvt Ltd.
- Milton Ohring. (1992). *The Materials Science of Thin Films*. (2<sup>nd</sup> ed). New Delhi: Academic Press.
- Chopra.K. L. (1979). *Thin Film Phenomena* .(2<sup>nd</sup> ed). New Delhi: Tata McGraw Hill Pvt Ltd.
- Chopra K. L. & Das. S. R. (1983). *Thin Film Solar Cells*. (1<sup>st</sup> ed).London: Plenum press





## DEPARTMENT OF CHEMISTRY

**Semester II**  
**Research Methodology (Elective II (a))**  
**Course Code: PG2024**

No. of hours per week	Credit	Total no. of hours	Marks
4	3	60	100

### Objectives

- To understand the importance of research for future development.
- To get information about computation techniques in research

### Course Outcomes (COs)

CO No.	Upon completion of this course, the students will be able to:	PSO Addressed	Cognitive Level
CO-1	understand the sources of literature survey and analytical techniques for documentation of research and cheminformatics for molecular representation	PSO-1	U
CO-2	apply the features of literature survey in research and analytical techniques to characterize compounds	PSO-2,3	A
CO-3	analyse the sources of research information and chemical compounds	PSO-2,3	Y
CO-4	evaluate the results using analytical techniques	PSO-2,3	E
CO-5	create a journal article	PSO-3	C

### Unit I Literature Survey (12 Hours)

Source of chemical information - primary - secondary and tertiary sources. Literature survey - indexes and abstracts in science and technology. Applied science and technology index - chemical abstracts - chemical titles - current chemical reactions - current contents and science citation index. Classical and comprehensive reference works in chemistry- synthetic methods and techniques - treatises - reviews - patents and monographs.

### Unit II Chemical Abstracts (12 Hours)

Current awareness searching - CA weekly issues and CA issue indexes. Retrospective searching - CA volume indexes- general subject index - chemical substance index- formula index - index of ring systems - author index and patent index. CA collective indexes - collective index (CI) and decennial index (DI). Access points for searching CA indexes- index guide - general subject - terms - chemical substance names - molecular formulas - ring systems - author names - patent numbers. Locating the reference - finding the abstract - finding the original document chemical abstract and service source index.

### Unit III Research Problem and Scientific Writing (12 Hours)

Identification of research problem - assessing the status of the problem - guidance



from the supervisor - actual investigation and analysis of experimental results - conclusions. Scientific writing - research reports - thesis - journal articles and books. Steps to publishing a scientific article in a journal. Types of publications - communications - articles and reviews. Documenting - Abstracts indicative - descriptive abstracts - informative abstract - footnotes - end notes - referencing styles - bibliography - journal abbreviations - abbreviation used in scientific writing.

**Unit IV Instrumental Analysis (12 Hours)**

Principle - instrumentation and applications - AFM - SEM - STM - TEM and XRD. Determination of surface morphology and particle size. Sample preparations and applications of UV - IR - NMR and mass spectroscopy.

**Unit V Cheminformatics (12 Hours)**

Cheminformatics - history and applications. Representing molecules - connection tables and line notation - Inchi - SMILES and WLN canonicalization. Line notation versus connection tables. Query languages - SMARTS. Molecular similarity. 2D topology and 3D configuration. Chemistry softwares - Chemdraw - writing chemical equations and schemes - editing - transporting picture to word and image document. Origin -importing and exporting data - scientific graphing and data analysis - curve fitting and peak analysis - transporting graph to tag image file format.

**Text Books:**

1. Berg, B.L. (2009). *Qualitative Research Methods for the Social Sciences*. (7<sup>th</sup> ed.). India: Pearson Education.
2. Patton, M.Q. (2002). *Qualitative research and evaluation methods*. (3<sup>rd</sup> ed.). India: Sage Publications.
3. Alexis, L. & Mathews, L. (1999). *Fundamentals of Information Technology*. Chennai: Leon Vikas.
4. Mohan, J. (2001). *Organic Spectroscopy Principles and Applications*. India: Narosa publishing house.
5. Kemp, W. (1994). *Organic Spectroscopy*. (3<sup>rd</sup> ed.). New York: acmillan.
6. Polanski, J. (2009). *Cheminformatics*. Poland: Elsevier Publications.

**Reference Books:**

1. Silverman, D. (2011). *Qualitative Research: Issues of Theory, Method and Practice*. (3<sup>rd</sup>ed.). India: Sage Publications.
2. Marczyk, G. Dematteo, D. &Festinger, D. (2005). *Essential of Research Design and Methodology*. New York: John Wiley and Sons.
3. Silverstein, S.M., Bassler, G.V. &Morris, T.C. (2004). *Spectrometric identification of organic compounds*. (6<sup>th</sup> ed.). New York: Wiley.
4. Dyer, J.R. (1987). *Applications of Absorption spectroscopy of Organic Compounds*. New York: Prentice Hall.
5. Dani, V.R. (1995). *Organic spectroscopy*. India: Tata McGraw Hill.
6. Gasteiger, J. & Engel, T. (2003). *Cheminformatics*. New York: John Wiley and Sons.



**Semester II**  
**Research Methodology Elective II**  
**Sub. Code: PG1724**

**Objectives**

1. To motivate the students for research based studies.
2. To gain knowledge about statistical analysis.
3. To enrich them with wide knowledge of instrumental analysis.
4. To get a basic idea related to the application of computers in research.
5. To gain basic knowledge on cheminformatics.

**Unit I: Literature Searching and Preparation of Project Report**

Sources of information: primary, secondary and tertiary sources - Libraries, Databases, Abstracts, Journals, Books, Newspapers, Government documents, Conference proceedings, Dissertations and thesis. Internet - Inlib net. Presentation of seminar - OHP and power point. Project report writing - International conventions.

**Unit II: Statistical Analysis**

Classification of errors. Expression and calculation of errors in different forms - Precision and accuracy with respect to random errors. Confidence limits. Tests of significance - F-test, t-test, chi square test and annova. Regression analysis - correlation analysis.

**Unit III: Instrumental Analysis**

Applications of UV, IR, NMR, and Mass spectra in structural elucidations. ESR, Study of morphology – Principle of XRD and SEM, STM and AFM and application.

**Unit IV: Computer in Research**

Basic features common to Word, Excel, Access, Powerpoint. Toolbars, dialog box, Internet: introduction, history, types of internet connections, HTML, HTTP, web design, hyperlinks, URLs, domain server, static and dynamic ID, protocols and internet security.

**Unit V: Cheminformatics**

Cheminformatics: History, Representing molecules: older systems - connection tables, line notation – Inchi, SMILES, WLN canonicalization. Line notation versus connection tables. Query languages – SMARTS. Nomenclature: IUPAC names, trade names, common names. Molecular similarity: Ways to measure similarity – 2D topology, 3D configuration, Physical properties, clustering. Chemical registration system. Chemistry softwares.

**Reference Books**

1. Berg, B.L. (2009). Qualitative Research Methods for the Social Sciences. (7<sup>th</sup> ed.), Pearson Education Inc.
2. Patton, M.Q. (2002). Qualitative research and evaluation methods. (3<sup>rd</sup> ed.), Sage Publications.
3. Silverman, D. (2011). Qualitative Research: Issues of Theory, Method and Practice. (3<sup>rd</sup> ed.), Sage Publications.
4. Polanski, J. (2009). Chemoinformatics, Elsevier Publications.
5. Marczyk, G., Dematteo, D., & Festinger, D. (2005). Essential of Research Design and Methodology. John Wiley & Sons, Inc.
6. Vogel, A.I. (1978). A Text Book of Quantitative Inorganic Analysis. (4<sup>th</sup> ed.), ELBS.
7. Maidasane, D. (2005). Learning Computer Fundamentals, MS Office and Internet and Web Technology. Firewall media, New Delhi.
8. Gasteiger, J., & Engel, T. (2003). Chemoinformatics, Wiley, New York.





## DEPARTMENT OF BOTANY

## SEMESTER – II

## ELECTIVE COURSE IV: a)- RESEARCH METHODOLOGY, COMPUTER APPLICATIONS &amp; BIOINFORMATICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
BP232EC4	2	2	-	-	2	4	60	25	75	100

**Pre-requisite**

To impart expertise about analysis and research.

**Learning Objectives**

- 1.To equip students to collect, analyze and evaluate data generated by their own inquiries in a scientific manner.
2. To provide an overview on modern equipments that they would help students gain confidence to instantly commence research careers and/or start entrepreneurial ventures.

**Course Outcomes**

On completion of this course, the students will be able to:		
CO1	realize the need of centrifuges and chromatography and their uses in research	K1 & K2
CO2	learn the principles and applications of electrophoresis	K2 & K3
CO3	construct the phylogenetic trees for similar characteristic feature of plant genomes and study <i>de novo</i> drug design through synthetic biology.	K5 & K6
CO4	understand the concept of pairwise alignment of DNA sequences using algorithms.	K3 & K4
CO5	interpret the features of local and multiple alignments.	K4 & K5

UNIT	CONTENTS	No. of hours
I	Literature collection and citation: bibliography —bibliometrics (scientometrics): definition-laws — citations and bibliography - *biblioscape— plagiarism— project proposal writing — dissertation writing – paper presentation (oral/poster) - E-learning tools- monograph — introduction and writing-Standard operating procedure (SOP) – introduction and preparation — Research Institutions - National and International.	12
II	Basic principles and applications of pH meter, UV-visible spectrophotometer, centrifuge, lyophilizer, chromatography- TLC, Gas chromatography with mass spectrum (GC/MS), and HPLC-Scanning electron microscopy-Agarose gel Electrophoresis — Polyacrylamide Gel Electrophoresis –Polymerase chain reaction	12
III	Introduction to computers and Bioinformatics. Types of hardware and software operating systems. Fundamentals of networking, operation of networks, telnet, ftp, www, Internet. Biological Research on the web: Using search engines, finding scientific articles.	12
IV	Public biological databases, searching biological databases. Use of nucleic acid and protein data banks.	12

<b>V</b>	NCBI, EMBL, DDBJ, SWISSPORT, Protein prediction and Gene finding tools. Techniques in Bioinformatics- BLAST, FASTA, Multiple Sequence Analysis .	<b>12</b>
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**Textbooks**

1. Veerakumari, L,2017. Bioinstrumentation. MJP Publisher, India. p578.
2. Sree Ramulu, V.S, 2019. Thesis Writing, Oxford& IBH Pub. New Delhi.
3. Kothekar, V and T.Nandi, 2009. An introduction to Bioinformatics. Panima publishing crop, New Delhi.
4. Mani, K and N. Vijayaraj, 2004. Bioinformatics A Practical Approach.1st Edn. Aparna publication, Coimbatore.
5. Gurumani. N, 2019. Research Methodology: For Biological Sciences, MP. Publishers.

**Reference books**

1. Narayana, P.S.D. Varalakshmi, T. Pullaiah, 2016. Research Methodology in Plant Science, Scientific Publishers, Jaipur, Rajasthan.
2. Pevsner. J, 2015. Bio informatics and functional genomics .Hoboken,NJ:Wiley-Blackwell.
3. Arthur Conklin W.M and Greg White, 2016. Principles of computer security. TMH. McGraw-Hill Education; 4 edition.
4. Irfan Ali Khan and Attiya Khanum (eds.), 2004. Introductory Bioinformatics. Ukaaz Publications, Hyderabad.
5. Arthur Conklin W.M., and Greg White. 2016. Principles of computer security. TMH., McGraw-Hill Education; 4<sup>th</sup> edition

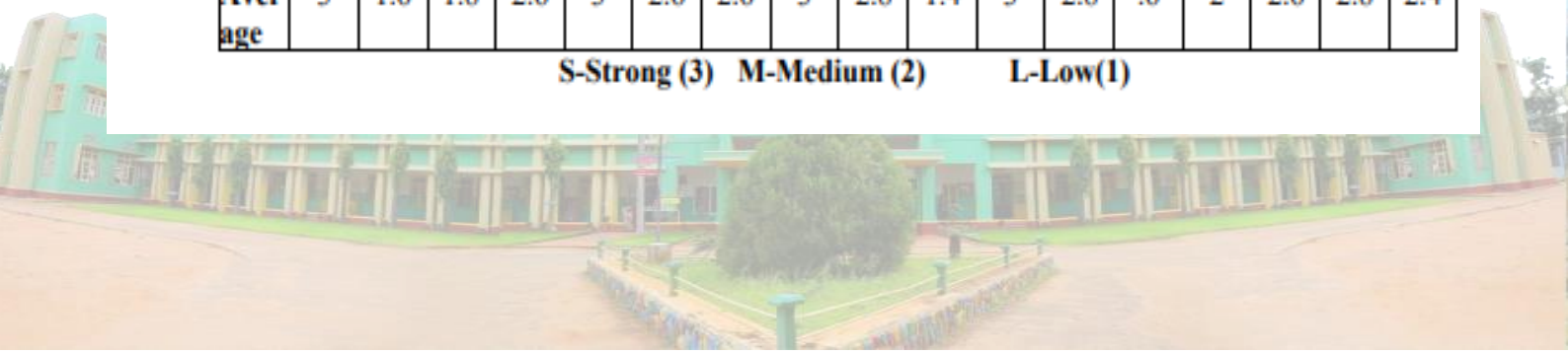
**Web resources:**

1. <https://www.kobo.com/in/en/ebook/bioinstrumentation-1>
2. <https://www.worldcat.org/title/bioinstrumentation/oclc/74848857>
3. <https://www.amazon.in/Bioinstrumentation-M-H-Fulekar-Bhawana-Pandey-ebook/dp/B01JP3M9TW>
4. <https://en.wikipedia.org/wiki/bioinstrumentation>
5. <https://www.britannica.com/science/chromatography>

**Mapping with Programme Outcomes**

Cos	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PSO1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7	PS O8	PS O9	PS O10
CO1	3	2	2	2	3	3	3	3	3	1	3	3	3	3	2	3	3
CO2	3	2	2	3	3	2	2	3	3	2	3	3	3	2	3	3	3
CO3	3	1	2	3	3	3	2	3	3	1	3	3	3	2	2	2	3
CO4	3	2	1	3	3	2	3	3	2	1	3	2	2	1	3	3	1
CO5	3	1	2	2	3	3	3	3	3	2	3	3	2	2	3	3	2
<b>Total</b>	15	8	9	13	15	13	13	15	14	7	15	14	13	10	13	14	12
<b>Average</b>	3	1.6	1.8	2.6	3	2.6	2.6	3	2.8	1.4	3	2.8	.6	2	2.6	2.8	2.4

S-Strong (3)    M-Medium (2)    L-Low(1)





**Semester - II**  
**Research Methodology**  
**Course Code: PB2022**

No. of hours per week	Credit	Total no. of hours	Marks
6	5	90	100

**Objectives:**

1. To understand some basic concepts of research and its methodologies.
2. To select and define appropriate research problem and parameters.
3. To organize and conduct research in a more appropriate manner and write a research report and thesis.

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	remember the basic concepts of research and its methodologies	PSO – 4	R
CO - 2	understand the principles and working mechanisms of various instruments	PSO – 5	U
CO - 3	apply computer skills in research	PSO – 3	Ap
CO - 4	analyze the biological data in solving biological problems	PSO – 1	An
CO - 5	create skills in qualitative and quantitative data analysis and presentation	PSO – 3	C

**Unit I**

Research- Objectives of research, Types of research, Significance, Literature collection- Index card, reference card and Abstract card. Literature citation- Different systems of citing references- Name year system, Citation sequence system and Alphabet number system. Research report, components of a project report, tables, figures, foot note, thesis format, journal format- appendices, e- journal and e- book. Role of supervisors/ Guides in research.

**Unit II**

Microscopy – Principle, Instrumentation and uses of Light Microscope, Dark-Field Microscope, Phase contrast Microscope, Fluorescent Microscope, Electron Microscope – SEM and TEM, Confocal Microscope; Micrometry; Photomicrometry.

**Unit III**

Spectrophotometer- Principle, Instrumentation and uses of UV-Vis Spectrometry, Atomic Adsorption Spectrometry, Nuclear Magnetic Resonance Spectrometry, Flame Photometer. Chromatography – Affinity Chromatography, Ion exchange chromatography and High Performance Liquid Chromatography.



**Unit IV**

Centrifugation – Principles of sedimentation, Types of rotors, Differential centrifugation, Density gradient centrifugation, Ultracentrifuge. Electrophoresis – Agarose gel electrophoresis (AGE), Sodium Dodecyl Sulphate-Polyacrylamide Gel Electrophoresis (SDS-PAGE). PCR – Principle and technique. Cryobiology – Lyophilization and its application in Biology.

**Unit V**

Data collection and Analysis of data– Mean, Median, Mode, Standard deviation, Standard error, Student 'T' test, Chi – square test, Correlation, Regression, ANOVA, SPSS.

**Reference Books:**

1. Jayaraman, J. (1972). *Techniques in Biology*. Madras: Higginbothams Pvt. Ltd.
2. Khan, I. A., & Khanum, A. (1994). *Fundamentals of Biostatistics*. Hyderabad: Vikas Publishing.
3. Khan, J.A. (2008). *Research Methodology*. New Delhi: A.P.H Publishing Corporation.
4. Kothari, C.R. (2004). *Methodology: Methods and Techniques*. Research New Age International Publishers Ltd.
5. Kothari, C. R. (1991). *Research Methodology: Methods and Techniques*. New Delhi: Wiley Eastern Ltd.
6. Michael T. Madigan., John M. Martinko., & Jack Parker. (2003). *Brock Biology of Microorganisms* (10<sup>th</sup> ed.). USA: Pearson Education International.
7. Ranjit Kumar, A. (2011). *Research Methodology: a step by step guide by beginners* (3rd ed.). London: SAGE Publications Ltd.
8. Sree Ramulu, V. S. (1988). *Thesis Writing*. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
9. Thomas, A. Scruggs., & Margo, A. (2006). *Mastrapiere, Applications of Research Methodology*. London: Elsevier Ltd., JAI Press.



**Semester II**  
**Core V: Research Methodology**  
**Sub. Code: PB1722**

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	4	90	100

**Objectives**

1. To introduce the students the systematic, theoretical analysis of the body of methods and principles associated with a branch of knowledge which encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques involved in plant science which will enable them to pursue various research activities.
2. Acquire and enhance specific laboratory skills including microscopy, spectrophotometry, tissue culture, organelle isolation, chromatography, bioassays to formulate original questions about plants into empirically testable hypotheses, collect and analyze data obtained from original research, and translate and apply experimental data to advance the field and solve real-world problems.

**Unit I**

**Research-** Objectives of research, Types of research, Significance, Literature collection- Index card, reference card and Abstract card. Literature citation- Different systems of citing references- Name year system, Citation sequence system and Alphabet number system. Research report, components of a project report, tables, figures, foot note, thesis format, journal format- appendices, e- journal and e- book. Role of supervisors/ Guides in research.

**Unit II**

**Microscopy** – Principle, Instrumentation and uses of Light Microscope, Dark-Field Microscope, Phase contrast Microscope, Fluorescent Microscope, Electron Microscope – SEM and TEM, Confocal Microscope; Micrometry; Photomicrometry.

**Unit III**

**Spectrophotometer** - Principle, Instrumentation and uses of UV-Vis Spectrometry, Atomic Adsorption Spectrometry, Nuclear Magnetic Resonance Spectrometry, Flame Photometer. **Chromatography** – Affinity Chromatography, Ion exchange chromatography and High Performance Liquid Chromatography.

**Unit IV**

**Centrifugation** – Principles of sedimentation, Types of rotors, Differential centrifugation, Density gradient centrifugation, Ultracentrifuge.

**Electrophoresis** – Agarose gel electrophoresis (AGE), Sodium Dodecyl Sulphate-Polyacrylamide Gel Electrophoresis (SDS-PAGE).

PCR – Principle and technique.

Cryobiology – Lyophilization and its application in Biology.

**Unit V**

Data collection and Analysis of data – Mean, Medium, Mode, Standard deviation,





Standard error, Student 'T' test, Chi – square test, Correlation, Regression, ANOVA, SPSS.

**Reference Books**

1. Jayaraman, J. (1972). *Techniques in Biology*. Madras: Higginbothams Pvt. Ltd.
2. Khan, I. A., & Khanum, A. (1994). *Fundamentals of Biostatistics*. Hyderabad: Vikas Publishing.
3. Khan, J.A. (2008). *Research Methodology*. New Delhi: A.P.H Publishing Corporation.
4. Kothari, C.R. (2004). *Methodology: Methods and Techniques*. Research New Age International Publishers Ltd.
5. Kothari, C. R. (1991). *Research Methodology: Methods and Techniques*. New Delhi: Wiley Eastern Ltd.
6. Michael T. Madigan., John M. Martinko., & Jack Parker. (2003). *Brock Biology of Microorganisms* (10<sup>th</sup> ed.). USA: Pearson Education International.
7. Ranjit Kumar, A. (2011). *Research Methodology: a step by step guide by beginners* (3rd ed.). London: SAGE Publications Ltd.
8. Sree Ramulu, V. S. (1988). *Thesis Writing*. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
9. Thomas, A. Scruggs., & Margo, A. (2006). *Mastropiere, Applications of Research Methodology*. London: Elsevier Ltd., JAI Press.



DEPARTMENT OF ZOOLOGY



**SEMESTER II**  
**ELECTIVE COURSE IV: a) RESEARCH METHODOLOGY**

Course Code	L	T	P	S	Credits	Inst. Hours	Total hours	Marks		
								CIA	External	Total
ZP232EC4	2	1		1	3	4	60	25	75	100

**Pre-requisite**

Students should have a good understanding of the fundamental methods used in experimental biology.

**Learning Objectives**

1. To impart knowledge on the basic principle, methodologies and applications of instruments in biological sciences.
2. Develop essential research skills to operate and apply various biological science instruments.

**Course Outcomes**

On the successful completion of the course, students will be able to:		
1.	recall the principles of laboratory equipments, research techniques and the process of scientific report writing.	K1
2.	Explain the procedures involved in operating laboratory equipment, applying research techniques, and engaging in scientific writing.	K2
3.	apply biological techniques in laboratory settings to gain practical experience in research processes and scientific report writing.	K3
4.	analyze the principles and techniques to make wise choices in experimental design, data interpretation, and research reports in biological sciences.	K4
5	evaluate the quality, reliability, and limitations of data generated by research techniques and obtained from literature for specific research goals.	K5

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyse; K5 - Evaluate

Units	Contents	No. of hours
I	Analytical Techniques: Good laboratory practice (GLP), pH meter, Colorimeter, Spectrophotometer - UV-Visible, Atomic Absorption, Flame photometer, FTIR spectrometry.	12
II	Microscopy & Micro technique: Principle, Working mechanism and applications of Bright field, Phase contrast, Electron, Confocal Microscope and Atomic force microscope. Histology - Fixation, Sectioning and Staining. Histochemistry for carbohydrates, proteins, lipids.	12
III	Separation Techniques: Centrifugation - Differential and Density gradient, types and applications of Centrifuges. Chromatography - Principle, HPLC and Affinity chromatography, GAS Chromatography Mass Spectrometry. Electrophoresis - Principle, Agarose gel electrophoresis and PAGE.	12
IV	Tracer techniques: Radioactive Isotopes, Radiolabeling, Radiocarbon dating, Radio activity counters - Scintillation Counter, Geiger Muller Counter.	12
V	Scientific Writing: Essential steps in research, Review of literature, Literature citation, Research report - Abstract, Tables - Figures - Formatting and typing, Open access journals, Predatory journals, Impact factor, Citation index, H-index, Plagiarism, Copy Right.	12

<b>Self-study</b>	Principle, Working mechanism and applications of Electron and Phase contrast Microscope, Centrifugation - Principle, types and applications of Centrifuges, Bioinstrumentation of pH meter, Colorimeter, and UV-Visible
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	Spectrophotometer, Quantification of carbohydrate, protein, lipid, Essential steps in research.
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**Textbooks**

1. Veerakumari. L, 2006. *Biotastrumentation*. MJP Publishers. Triplicane, Chennai.
2. Gurumani. N, 2006. *Research Methodology for Biological Sciences*. MJP Publishers. Triplicane, Chennai

**Reference Books**

1. Marimuthu. R, 2008. *Microscopy and Microtechnique*. MJP Publishers. Chennai.
2. Keith Wilson and John Walker, 2018. *Principles and Techniques of Practical Biochemistry* (8<sup>th</sup> ed.). Cambridge University Press. India.
3. Pranav Kumar, 2018. *Fundamentals and Techniques of Biophysics and Molecular Biology*. Pathfinder publication. India.
4. Panerselvam R, 2016. *Research Methodology*. PHI Learning Pvt. Ltd. India.
5. Gurumani N, 2010. *Scientific thesis writing and paper presentation*. MJP Publishers. Chennai

**Web Resources**

1. <https://en.wikipedia.org/wiki/Microtechnique>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/>
3. <https://www.vedantu.com/physics/spectroscopy>
4. [https://en.wikipedia.org/wiki/Blot\\_\(biology\)](https://en.wikipedia.org/wiki/Blot_(biology))
5. [https://en.wikipedia.org/wiki/List\\_of\\_research\\_methods\\_in\\_biology](https://en.wikipedia.org/wiki/List_of_research_methods_in_biology)

**MAPPING WITH PROGRAMME OUTCOMES  
MAPPING WITH PROGRAMME SPECIFIC OUTCOMES**

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	3	2	3	2	3	3	2	3	2
CO2	3	1	1	3	2	3	2	3	3	2	2	3
CO3	3	2	1	2	2	2	2	2	2	3	2	2
CO4	3	1	1	3	1	3	2	3	3	3	3	3
CO5	3	2	1	2	3	3	2	2	3	2	2	2
<b>Total</b>	15	8	5	13	10	14	10	13	14	12	12	12
<b>Average</b>	3	1.6	1	2.6	2	2.8	2	2.6	2.8	2.4	2.4	2.4

**3 -Strong; 2 -Medium; 1 -Low**



**Semester II**  
**Core VIII - Research Methodology**  
**Course Code: PZ2024**

No. of hours/ week	No. of credits	Total number of hours	Marks
5	4	75	100

**Objectives**

1. To enable the students to understand the working principles of bio-instruments and methodologies used in biological investigations.
2. To enhance report writing skills and create self-employment opportunities.

**Course Outcomes**

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	outline the principles and working mechanism of laboratory equipments and research techniques.	PSO - 1	R
CO - 2	explain laboratory or field procedures, methods, and instrumentation for biological studies.	PSO - 1	U
CO - 3	analyze scientific methods to develop hypotheses, design and execute experiments by selecting the appropriate research techniques.	PSO - 2	An
CO - 4	conceptualize research processes, data presentation, report writing and publication in journals.	PSO - 3	Ap
CO - 5	evaluate scientific ideas and design experiments to address medical, social and environmental problems.	PSO - 4	E

**UNIT I (Ref. 1, 2)**

**Microscope:** Principle - types - interference, fluorescence, confocal, electron microscopes - scanning tunneling microscope, atomic force microscope, near field scanning optical microscope, magnetic force microscope. Photomicrography.

**UNIT II (Ref. 1, 2, 5)**

**Centrifugation:** Principle - factors affecting sedimentation rate - Types and applications of centrifuges. Cryotechniques- cryopreservation. **Cytotechnique:** Whole mounts. **Microtome:** Rotary and Freezing microtome. **Microtomy:** Fixation - dehydration - clearing - embedding - sectioning - staining - mounting.

**UNIT III (Ref. 3, 4, 5)**

**Chromatography:** Principle, types - gas and liquid chromatography - High Performance Liquid Chromatography - Ion exchange - Affinity chromatography. **Electrophoresis:**



Principles, types - gel - Polyacrylamide gel, agarose gel, Blotting techniques, Iso electric focusing - Immunoelectrophoresis. Protein sequencing methods.

#### UNIT IV (Ref. 3, 4, 5)

**Spectroscopy:** principle, types - UV-Visible Spectroscopy, Atomic Absorption Spectroscopy, flame photometer, chemiluminometer, Nuclear Magnetic Resonance spectroscopy, FTIR spectrometry - Electron Spin Resonance, Magnetic Resonance Imaging - applications. Radio activity counters.

#### UNIT V (Ref. 6, 7)

**Experimental design and Report writing:** Essential steps in research - Literature collection - Review of literature - Bibliography - Literature citation - Research report - Tables - Figures - Formatting and typing - Online literature collection - open access journals - Predatory journals - Impact factor - Citation index- H-index- Plagiarism - Copy Right - Patent.

#### Textbooks

Veerakumari, L. (2006). *Bioinstrumentation*. Chennai: MJP Publishers.

Gurumani, N. (2006). *Research Methodology for Biological Sciences*. Chennai: MJP Publishers.

#### Reference Books

1. Marimuthu, R. (2008). *Microscopy and Microtechnique*. Chennai: MJP Publishers.
2. Prakash, M. and C.K. Arora (1998). *Microscopical Methods*. New Delhi: Anmol Publications Pvt. Ltd.
3. Keith Wilson and John Walker (2018). *Principles and Techniques of Practical Biochemistry (8<sup>th</sup> ed.)*. United Kingdom: Cambridge University Press.
4. Pranav Kumar (2018). *Fundamentals and Techniques of Biophysics and Molecular Biology*. New Delhi: Pathfinder publication.
5. RamnikSood (2006). *Medical Laboratory Technology*. New Delhi: Jaypee Brothers Medical Publishers Pvt. Ltd.
6. R. Panerselvam. (2016). *Research Methodology*. New Delhi: PHI Learning Pvt. Ltd.
7. Gurumani, N. (2010). *Scientific thesis writing and paper presentation*. Chennai: MJP Publishers.





**Semester II**  
**Core VI - Research Methodology**  
**Sub. Code: PZ1723**

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	4	90	100

**Objectives**

1. To enable the students to understand the working principles of bioinstruments and methodologies used in biological investigations and report writing.
2. To create self employment opportunities using the knowledge acquired.

**Unit I**

**Microscope:** Principle – Instrumentation, Types– bright field, dark field, phase contrast, interference, fluorescence, polarization, confocal, electron microscopes – scanning tunneling microscope, atomic force microscope, near field scanning optical microscope, magnetic force microscope. Photography – light – film – camera types – photomicrography.

**Unit II**

**Centrifugation:** Principle - Factors affecting sedimentation rate – Types and applications of centrifuges. pH meter: principle – electrodes – applications. Cryotechniques – cryopreservation. Cytotechnique: Whole mounts. Microtome: Rotary and Freezing microtome. Microtomy: Fixation – Dehydration – Clearing - Embedding - Sectioning – staining – mounting.

**Unit III**

**Chromatography:** Principle, types – paper, thin layer, column, gas and liquid chromatography – High Performance Liquid Chromatography – Ion exchange – Affinity chromatography. Electrophoresis: Principles, types – Paper and gel – Polyacrylamide gel, agarose gel, Iso electric focusing – Immunoelectrophoresis. Protein sequencing methods.

**Unit IV**

Spectrophotometer: principle, design and applications. Spectroscopy: principle- design- types- Atomic Absorption Spectroscopy, flame photometer, chemiluminometer, Nuclear Magnetic Resonance spectroscopy, FTIR spectrometry - Electron Spin Resonance, Magnetic Resonance Imaging – applications. Radio activity counters.

**Unit V**

**Experimental design and Report writing:** Essential steps in research – Literature collection – Review of literature – Research and discriminative reading – Bibliography- Index card – Literature citation – Plagiarism - Alphabet number system – Research report - Tables – Figures – Formatting and typing – Online literature collection – open access journals - Impact factor and Copy Right - Laboratory safety.

**Reference Books**

1. Veerakumari, L. (2006). *Bioinstrumentation*. Chennai: MJP Publishers.
2. Gurumani. N. (2006). *Research Methodology for Biological Sciences*. Chennai: MJP Publishers.
3. Robert L. Dryer & Gene F. Lata (1989). *Experimental Biochemistry*. New York: Oxford University Press.
4. Rana, S.V.S. (2002). *Biotechniques*. Meerut: Rastogi Publications.
5. Keith Wilson & John Walker (2000). *Principles and Techniques of Practical Biochemistry* (5<sup>th</sup> ed.). United Kingdom: Cambridge University Press.
6. Marimuthu, R. (2008). *Microscopy and Microtechnique*. Chennai: MJP Publishers.
7. Ramnik Sood (2006). *Medical Laboratory Technology*. New Delhi: Jaypee Brothers Medical Publishers Pvt. Ltd.



**Semester I****C2: Research Methodology****Sub. Code: MPZ182**

No. of hours per week		Credit	Total no. of hours	Marks
Contact	Library			
5	3	4	75	100

**Objective**

To enable the students to understand the basic concepts of research and its methodologies, identify appropriate research topics, select and define appropriate research problem and parameters, prepare a project proposal (to undertake a project), organize and conduct research (advanced project) in a more appropriate manner, write a research report and thesis and write a research proposal.

**Unit I**

Literature collection: Abstracts, reviews, journals, reference card. Literature citation - Name-year system of citation in the text and in references. Scope, identification and selection of research problems. Designing experiments. Data collection and analysis. Methods of edition and abstraction. Report writing – formatting and typing. Preparation of manuscript and proof reading for journals and conferences. Research funding agencies. Citation, Calculation of h - index, Scopus index and Impact factor.

**Unit II**

Principles of Microtechniques. Histology: Fixatives and Histological stains – Fixation - Tissue processing - Staining. Microtome and Freezing Microtome (Cryostat).

Histochemistry: Histochemical stains - Principles involved in identification of carbohydrates, Proteins, Lipids, Enzymes and Nucleic acids.

Principles and applications of Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), STEM. Preparations of tissues for SEM and TEM. Micrometer and its application. Photomicrography - principles and applications.

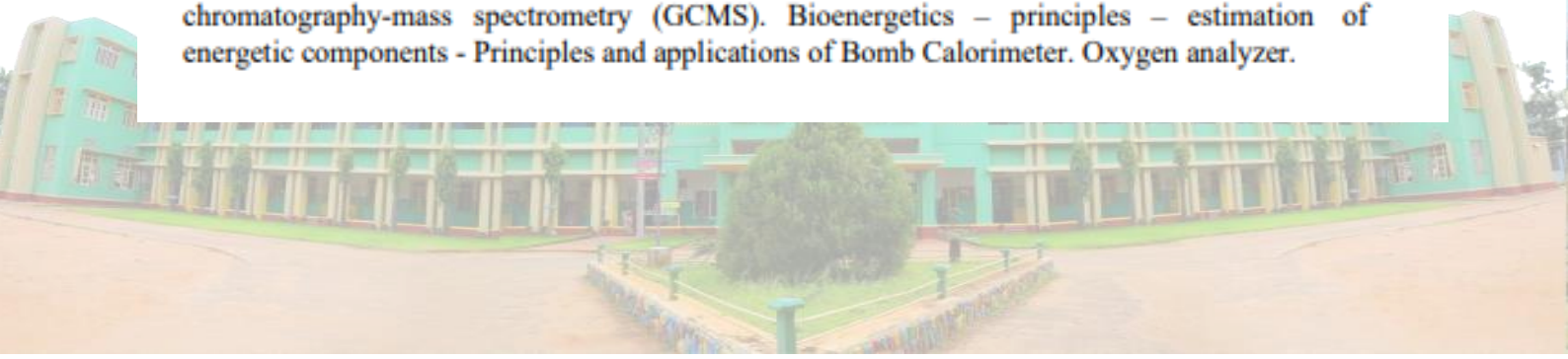
**Unit III**

Chromatography: Types, Principles and Applications of TLC, Column, Ion-exchange, HPLC, GLC and Affinity. Electrophoresis: Types, Principles and Applications of Agarose Gel (AGE), PAGE, SDS-PAGE. Blotting Techniques: Southern and Western.

Immunological Techniques: Antigen and Antibody preparation and purifications-Immunodiffusion - Immunoelectrophoresis, ELISA. Tracer techniques: Principles and applications of Autoradiography, Geiger Muller Counter, Scintillation Counter.

**Unit IV**

pH determination: pH indicators – pH meter. Principle and operation. Buffer solution - preparation – significance. Acid - base titration curve. Centrifugation: Principle, types of centrifugation, centrifuges and uses. Photometry: Principle, operation and applications of Colorimeter, Spectrophotometer, Atomic absorption spectrophotometer, Fourier Transform Infrared spectrometer (FTIR) and Flame photometer. NMR spectroscopy and gas chromatography-mass spectrometry (GCMS). Bioenergetics – principles – estimation of energetic components - Principles and applications of Bomb Calorimeter. Oxygen analyzer.



## Unit V

Statistical methods and applications: Experimental designs – Sampling – Probability - Normal curve - Test of significance: students “t” test - Chi Square test, F-test, Z-test - Analysis of variance (ANOVA) - one way and two way. Correlation coefficient- simple linear and multiple correlations. Simple linear regression. Bioinformatics: Biological databases, sequence comparisons, multiple sequence alignment, profiles, motifs and feature identification, phylogenetic analysis. Bioinformatics in genomes. Bioinformatics software.

## Reference Books

- Gurumani, N. (2006). *Research Methodology for Biological Sciences*. Chennai: MJP Publishers.
- Robert L. Dryer & Gene F. Lata (1989). *Experimental Biochemistry*. New York: Oxford University Press.
- Rana, S.V.S. (2002). *Biotechniques*. Meerut: Rastogi Publications.
- Keith Wilson & John Walker (2005). *Practical Biochemistry - Principles & Techniques* (5<sup>th</sup> ed.). London: Cambridge University Press Publications.
- Jayaraman, J. (2011). *Laboratory Manual in Biochemistry*. New Delhi: New Age International Pvt. Ltd Publishers.
- Palanichamy S. & Shanmugavelu, M. (1997). *Research methods in. Biological Sciences*. Palani: Palani Paramount Publications.
- Plummer, D.T. (2001). *An introduction to Practical Biochemistry*. Oxford University Press, London.
- Oser, B.L. (1976). *Hawk's Physiological Chemistry*, Tata McGraw-Hill Publishing Co., Ltd., New Delhi.
- Brewer, J., Pesce, A. & Ashworth, R. (1974). *Experimental Techniques in Biochemistry*. Englewood Cliffs, New Jersey: Prentice Hall Publication.
- Saravanavel P. (2006). *Research Methodology*. Sarojini Naidu Marg, Allahabad : Kitab Mahal Publishers.
- Zar, J.H. (1984). *Biostatistical Analysis* (2<sup>nd</sup> ed.). Prentice-Hall International, Inc., London.
- Gurumani, N. (2005). *An Introduction to Biostatistics*. Chennai: MJP Publishers.
- Day. R.A. (1994). *How to write and publish a scientific paper*. London: Cambridge University Press.



## DEPARTMENT OF ENGLISH

### Semester II

### Core VII: Research Methodology

**Course Code: PE2023**

Hours / Week	Credits	Total Hours	Marks
6	4	90	100

#### Objectives

1. To master the rudiments of research writing
2. To equip the students to become informed researchers
3. To enhance the students in developing the language skills for research writing
4. To sensitize the students to become morally and ethically responsible researchers

#### Course Outcomes

CO	Upon completion of this course the students will be able to:	PSOs Addressed	CL
CO-1	understand the formal aspects of research.	PSO-3	U
CO-2	equip themselves in Research Methodology	PSO-1	Ap
CO-3	skilled at selecting and limiting the research topic.	PSO-2	Ap
CO-4	develop the ability to organize ideas and present them coherently with a considerable degree of sophistication in keeping with the norms of scholarly research and writing.	PSO-2	Ap

#### Unit I: (MLA Handbook – Seventh Edition)

Research and Writing  
 The Research Paper as a Form of exploration  
 The Research Paper as a Form of Communication  
 Selecting a Topic  
 Taking Notes  
 Outlining  
 Writing Drafts

#### Unit II

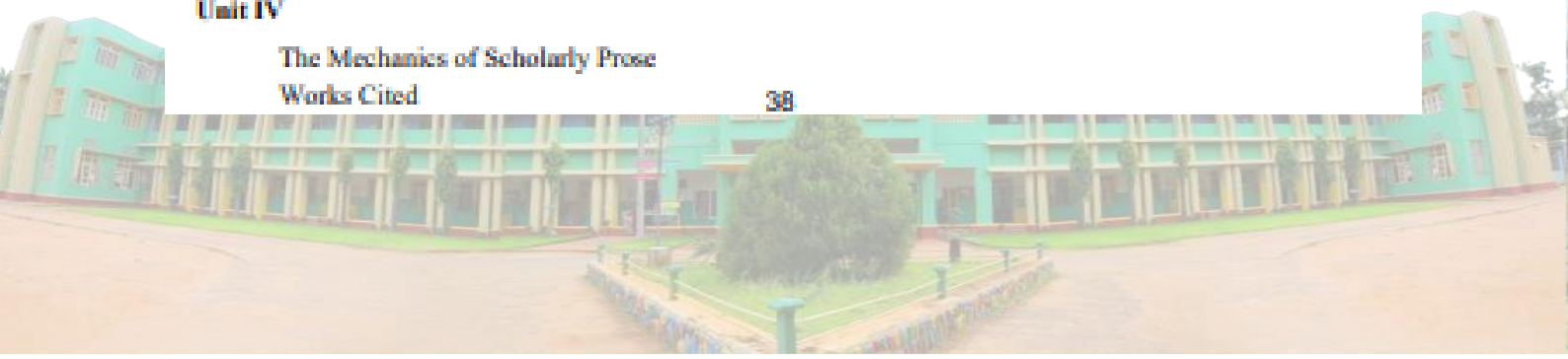
Principles of MLA Style  
 Introduction  
 Why Document Sources  
 Plagiarism and Academic Dishonesty

#### Unit III

Think: Evaluating your Sources  
 Select: Gathering Information about your Sources  
 Organize: Creating your Documentation  
 The Format of the Research Paper (MLA Handbook – Seventh Edition)

#### Unit IV

The Mechanics of Scholarly Prose  
 Works Cited





**Unit V**

In-text Citations

Citations in forms other than Print

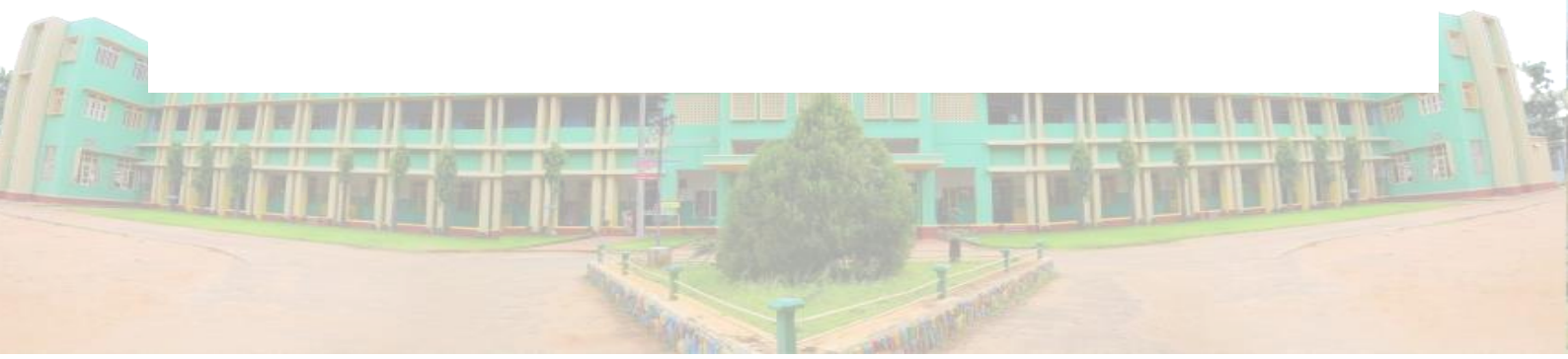
**Self Study**

Practical Application

**Reference Book:**

*MLA Hand Book.* (8<sup>th</sup> ed.). (2016). America: Modern Language Association

*MLA Hand Book for Writers of Research Papers.* (7<sup>th</sup> ed.).(2009) America: Modern Language Association.





**Semester II**  
**Core VII: Research Methodology**  
**Sub. Code: PE1723**

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

**Unit I**

Principles of MLA Style  
Introduction  
Why Document Sources  
Plagiarism and Academic Dishonesty

**Unit II**

Think: Evaluating your Sources  
Select: Gathering Information about your Sources  
Organize: Creating your Documentation

**Unit III**

The Mechanics of  
Scholarly Prose  
Works Cited

**Unit IV**

In-text Citations  
Citations in forms other than Print

**Unit V**

Practical Application

**Reference Book**

(2016). *MLA Hand Book*. (8<sup>th</sup> ed.). America: Modern Language Association.



**Semester I**  
**C2 : Research Methodology**  
**Sub. Code: MPE182**

No. of hours per week		Credit	Total no. of hours	Marks
Contact	Library			
5	3	4	75	100

**Objectives**

1. Unit I & II [Research Methodology] ; Students will be trained in the formal aspects of research. It will include an introduction to research methods, selection and phrasing of the topic, collection and ordering of material, and giving a structured form to the same. Its aim is to help the student develop the ability to organize ideas and present them coherently with a considerable degree of sophistication in keeping with the norms of scholarly research and writing. This should be reflected in the dissertation to be submitted by the student for evaluation and award of the degree of M.Phil.
2. Units 3, 4 and 5: The objective of learning “Literary Theory and Criticism” in 3 units is to equip students with essential tools of literary research. It is to introduce them to the prime, thematic concerns of contemporary literary theory.

**Unit I: Research Methodology**

Research and Writing, Plagiarism, Mechanics of Writing, the Format of the Research Paper

**Unit II: Research Methodology**

Documentation, List of Works Cited, Citing Sources in the Text, Abbreviations

Suggested Reading:

**Unit III: Literary Theory**

1. Post structuralism and Deconstruction
2. Psychoanalytical Criticism
3. Feminist Criticism
4. Postcolonial Criticism
5. Eco Criticism

**Unit IV: Literary Criticism**

1. Derrida : Structure, Sign and Play in the Human Sciences
2. Foucault : What is an author?
3. Lacan : The Mirror Image

**Unit V**

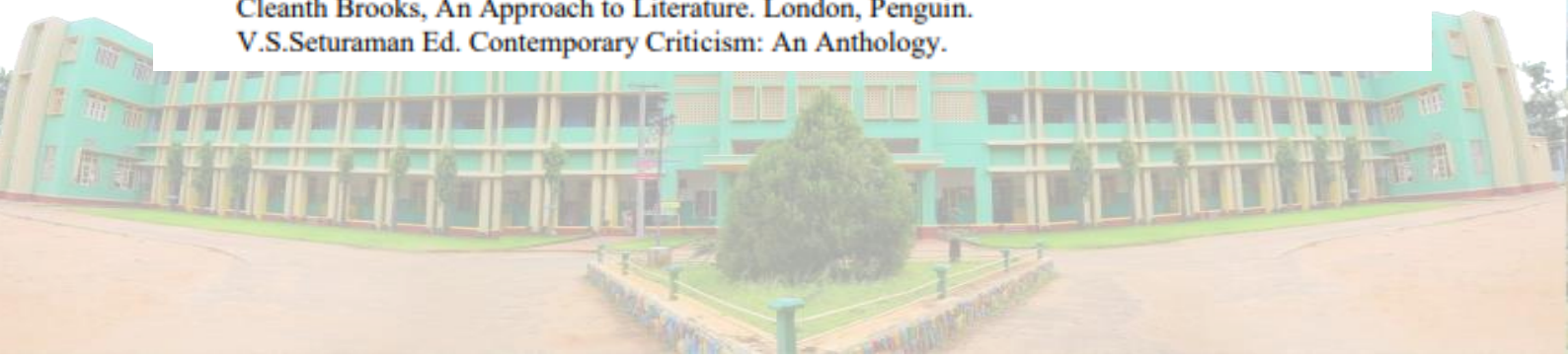
1. Stuart Hall : Cultural Studies: Two Paradigms
2. Sudesh Mishra : Diaspora Criticism
3. Kate Rigby : Eco Criticism
4. Sharan Kumar Limbale: “Dalit Literature and Marxism” from Towards an Aesthetic of Dalit Literature. Tr. Alok Mukherjee

**Text Books**

1. Joseph Gibaldi. MLA Handbook Edition VII
2. Peter Barry, (2010). Beginning Theory. UK, Manchester University Press.

**Reference Books**

- David Lodge Ed. Modern Criticism and Theory: A Reader. London: Longman.  
 Cleanth Brooks, An Approach to Literature. London, Penguin.  
 V.S.Seturaman Ed. Contemporary Criticism: An Anthology.



**Semester I**  
**C2: Research Methodology, Rhetoric, Literary Theory and Criticism**

**Sub. Code.: MPE192**

No. of hours per week		Credit	Total no. of hours	Marks
Contact	Library	4	75	100
5	3			

**Objectives:**

1. Units I& II [Research Methodology]; Students will be trained in the formal aspects of research. It will include an introduction to research methods, selection and phrasing of the topic, collection and ordering of material, and giving a structured form to the same. Its aim is to help the student develop the ability to organize ideas and present them coherently with a considerable degree of sophistication in keeping with the norms of scholarly research and writing. This should be reflected in the dissertation to be submitted by the student for evaluation and award of the degree of M.Phil.
2. Units III, IV & V: The objective of learning “Literary Theory and Criticism” in 3 units is to equip students with essential tools of literary research. It is to introduce them to the prime, thematic concerns of contemporary literary theory.

**Unit I: Research Methodology**

Research and Writing, Plagiarism, Mechanics of Writing, the Format of the Research Paper

**Unit II: Rhetoric**

Documentation, List of Works Cited, Citing Sources in the text, Abbreviations, Argument

**Unit III: Literary Theory**

1. Post Structuralism and Deconstruction
2. Psychoanalytical Criticism
3. Feminist Criticism
4. Postcolonial Criticism
5. Eco Criticism

**Unit IV: Literary Criticism**

Derrida : Structure, Sign and Play in the Human Sciences  
Focault : What is an Author?  
Laçan : The Mirror Image

**Unit V: Literary Criticism**

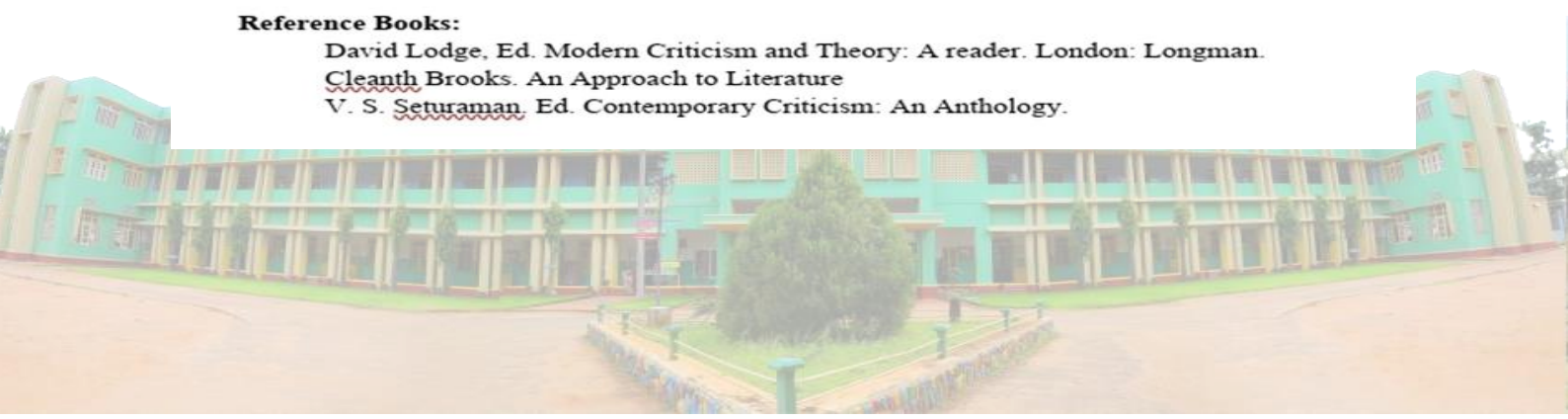
Stuart Hall : Cultural Studies: Two Paradigms  
Sudesh Mishra : Diaspora Criticism  
 Kate Rigby : Ecocriticism  
Sharan Kumar Limbale : Dalit Literature and Marxism from “Towards an Aesthetic of Dalit Literature. Tr. Alok Mukherjee

**Text Books:**

Joseph Gibaldi. MLA Handbook. Edition VIII.  
 Peter Barry, (2010). Beginning Theory. UK, Manchester University Press.

**Reference Books:**

David Lodge, Ed. Modern Criticism and Theory: A reader. London: Longman.  
Cleanth Brooks. An Approach to Literature  
 V. S. Seturaman, Ed. Contemporary Criticism: An Anthology.





L	T	P	C
4	-	-	4

**RESEARCH METHODOLOGY**

**Objectives:**

- To introduce the scholars to the basic concepts of research.
- To train the scholars in the art of thesis writing and the methods of analyzing and organizing the material and the mechanics of thesis.
- To learn to use relevant critical concepts in order to effectively analyze and evaluate examples of rhetorical discourse

**Unit I: FUNDAMENTALS OF RESEARCH**

Selecting a Topic - Using the Library - Compiling a Working Bibliography - Taking Notes - Plagiarism

**Unit II: STYLE AND ORGANISATION**

Outlining - Language and Style – Paraphrasing - Writing Drafts

**Unit III: MECHANICS OF WRITING**

Spelling – Punctuation - Typing, Margin and Spacing

**Unit IV: FORMAT**

Principles of MLA Styles - Details of MLA Styles

**Unit V: DOCUMENTATION**

Parenthetical Documentation - Preparing List of Works Cited - Sample Entries

**References:**

*MLA Handbook* 8<sup>th</sup> Edition. The Modern Language Association of America. 2016.  
Gilbaldi, Joseph. *The MLA Style Manual and Guide to Scholarly Publishing*. Modern Language Association of America. 1998.



## DEPARTMENT OF HISTORY

**SEMESTER II**  
**SKILL ENHANCEMENT COURSE- 1: RESEARCH AND REPORT WRITING**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
HP232SE1	2	1	-	1	2	4	60	25	75	100

**Pre-requisite:**

The students should have basic knowledge about research and report writing.

**Learning Objectives:**

1. To explain the importance of report writing.
2. To point out the methods of research writing and project proposals.

**Course Outcomes**

On the successful completion of the course, student will be able to:		
1.	tell the importance of report Writing	K1
2.	analyze the method of research writing	K4
3.	explain the methods of writing research proposals	K2
4.	evaluate the importance of ethics in research	K5
5.	apply the best practices	K3

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate

Units	Contents	No. of Hours
I	<b>Introduction:</b> Significance of Report Writing in academics and research- Requirement of report writing- research goals. Various kinds of Reports and its presentations- Characteristics of Academic and Research Reports /Presentations.	12
II	<b>Research Writing</b> Types of Research Papers, Structure of research papers -Research Paper Formats -Abstract writing – Methodology -Results and discussions –Uses of plagiarism detection tools.	12
III	<b>Report Writing</b> Writings project proposals - Lecture notes - Progress reports- Utilization reports - Scientific Reports – Analyse One Government report from the Library	12
IV	<b>Ethics and research-</b> fabrication- plagiarism- misrepresentation	12
V	<b>Best practices-</b> formulating the focus of the research-possess and Develop cultural knowledge- importance of socially beneficial research.	12





Self study	Writings project proposals
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**Text books**

1. Stephen Weldenborner, Domenick Caruso & Gary Parks, 1982. *Writing Research Papers: A guide to the Process*, Bed Ford Publications, New York.
2. Ravikumar, C.P., 2000. *On Writing a Thesis*, IETE Journal of Education
3. Joan Lambert & Curtis Frye, 2016. *Microsoft Office*, Microsoft Press, Washington.
4. Arka Bhattacharya, A., 2015. *A Hand Book of Report Writing*, Books Way Publications, Kolkata.
5. Baugh, L. Sue, 1992. *How to write term papers and reports*. VGM Career Horizons Publishers, Lincolnwood.

**Reference Books**

2. David Carlisle, Michel Goossens, Sebastian Rahtz & Adrian Clark, 1994. *Essential LATEX++*, Jon War brick with additions, New York.
3. Borden, Iain and Katerina Ruedi Ray, 2014. *The Dissertation: A Guide for Architecture Students*. Third Edition.
4. Naushad Alam, Q.J. Admad Peer & Banarsi Lal, 2019. *Technical Report Writing and Research Methodology*, Write & Print Publications, Mumbai.
5. Kothari, C.R., & Gaurav Gang, 2019. *Research Methodology*, New Age International Publications, New Delhi.
6. Turabian, Kate L., 2007. *A Manual for Writers of Term Papers Theses, and Dissertations*, 7th Ed, University of Chicago Press, Editorial Staff, London.

**Web Resources**

1. <https://www.researchgate.net/publication/325546150>
2. <https://www.adelaide.edu.au/writingcentre/ua/media/28/learningguide-writingaresearchreport.pdf>
3. <https://t4tutorials.com/report-writing-in-research-methodology/>
4. <https://www.questionpro.com/blog/research-reports/>
5. <https://www.formpl.us/blog/research-report>

**MAPPING WITH PROGRAMME OUTCOMES  
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	2	2	3	3	2	2	3	2	2	2
CO2	2	3	2	2	3	3	2	2	2	2	2	2
CO3	2	3	2	2	3	3	2	2	2	2	2	2
CO4	2	3	2	2	3	3	2	3	2	2	3	2
CO5	2	3	3	2	3	3	3	2	3	3	3	3
TOTAL	10	15	11	10	15	15	11	11	12	11	12	11
AVERAGE	2	3	2.2	2	3	3	2.2	2.2	2.4	2.2	2.4	2.2

3 – Strong, 2- Medium, 1- Low



**Semester III**  
**Core – XI: Research Methodology**  
**Course Code: PH2033**

Hours / week	Credits	Total Hour	Marks
6	4	90	100

**Objectives**

1. To understand the methods of Historical Research.
2. To develop the necessary skills to write Historical research projects.

**Course Outcomes**

CO. No.	Course Outcomes Upon completion of this course, students will be able to	PSOs addressed	CL
CO-1	Define the concept of Research	PSO-4	R
CO-2	Analyze the requirements needed for the researcher, selection of a research guide and topic.	PSO-4	An
CO-3	Test the importance of sources in Historical Research	PSO-4	Ev
CO-4	Develop the necessary skills to write a historical research project	PSO-4	C
CO-5	Discuss the framing of the Thesis.	PSO-4	U

**Unit-I**

Introduction: Define Research- Meaning- Scope of Research- Types of Research- Historical- Comparative- Correlative- Experimental- Methods of Research - Historical Method- Scientific Method- Inductive and Deductive Methods- Organizations of Research works - Characteristics- Limitations.

**Unit-II**

Choice of the Topic: Pre-requisites of a Researcher- Selection of Research Guide- Selection of the Topic- Criteria for selecting a Topic- Review of Literature- Hypothesis- Objectives- Designing the Study- Thesis Outline.

**Unit-III**

Analysis of Sources: Sources- Primary- Secondary- Oral- Use of Digital Library- Online Sources- Survey- Interview- Personal Diaries- Questionnaire- Collection of Data - Historical Analysis – Criticism- Internal and External Criticism - Subjectivity- Barriers to Objectivity- Objectivity- Pre-requisites for Objectivity.



#### Unit-IV

Synthesis of Facts- Synthetic Operation- Historical Facts- Role of Reasoning- Checklist for Synthesis- Emphasis - Exposition of the Subject- Meaning of Exposition- Interpretation- Statistical Method.

#### Unit-V

Framing of the Thesis: Documentation- Meaning- Purpose – Content- Thesis Design- Footnotes – Styles of Footnote – Preparation of Tables - Modern Language Association (MLA) Style – Chicago style – American Psychological Association (APA) Style - Bibliography - Arrangements of Thesis.

#### Text Books

1. Rajayyan, K. (1987). *History in Theory and Method*. Madurai, Rathna Publications
2. Subramanian, N. (1973). *Historiography*. Madurai, Kodel Publications.

#### Reference Books

1. Arnold Toynbee, (1972). *A Study of History*. London, Oxford University Press.
2. Arumugam, N. (2014). *Research Methodology*. Nagercoil, Saras Publication.
3. Colling Wood, R.G. (1992). *The Idea of History*. Oxford, Oxford University Press.
4. Krishnaswamy, A. (1975). *An Introduction to Toynbee's Study of History*. Chidambaram, Paari Printers.
5. Rajayyan, K. (1976). *History in Theory and Methods*. Madurai, Raj Publishers.
6. Sehvaraj, C. (2011). *Historiography with Special Reference to India*. Udhayamarthandam, C.S.R. Publications.
7. Shaik Ali, B. (1978). *History: Its Theory and Method*. Madras, Macmillan India Press.
8. Subramanian, N. (1993). *Historiography and Historical Methods*. Vadipatty, Ajanthaa Atchagam
9. Venkatesan, G. (2004). *Historiography*. Rajapalayam, V.C. Publications.
10. Venkatesan, K. (2011). *Historiography*. Rajapalayam, V.C. Publications.





**III Semester**  
**Historiography and Research Methodology**  
**Subject Code: PHI733**

No. of Hours Per week	No. of Credits	Total No. of Hour	Marks
6	4	80	70

**Objectives**

1. To understand theories of history and the contributions of important historians
2. To develop the necessary skills to write a historical research project

**Unit-I**

Meaning of History – Definition – Scope and purpose – Kinds of History – History and other Disciplines – Uses and abuses of History – Lessons of History – Art or Science – Theories and Concepts – Causation & Change – Historical materialism – Positivism - Theory of Great Men – Role of ideas and Institutions – Historical Determinism.

**Unit-II**

Traditions of Historical writings – Greek Historiography - Roman – Chinese – Indian – Ancient -

Medieval – Western – Arabic – Idealist – Classical - Marxist Historiography – Subaltern Historiography – Maxim Karghi - Approaches to History - Theological – St. Augustine – Oriental List – Sir William Ones - Max Muller – Imperialist – James Mill - V.A. Smith - Elphinstone – Nationalist – R.G. Bhandarkar

**Unit-III**

Jadunath Sarkar – R.C. Majumdar – K.A. Nilakanta Sastri – T.V. Mahalingam - R.K. Mukerjee – Ranajit Guha - Marxist – D.D. Kosambi – R.S. Sarma – Romila Thapar – Recent Marxist – N.G.S. Narayanan – Y.Subbarayulu – Post Nationalist – P.N. Kunjan Pillai – K.K. Pillai – Sheik Ali – N. Subramanian- K. Rajayyan.

**Unit-IV**

Sources for the study of Indian History - Primary – Secondary - Writing History - Selection of a topic – Collection of Sources – Card system – Heuristics – Criticism – Internal Criticism – External Criticism

**Unit-V**

Thesis engineering – Hypothesis - Synthesis – Exposition – Foot Notes – Bibliography – Appendix.

**Book for Study**

1. Subramanian .N. (1973). Historiography. Madurai, Kodel Publications.
2. Venkatesan, G. (2004). Historiography. Rajaplayam, V.C. Publication.

**Reference Books**

1. Arnold Toynbee, (1972). A Study of History. London, Oxford University Press.
2. Collingwood, R.G. (1992). The idea of History. Oxford, Oxford University Press.
3. Krishnaswamy, A. (1975). An Introduction to Toynbee’s Study of History. Chidambaram, Paari Printers.
4. Rajayyan, K. (1976). History in Theory and Methods. Madurai, Raj Publishers.
5. Shaik Ali, B. (1978). History Its Theory and Method. Madras, MacMillan India Press.



## DEPARTMENT OF ECONOMICS

### Semester - II

#### Core – VIII: Research Methodology

**Course Code: PF2024**

Hours / Week	Credits	Total Hours	Marks
<b>6</b>	<b>5</b>	<b>90</b>	<b>100</b>

#### Objectives

1. To familiarize the students with methodology of research and its application in Economics.
2. To enable the students to bring out suggestions, possible solutions for Social and Economic problems.

#### Course Outcomes

Co. No	Upon completion of M.A. Economics, the graduates will be able to :	PSO addressed	CL
CO - 1	understand the basic concepts of research	PSO - 1	U
CO - 2	analyse the research problems and the problems of a researcher	PSO - 2	An
CO - 3	identify the methods of data collection	PSO - 4	Re
CO - 4	apply the research design and techniques	PSO - 4	Ap
CO-5	find out the solution to defining the problem	PSO - 2	Re

#### Unit - I Nature of Social Science and Research

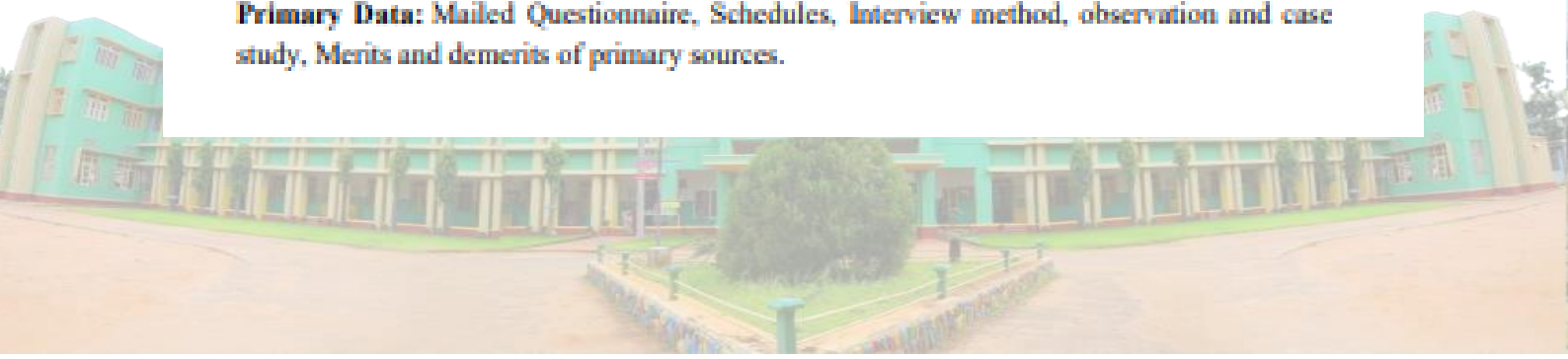
Meaning of Research – Objectives of Research – Motivation in Research – Types of Research – Research approaches – Significance of Research- Research Method Vs Methodology – Research and Scientific Method – Criteria of Good Research – Qualities of a good researcher -Problems encountered by Researchers in India.

#### Unit - II Research Problem

Meaning of research problem – Selecting the problem – Necessity of defining the problem – Technique involved in defining a problem - Research Design: Meaning – Need – features – Concepts – Different research designs.

#### Unit - III Methods and Sources of Data Collection

**Primary Data:** Mailed Questionnaire, Schedules, Interview method, observation and case study, Merits and demerits of primary sources.





**Secondary Data:** Significance of secondary Data – Methods of collection of secondary data - Evaluating secondary Data – Sources of Secondary Data – Merits and demerits of Secondary source.

**Sampling:** Survey and sampling techniques – Census and sample survey – Steps in sampling design – Criteria for selecting a sample procedure – Methods of sampling.

#### **Unit - IV Formulating and Testing of Hypothesis**

Definition of Hypothesis – Characteristics of Hypothesis – Basic concepts concerning Testing of Hypothesis – Procedure for Hypothesis Testing – Flow Diagram for Hypothesis Testing – Test of Hypothesis – Important Parametric Tests: “t” test, “F” test and “Z” test – Chi-square test- Meaning, Characteristics

#### **Unit - V Interpretation and Report Writing**

Data processing – Tabulation – Editing – Coding – Analysis and Interpretation of data presenting results: Written and oral reports – Stages in drafting written research report – Layout of research report – Foot notes and Bibliography.

#### **Reference Books**

1. Kothari, C.R. (2007). *Research Methodology, Methods and Techniques*. (6<sup>th</sup> ed.). New age international publishers.
2. Sadhu, A.N., & Singh. (1988). *Research Methodology Social Sciences*. (2<sup>nd</sup> ed.). Bombay, Himalaya publishing house.
3. Ghosh, B.N. (1992). *Scientific Method and Social Research*. (1<sup>st</sup> ed.). Sterling Publishers (p) Ltd.
4. Kurien, G.T. (1985). *A guide to Research in Economics*. (1<sup>st</sup> ed.). Rainbow publications.
5. Krishnaswami, O.R. (1998). *Methodology of Research in Social Sciences*. (4<sup>th</sup> ed.). Bombay: Himalaya publishing house.



**Semester V**  
**Elective I (a): Research Methodology**  
**Sub. Code: FC1754**

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	5	75	100

**Objectives**

1. To enable the students to understand the concept and techniques of research.
2. To adopt the methodology of research through conduct of surveys, analysis of data and apply for projects

**Unit I: Basics of Research**

Meaning of Research – Need for Economic Research, objectives, scope of research – Research Methods Vs Research Methodology - Criteria of good research – Problems encountered by researchers in India.

**Unit II: Different Types of Research**

Experimental Research – Field investigation research – Survey Research – Evaluation Research – Action Research – Descriptive Research – Case study method

**Unit III: Various steps in Research:**

Identifying a research problem – Survey of literature – Selecting the objectives – Hypothesis – Meaning - Characteristics and types – Collection and analysis of data.

**Unit IV: Methods of Collection of Data:**

Primary data – Secondary data. Observation method – Interview method – Questionnaire method – Census method – Sampling method – Different types of sampling.

**Unit V: Interpretation and Thesis Writing:**

Data processing – Tabulation – Editing – Coding – Analysis and interpretation of data – Format for research – Structure of report – Preliminary, Text, Reference material – Footnote index – Bibliography.

**Text Book**

Kothari, C.R. (2009). *Research Methodology*, New Delhi: New Age International Publishers.

**Reference Books**

1. Sonachalam, K.S. (1999). *Research Methodology*, United States: Emerald Publishers.
2. Saravanavel. (2004). *Research Methodology*, New Delhi: Kitab Mahal.
3. Paneerselvam. (2014). *Research Methodology*, New Delhi: PHI Learning Private Ltd.
4. Ranjith Kumar. (2014). *Research Methodology*, United States: Sage Publications.
5. Ghosh, B.N. (1992). *Scientific Method and Social Research*. (1<sup>st</sup> ed.). Sterling Publishers (p) Ltd.



**Semester II**  
**Core VIII: Research Methodology**  
**Sub. Code: PF1724**

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

**Objectives**

1. To familiarize the students with methodology of research and its application in Economics.
2. To enable the students to bring out suggestions, possible solutions for Social and Economic problems.

**Unit I: Nature of Social Science and Research**

Meaning of Research – Objectives of Research – Motivation in Research – Types of Research – Research approaches – Significance of Research- Research Method Vs Methodology – Research and Scientific Method – Criteria of Good Research – Problems encountered by Researchers in India.

**Unit II: Research Problem**

Meaning of research problem – Selecting the problem – Necessity of defining the problem – Technique involved in defining a problem - Research Design: Meaning – Need – features – Concepts – Different research designs.

**Unit III: Sources of Data Collection**

**Primary Data:** Mailed Questionnaire, Schedules, Interview method, observation and case study, Merits and demerits of primary sources.

**Secondary Data:** Significance of secondary Data – Evaluating secondary Data – Sources of Secondary Data – Merits and demerits of Secondary source.

**Sampling:** Survey and sampling techniques – Census and sample survey – Steps in sampling design – Criteria for selecting a sample procedure – Different types of sampling.

**Unit IV: Formulating and Testing of Hypothesis**

Definition of Hypothesis – Characteristics of Hypothesis – Basic concepts concerning Testing of Hypothesis – Procedure for Hypothesis Testing – Flow Diagram for Hypothesis Testing – Test of Hypothesis – Important Parametric Tests: “t” test, “F” test and “Z” test of significance – Chi-square test.

**Unit V: Interpretation and Report Writing**

Data processing – Tabulation – Editing – Coding – Analysis and Interpretation of data presenting results: Written and oral reports – Stages in drafting written research report – Layout of research report – Foot notes and Bibliography - Qualities of a good research.

**Reference Books**

1. Kothari, C.R. (2007). *Research Methodology, Methods and Techniques*. (6<sup>th</sup> ed.). New age international publishers.
2. Sadhu, A.N., & Singh. (1988). *Research Methodology Social Sciences*. (2<sup>nd</sup> ed.). Bombay, Himalaya publishing house.
3. Ghosh, B.N. (1992). *Scientific Method and Social Research*. (1<sup>st</sup> ed.). Sterling Publishers (p) Ltd.
4. Kurien, G.T. (1985). *A guide to Research in Economics*. (1<sup>st</sup> ed.). Rainbow publications.



## DEPARTMENT OF COMMERCE

### Semester V Major Core XIV - Research Methodology Course Code: AC2054

Hours / Week	Credits	Total Hours	Marks
5	4	75	100

#### Objectives

3. To enable the students acquire knowledge on research.
4. To help the students to collect, analyse the data and to prepare the research report.

#### Course Outcome

COs.	Upon completion of this course the students will be able to:	PSO addressed	CL
CO-1	understand the concept and different types of research studies	5	U
CO-2	formulate the research problem for preparing research design	5	C
CO-3	identify the methods of collecting data	5	R
CO-4	make use of statistical tools to analyse the data	5	An
CO-5	preparation of research report	3	C

#### Unit I: Introduction to Research

Concept – Definition – Characteristics – Objectives – Nature – Importance of Research – Classification of Research: Pure and Applied – Descriptive and Analytical – Quantitative and Qualitative – Conceptual and Empirical – Exploratory and Survey.

#### Unit II: Research Problem and Research Design

Research Problem: Concept – Criteria for Selecting Research Problem – Selection of the Research Problem – Steps in selecting the Research Problem – Research Design: Definition – Classification – Features – Types of Research Design; Exploratory – Descriptive – Diagnostic – Experimental – Informal and Formal Experimental Designs – Selection of Research Problem – Features and Criteria of Good Research Design.

#### Unit III: Review of Literature and Sampling Design

Review of Literature – Introduction – Levels of Information – Types of Information Sources: Indexes and Bibliographies – Dictionaries – Encyclopedias – Handbooks – Directories -Sampling Design: Concept – Factors Affecting the Size of the Sample –Stages in Sample Design –Sample Design Characteristics – Types of Sample Design: Probability and Non-probability Sampling.

#### Unit IV: Data Collection and Analysis

Data collection – Meaning - Methods of Data Collection – Primary Data: Observation – Interview – Survey through Questionnaire and Schedule – Distinction between Schedule and Questionnaire – Secondary Data – Sources - Processing of Data: Editing – Coding – Classification – Tabulation. Analysis of Data: Concept – Types of Analysis – Qualitative Analysis – Content Analysis – Quantitative Analysis –Statistical Analysis of Data: Arithmetic Mean – Median – Mode.

#### Unit V: Writing Research Report

Introduction – Report Drafting – Steps: Statement of Problem and its Analysis – Outline of Research Work – Rough Draft – Redrafting – Bibliography – Final Draft - Contents of the Research





**Semester I**  
**Elective I (a): Research Methodology**  
**Sub. Code: PA1715**

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	4	90	100

**Objectives**

1. To familiarize the students with the Methodology of Research.
2. To help the students to collect the data as well as to prepare research report.

**Unit I: Introduction to Research**

Research: Objectives - Motivations in Research - Types and Methods - Research Process - Criteria of Good Research.

**Unit II: Research Problem and Design**

Selecting the problem - Defining the problem - Sources - Criteria for Good Research Problem - Research Design: Need for Research Design - Features of a Good Design - Different Research Design.

**Unit III: Data Collection and Sample Design**

Primary data; Observation method – Interview method – Questionnaire – Interview Schedule - Differences between Questionnaire and Schedules - Other methods – Secondary Data: Characteristics – Methods - Case Study - Sample Design; Steps – Characteristics - Types of Sampling.

**Unit IV: Processing and Analysis of Data**

Processing – Editing - Coding – Tabulation - Analysis of Data; Average – Correlation - Regression - Chi-square Test - Garrets Ranking – Testing of Hypothesis; Null Hypothesis-Alternative Hypothesis - Procedure for Hypothesis Testing.

**Unit V: Report Writing**

Significance of Report Writing - Steps in Writing Reports- Oral Presentation - Layout of Research Report - Types of Report – Footnotes - Appendix:-Norms for Using Index and Bibliography-Introduction to SPSS – Creation of Variables – Data Window – Variable Window.

**Reference Books**

1. Kothari,C.R. ( 2006). *Research Methodology*. (3<sup>rd</sup> ed). New Delhi: New Age International Private Limited Publishers.
2. Saravanavel,P. (2014). *Research Methodology*. (16<sup>th</sup> ed). Allahabad: Kitab Mahal Publication.
3. Donald, R. Cooper. (2006). *Business Research Methods*. (9<sup>th</sup> ed). Delhi: Tata McGraw - Hill Publishing Company Limited.
4. Anderson et al. (2002). *Thesis & Assignment Writing*. (1<sup>st</sup> ed). United States: John Wiley & Sons.
5. Panneerselvam, R. (2009). *Research Methodology*. (5<sup>th</sup> ed). New Delhi: PHL Learning Private Limited.





**Semester I**  
**C2: Research Methodology**  
**Sub. Code: MPA182**

No. of hours per week		Credit	Total no. of hours	Marks
Contact	Library	4	75	100
5	3			

**Objective**

To equip students with basic understanding of research methodology and application of modern analytical tools & techniques for management decision making.

**Unit I: Introduction**

Research: Meaning – purpose- Types of Research – Steps in Research - Meaning, Definitions of Research Methodology - Nature of Social Research - Research and Business decisions - Procedures of conducting Research - Types and Methods of Research - Form of scientific models - Selection and formulation of Research problem – Review of Literature - Research Gap. Unit II: Research Design & Data Collection

Preparation of Research Design - Evaluation of research design - Factors affecting research design - Sampling techniques - Methods of sampling - Sources of Information- Collection of data - Methods of data collection - Selection of a appropriate method of data collection – Sources - Techniques - Questionnaire design: Pilot study - pretesting – Interview schedule - Scaling techniques.

**Unit III: Analysis of Data -I**

Data processing: Meaning, Steps - Analysis of data – Interpretation of data through SPSS – Correlation – Partial and multiple, Regression – Partial and Multiple- Garret Ranking Techniques - Time series analysis.

**Unit IV: Analysis of Data –II**

Hypothesis - Concept, steps, sources - Formulation of hypothesis - Testing of hypothesis - Two tailed and one tailed test - Chi – Square test, 't' test, 'z' test, 'F' test and ANOVA.

**Unit V: Report Writing**

Research Reports - Problems and Precautions - Types - Mechanics - Layouts - Formats, Style sheets - Contents of research report - Steps in drafting reports - Footnotes and bibliography writing.

**Reference Books**

Kothari, C.R. & Gaurav Garg (2014). Research Methodology (3<sup>rd</sup> edition). New Delhi, New Age International Private Limited Publishers.

Saravanavel, P.(2014). Research Methodology (16th edition).Allahabad, Kitab Mahal Publication.

Donald R. Cooper.(2006) . Business Research Methods (9<sup>th</sup> edition). New Delhi, Tata McGraw-Hill publishing Company Limited.

Dr.Kapoor, D.R., & Puja Saigal. (2013). Research Methodology Methods & Techniques (1<sup>st</sup> edition) Regal Publications.

Jai Narain Sharma. (2011). Research Methodology (2<sup>nd</sup> edition). New Delhi, Deep & Deep Publication Private Limited.



## Semester I

## Core IV: Research Methodology

Course Code: PA2014

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	4	90	100

**Objectives:**

1. To familiarize the students with the Methodology of Research.
2. To help the students to collect the data as well as to prepare research report.

CO	Upon completion of this course the students will be able to :	PSO addressed	PO addressed	CL
CO-1	identify research problem and determine the research objectives	PSO-2	PO - 2	U
CO-2	understand the needs and features of good research design	PSO-2	PO - 2	U
CO-3	select the apt method of collecting data	PSO-2	PO - 1	Ab
CO-4	choose the required sample design for analysis	PSO-2	PO - 2	A
CO-5	prepare a systematic research report	PSO-2	PO - 3	C

**Unit I: Introduction to Research**

Objectives - Motivations in Research - Types and Methods – Scope of Business Research - Research Process – Research Gap - Criteria of Good Research.

**Unit II: Research Problem and Design**

Selecting the problem - Defining the problem - Sources - Criteria for Good Research Problem. Research Design: Need for Research Design - Features of a Good Design - Different Research Design.

**Unit III: Data Collection and Sample Design**

Primary data: Observation method – Interview method – Questionnaire – Interview Schedule - Differences between Questionnaire and Schedules - Other methods. Secondary Data: Characteristics – Methods - Case Study. Sample Design: Steps – Characteristics - Types of Sampling.

**Unit IV: Processing and Analysis of Data**

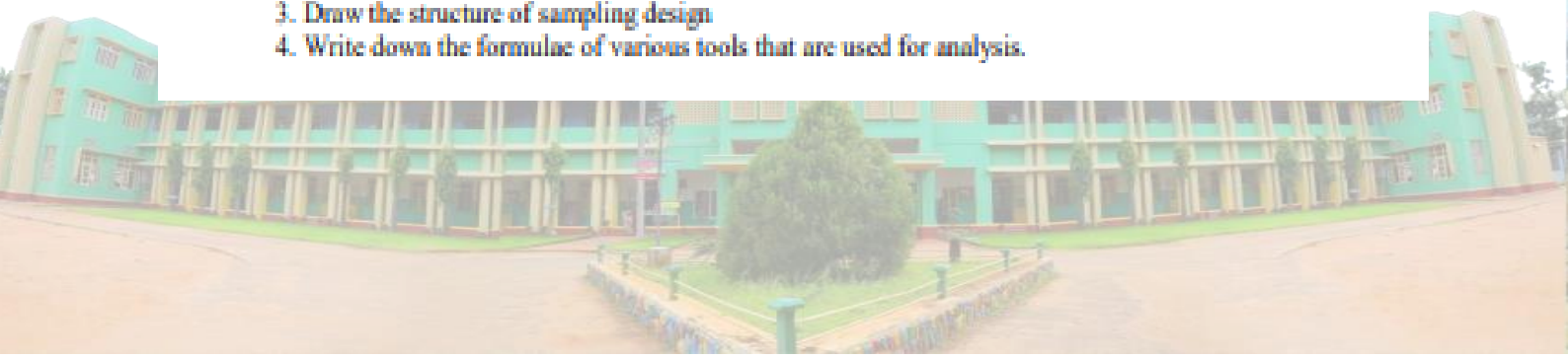
Processing - Editing - Coding – Tabulation - Analysis of Data: Average – Correlation -Regression - Chi-square Test - Garrets Ranking – Testing of Hypothesis; Null Hypothesis-Alternative Hypothesis - Procedure for Hypothesis Testing.

**Unit V: Report Writing**

Significance - Steps - Oral Presentation - Layout of Research Report - Types of Report – Footnotes – Appendix - Norms for Using Index and Bibliography. Introduction to SPSS – Creation of Variables – Data Window – Variable Window.

**Skill Development**

1. Draft the specimen of a Report
2. List out various data collection methods
3. Draw the structure of sampling design
4. Write down the formulae of various tools that are used for analysis.



**Reference Books**

1. Kothari,C.R. ( 2006). *Research Methodology*. (3<sup>rd</sup> ed). New Delhi: New Age International Private Limited Publishers.
2. Saravanavel,P. (2014). *Research Methodology*. (16<sup>th</sup> ed). Allahabad: Kitab Mahal Publication.
3. Donald, R. Cooper. (2006). *Business Research Methods*. (9<sup>th</sup> ed). Delhi: Tata McGraw - Hill Publishing Company Limited.
4. Anderson et al. (2002). *Thesis & Assignment Writing*. (1<sup>st</sup> ed). United States: John Wiley & Sons.
5. Panneeselvam, R. (2009). *Research Methodology*. (3<sup>th</sup> ed). New Delhi: PHL Learning Private Limited.



## DEPARTMENT OF SOCIAL WORK

SEMESTER II  
CORE COURSE VI - SOCIAL WORK RESEARCH AND STATISTICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
WP232CC2	5	2	-	-	4	7	105	25	75	100

**Prerequisites:** Basic Understanding of Social Problems

**Learning Objectives**

1. This course will deal with research problems, construction of hypotheses, testing, research designs, sampling concepts, etc.
2. This course is the process that throws light on the research works during data collection, and codification and interpretation of the data.

**Course Outcomes**

On the successful completion of the course, students will be able to:		
1.	recall the concepts of social work research and identify its nature.	<b>K1</b>
2.	explain the scientific process and ethical issues	<b>K2</b>
3.	apply the research design for data collection and sketch the tools.	<b>K3</b>
4.	formulate hypothesis for the research problem and carryout data analysis	<b>K4</b>
5.	evaluate the research problem based on statistical methods.	<b>K5</b>
6.	develop the research projects in social work.	<b>K6</b>

**K1** - Remember; **K2** - Understand; **K3** – Apply, **K4**- Analyze, **K5**- Evaluate- ; **K6** -Create

Units	Contents	No. of Hours
<b>I</b>	<b>Introduction to Social Work Research :</b> Social Work Research: Concept, Definition, Objectives, Scope, Characteristics and Functions –Types of Research: Pure and Applied Research – Difference between Social Work Research and Social Research. Scientific method in Social Work Research – Need and importance of evidence based practice. Ethical issues in Social Work Research – Formation of Ethics Committee.	<b>21</b>
<b>II</b>	<b>Basic Elements of Scientific method :</b> Basic Elements of Scientific method: Concept, Variable, Facts and Theory. Cause-Effect relationship and relevance to Social Work Research.. Identification and Formulation of Research Problems, Construction of Hypothesis and testing, Research Designs.	<b>21</b>
<b>III</b>	<b>Research Methodology :</b> Sampling: Concept, Definition and Importance – Techniques of Sampling: Probability and Non-Probability sampling – Sources and Types of Data - Methods and Tools of Data Collection – Qualitative and Quantitative Research methods, Participatory Research methods. Pre-test and pilot study, Scaling techniques: Reliability and Validity – Data Processing: Coding, Editing, Tabulation, Analysis and Interpretation – Research Reporting, Preparation of Research Proposals.	<b>21</b>
<b>IV</b>	<b>Statistics:</b> Statistics: Meaning, Need, Importance, and limitations of	<b>21</b>





	Statistics in Social Work Research – Frequency Distribution - Construction of Frequency Tables- Diagrammatic and Graphical Representation. Measures of Central tendency: Mean, Median and Mode - Measurers of dispersion: Range, Quartile deviation, Standard deviation - Test of significance: t-test, Analysis of Variance (ANOVA), Chi-Square test – Correlation.	
V	<b>Computer Applications in Social Research:</b> Computer Applications in Social Research - Use of Computers for Data Analysis – Introduction to Statistical Package for Social Sciences (SPSS)/R: Introduction, basic steps, defining data, data entry, data transformation, and data analysis - Statistical application.	21

<b>Self-study</b>	Computer Applications in Social Research - Use of Computers for Data Analysis.
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**Textbooks**

1. Alston M, Bowles W, 2012. *Research for Social Workers, An introduction to methods*, 3<sup>rd</sup> Edition, Australian Publications, Australia.
2. Adams J, Khan, Robert and David, 2007. *Research methods for Graduate Business and Social Science Students*, SAGE Publications, New Delhi.

**Reference Books**

1. AnandS, 2002. *Research Methods and Techniques in Social Science*, Common wealth Publishers, New Delhi.
2. AhujaR, 2010. *Research Methods*, Rawat Publications, Jaipur.
3. Anderson, D. R. 2014. *Statistics for learners of Economics and Business*, Boston: Cengage Learning.
4. Bryman A, 2004. *Social Research Methods*, Oxford University Press, New York.
5. Babbie E, 2013. *The Practice of Social Research*, 13<sup>th</sup> Edition Cengage Learning, USA.

**Web Resources**

1. [www.campbellcollaboration.org](http://www.campbellcollaboration.org)
2. [www.cochrane.org](http://www.cochrane.org)
3. [www.rip.org.uk](http://www.rip.org.uk)
4. <https://abhattach@usf.edu>
5. <https://www.cengage.com>

**MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOME**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	2	1	2	2	2	2	2	2	1	2
CO2	2	3	2	2	2	2	2	3	3	2	2	2	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	2	2	3	3	3	3	2	3
CO5	3	3	3	3	3	3	3	3	3	2	3	2	3
CO6	3	3	3	3	3	3	3	3	3	3	3	3	3
<b>Total</b>	<b>16</b>	<b>17</b>	<b>16</b>	<b>16</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>17</b>	<b>17</b>	<b>15</b>	<b>16</b>	<b>13</b>	<b>16</b>
<b>Average</b>	<b>2.7</b>	<b>2.8</b>	<b>2.7</b>	<b>2.7</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>2.8</b>	<b>2.8</b>	<b>2.5</b>	<b>2.7</b>	<b>2.2</b>	<b>2.7</b>

3– Strong

2 – Medium

1 - Low

