



Estd : 1957

NALLAMUTHU GOUNDER MAHALINGAM COLLEGE

(AUTONOMOUS AND AFFILIATED TO BHARATHIAR UNIVERSITY)

Re-Accredited by NAAC

An ISO 9001 : 2015 Certified Institution

Aided by the Government of Tamilnadu

POLLACHI - 642 001.



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7 MAY 2024

DATE :

INCLUSION OF RESEARCH ETHICS IN THE RESEARCH METHODOLOGY COURS WORK

An Ethics Committee (EC) has been constituted at NGM College and is an independent body composed of members with expertise in both scientific and non-scientific arenas which functions to ensure the protection of human rights and the well-being of research subjects based on six basic principles of autonomy, justice, beneficence, non-maleficence, confidentiality, and honesty. In our College, we integrate ethics education into the curriculum of Under Graduate, Post Graduate as well as research programmes by including courses or modules specifically focused on research ethics. Topics on paper publication, articles writing, thesis writing etc., have been included in the Post Graduate level.

Research programmes offered by all the research departments of Nallamuthu Gounder Mahalingam College adhere to the Bharathiar University syllabus. As per the UGC guidelines, institutionalized mechanism of research has been established to prevent dishonest or intentional plagiarism. The university has mandated the use of **URKUND** software to identify the originality in research work and eliminate the plagiarism. It is mandatory for any researcher of the college to go for a plagiarism check before the submission of the thesis. The College also provides facility of licensed 'Plagiarism Checker X' tool in the Central Library for post-graduate students, research scholars and faculty members in order to carry out their research work ethically.

The following is the list of programmes having the Research Ethics component in their courses.

Sl. No.	Programme Details		Courses containing Research Ethics component		Category of the Programme (UG/PG/Research)
	Programme	Year	Course Code	Course Name	
1.	B.Com. Computer Applications	2022-25	22UCC6AL	Advanced Learner Course-II: Basics of Research Techniques	Under Graduate

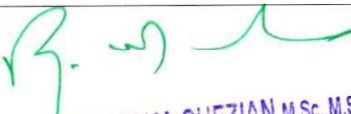
Note: Click the **Course Name** to
View the Syllabus



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Pollachi - 642 001, Coimbatore District.

Sl. No.	Programme Details		Courses containing Research Ethics component		Category of the Programme (UG/PG/Research)
	Programme	Year	Course Code	Course Name	
2.	M.Com. Computer Applications	2020-22	20PCC3E1	Major Elective-I: Research methodology	Post Graduate
3.	M.Sc. Botany	2022-24	22PBY413	Core-13: Research Methodology	Post Graduate
			22PBY414	Core-14: Bioinformatics and Cyber Security	Post Graduate
4.	M.Sc. Chemistry	2022-24	22PCY2E1	Major Elective-I: Green Chemistry, Research Methodology and Cyber Security	Post Graduate
5.	M.Phil./Ph.D. Tamil	2018-19	Paper-I	ஆய்வியல்நெறிமுறைகள் (Research Methodology)	Research
6.	M.Phil./Ph.D. English	2018-19	Paper-I	Research Methodology	Research
7.	M.Phil./Ph.D. Physics	2018-19	Paper-I	Research Methodology	Research
8.	M.Phil./Ph.D. Chemistry	2018-19	Paper-I	Research Methodology	Research
9.	M.Phil./Ph.D. Botany	2018-19	Paper-I	Research Methodology	Research
10.	M.Phil./Ph.D. Commerce	2018-19	Paper-I	Research Methodology	Research
11.	M.Phil./Ph.D. Computer Science	2018-19	Paper-I	Research Methodology	Research
12.	M.Phil./Ph.D. History	2022-23	Paper-I	Research Methodology	Research
13.	M.Phil./Ph.D. Economics	2018-19	Paper-I	Research Methodology	Research
14.	Ph.D. Physical Education	2018-19	Paper-I	Research Methods and Advanced Statistics	Research
15.	Ph.D. Library and Information Science	2018-19	Paper-I (18LISRC01)	Research Methods in Library and Information Science	Research
16.	M.Phil./Ph.D. Social Work	2018-19	Paper-I	Research Methodology	Research
17.	M.Phil. Zoology	2018-19	Paper-I	Research Methodology	Research




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22UCC6AL

Programme Code:	BCCA			Programme Title	Bachelor of Commerce with Computer Applications	
Course Code:	22UCC6AL			Course Title	Batch :	2022-2025
Lecture Hrs./ Week Or Practical Hrs./Week	SS	Tutorial Hrs./Sem	-	Advanced Learner Course II – Basics of Research Techniques	Semester:	VI
					Credits:	2**

Course Objective:

To understand some basic concepts of research and its methodologies

Course Outcomes (CO)

On the successful completion of the course, students will be able to

CO	Course Statement	Knowledge Level
CO1	Understand the basic concepts of research.	K1
CO2	Identify the research problems and to formulate research design	K2
CO3	Implement suitable method for data collection and frame questionnaire.	K3
CO4	Apply statistical tools for analysis	K4
CO5	Infer and interpret the data and prepare the research report	K5

Mapping

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	M	H	M	M	L	H	H	L	H	H	H	L
CO2	M	H	H	H	M	M	M	H	H	H	H	M
CO3	M	H	L	H	H	L	H	L	H	H	M	H
CO4	H	H	H	M	H	M	H	M	H	H	M	H
CO5	H	H	M	H	M	H	L	H	H	H	M	M

Unit	Content	Hours
Unit- 1	Research: Meaning – Objectives – Significance and types – Research process – Criteria of good research – Formulation of research problem – Selecting the research problem – Techniques involved in defining a research problem.	
Unit- 2	Research Design-Meaning-Need for Research design- Features of a good design - Important concepts of research design - Types of Research Design - Hypotheses-Types of hypotheses – Framing of hypotheses.	

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Unit- 3	Collection of Data: Primary – Secondary – Methods – Questionnaire – Types – Pre test – Pilot study – Testing and Validating Questionnaire.	
Unit- 4	Data Editing-data validation – Tabulation - Types of Tables. Data processing, analysis and presentation - Testing of hypotheses - Use of Statistical Packages - Entering data using Spreadsheet – Functions and Formulac.	
Unit- 5	Interpretation and Report Writing: Meaning of Interpretation – Why interpretation – Techniques of interpretation – Report writing – Mechanics of writing a Research report.	

Pedagogy and Assessment Methods:

Power point Presentations, Group discussions, Seminar ,Quiz, Assignment, Experience Discussion and Case study

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Kothari, C.R, and Gaurav Gar	Research Methodology Methods and Techniques	New Age International, New Delhi.	2019

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Devendra Thakur,	Research Methodology in Social Sciences,	Deep and Deep, New Delhi.	2017
2	Gopal Lal Jain	Mangal Deep, Jaipur.	Mangal Deep, Jaipur.	2014
3	Bhome Sharadha	Research Methodology	Himalaya publication house Pvt. Ltd, New Delhi	2018

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature Dr.P.Gomathi Devi	Name and Signature Dr.P.Archanaa	Name and Signature Prof.K.Srinivasan	Name and Signature Dr.R.ManickaChethan
Signature:	Signature:	Signature:	Signature: 

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Programme Code:	MCCA	Programme Title :	Master of Commerce with Computer Applications	
Course Code:	20PCC3E1	Course Title	Batch :	2020-'22
		Major Elective I: Research Methodology	Semester :	III
Hrs/Week:	6		Credits:	5

Course Objective

To give exposure to the students on the basic research skills

Course Outcomes (CO)

K1	CO1	To keep in mind the significance of doing a research
K2	CO2	To get the idea on various steps in research process
K3	CO3	To apply the various statistical tools to analyse the real business situations
K4	CO4	To analyse the various methodology to carry out the research work successfully

Syllabus

Unit	Content	Hours
Unit - 1	Introduction to Research: Meaning - Definition – Functions – Components – Purpose – Types of Research - Significance – Qualities of a good research and researcher – Steps in Research. Research Problem: Meaning - Identification, Selection and Formulation of Research Problem. Research Design: Components of Research Design – Methods of Research Design.	16
Unit - 2	Sampling Design: Census and Sample Survey – Characteristics of a Good Sample Plan – Steps in Sampling – Types of Sampling – Advantages and Limitations of Sampling.	14
Unit - 3	Pre-testing and Pilot Study. Data Collection: Primary Data - Meaning – Significance. Methods of Collecting Data: Observation – Interview Schedule – Questionnaire. Secondary Data - <i>Sources of Secondary Data</i> – <i>Precautions while using Secondary Data</i> .	16
Unit - 4	Hypothesis: Characteristics of a good Hypothesis – Formulation of Hypothesis – Procedure for Testing of Hypothesis – T test, F test and Chi Square Test, Karl Pearson Correlation, Spearman Rank Correlation, Regression	16

Unit - 5	Analysis and Interpretation of Data: Meaning – Need for Interpretation – Techniques of Interpretation. Report Writing: Types of Report – Layout of the Report – Steps in Writing the Report – Evaluation of Report-Research Ethics.	16
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Note:

The question paper shall cover 80% theory and 20% problems

* *Italicized* texts are for self-study.

Teaching Methods

Power point Presentations, Group discussions, Seminar, Assignment, Experience Discussion, Brain storming and Activity

Book for Study

1. Kothari, C.R. (2018), *Research Methodology – Methods and Techniques*, New Delhi: New Age International (P) Limited Publishers.

Books for Reference

1. Mittal, P.C. and Sushil Mehra (2010), *Business Research Methods and Techniques 1st Edition*, New Delhi: Vayu Education of India.
2. Krishnaswami, O.R. and M. Ranganatham (2011), *Methodology of Research in Social Sciences*, Mumbai: Himalaya Publishing House Pvt. Ltd.
3. Gupta, S.P. (2014), *Statistical Methods*, 44th Edition, New Delhi: Sultan Chand and Sons.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	L	M
CO2	M	L	L	L	M
CO3	H	M	M	H	H
CO4	M	L	L	L	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HoD	Checked by CDC	Approved by COE
Dr. P. Anitha	Dr. P. Anitha	Prof. K. Srinivasan	Dr. R. Muthukumaran
			

Programme code	M.Sc.	Programme Title : Master of Science in Botany		
Course Code: 22PBY413		Title: Core — 13 Research Methodology	Batch	2022-2024
			Semester	IV
Hrs/Week:	6		Credits	4

Course Objectives

The main objectives of this course are to:

- Understand the concepts and types involved in research
- Provide the student with a conceptual overview of statistical methods with emphasis on applications commonly used analysis research experiment value.
- Gain the knowledge about the graphical representation of data, estimation, elementary probability and statistical inference will be covered.

Course Outcomes (CO)

On the successful completion of the course, student will be able to:		
CO1	Remember the basic knowledge on research	K1
CO2	Get the idea in the developing strong hypothesis and methodology for research	K2
CO3	Acquire knowledge on basic concepts in Biostatistics	K3
CO4	Evaluate scientific findings through various statistical tools	K4
CO5	Execute the basic research activities using biophysical instruments	K4
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 -Evaluate		

Unit	Content	Hrs
Unit I	Research Methodology: Research- introduction, objectives, types (fundamental, applied, qualitative and quantitative) and significance –selecting research problem –research design – needs and feature of a good design – Basic principles of experimental designs.	14
Unit II	Literature collection and citation: bibliography – bibliometrics (scientometrics): definition- laws – citations and bibliography - <i>*biblioscape-plagiarism</i> – project proposal writing – dissertation writing – <i>paper presentation (oral/poster)</i> – E- learning tools- monograph – introduction and writing- monograph for <i>Aloe vera</i> and <i>Ocimum sanctum</i> –Standard operating procedure (SOP) – introduction and preparation – Research Institutions – National and International.	14
Unit III	Bio statistics – definition – basic principles – variables – collection of data, sample, population and sampling techniques – primary and secondary data – tabulation and presentation of data – measures of central tendency – mean, mode, median and geometric mean – measures of dispersion – range, standard deviation and standard error –hypothesis testing – test of significance – test in large and small sample – t-test, f-test and chi square test – correlation and regression analysis.	16
Unit IV	Tools and applications of Excel and SPSS: measures of central tendency and dispersion – measures of significance – analysis of variance (ANOVA-single factor) – multivariate analysis – probability of distribution (binomial, poisson and normal) –cluster analysis.	14
Unit V	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	14

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**Self study topics*

Power point Presentations, Seminar, Assignment, group discussions and demonstrations

Text Books

1. Kothari, C.R. and GauravGarg, 2014. Research Methodology: Methods and Techniques (3rd revised edition). *New Age International publisher, New Delhi.*
2. Gurumani, N 2010, An introduction to Biostatistics, , MJB publisher
3. Veerabala Rastogi, 2009. Fundamentals of Biostatistics, Ane Books India
4. Mount, D. W. 2004. *Bioinformatics: Sequence and genome analysis. Cold Spring Harbour Laboratory Press.*

Reference Books

1. Jayaraman, J. 2011. Laboratory Manual of Biochemistry, New Age International Private Limited.
2. Sadasivam, S. and Manickam, A. 2008. Biochemical Methods. New Age International Publishers, New Delhi.
3. Prasad and Prasad, 2000. Micro technique, EMKAY Publications.
4. Harborne, 1998. Phytochemical methods, Springer Netherlands
5. M.H. Cordon and R. Macrae, 1987. Instrumental analysis in the Biological Science, Blackie and Son Limited, London.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=w_Ujkt83i18
2. <https://www.youtube.com/watch?v=8iFfzYVuCuM>
3. https://www.youtube.com/watch?v=XEMyDu_VoeQ
4. https://www.youtube.com/watch?v=1Q6_LRZwZrc
5. <https://www.youtube.com/watch?v=Bku1p481z80>

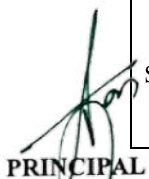
Journals:

1. Journal of Mixed Methods Research.
2. Journal of Research Methods and Methodological Issues.

PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO												
CO1	H	H	M	H	H	H	H	M	H	M	H	H
CO2	H	H	L	H	H	M	H	H	H	H	H	H
CO3	H	H	M	H	H	H	H	M	H	M	H	H
CO4	H	H	M	H	H	H	H	M	H	M	H	H
CO5	H	H	H	H	H	H	L	H	M	H	H	H

H-High M- Medium L –Low

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Name: Dr. R. Rakkimuthu	Name: Dr. R. Rakkimuthu	Name: Mr. K.Srinivasan	Name: Dr. R. Manicka Chezian
Signature:	Signature:	Signature:	Signature:


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Programme code	M.Sc.	Programme Title : Master of Science in Botany		
Course Code: 22PBY414	6	Title : Core – 14 Bioinformatics and Cyber security	Batch	2022-2024
			Semester	IV
Hrs/Week:			Credits	4

Course Objective

The main objectives of this course are to:

- Develop inter disciplinary skills in the application of computers in Botany to learn about the biological databases and machine learning techniques.
- Analyze the structure and functions of protein and nucleic acids using *in silico* tools and to apply the acquired programming knowledge in drug design for phytomedicines

Course Outcomes (CO)

On the successful completion of the course, student will be able to:		
CO1	Apprehend the ideas on molecular biology	K1
CO2	Apply various tools for genomic and proteomic studies	K2
CO3	Figure out the characteristics of biomolecules <i>insilico</i>	K3
CO4	Know the importance of Bioinformatics in Biology for the welfare of society	K4
CO5	Keep in mind the threats to cyber security and related social issues	K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate		

Unit	Content	Hrs
Unit I	Bioinformatics: Definition and Scope. Biological databases – Primary and secondary. Genomics: Definition – Gen Bank, DDBJ – Sequence and molecular file formats. Biological information portal: NCBI and EMB net. BLAST- An overview of BLAST tools available with NCBI – conserved domains – CpG islands.	14
Unit II	Gene prediction methods (Homology, <i>ab initio</i> , and comparative method). Pair wise and multiple sequence alignment, scoring matrices (PAM and BLOSUM). Molecular phylogeny (Cladistics and 64honetic methods) CLUSTAL and PHYLIP.	14
Unit III	Proteomics: Definition, Levels of protein structure, Protein secondary structure prediction (SOPMA and JPRED). Molecular visualization tool – Rasmol and Swiss PDB Viewer. Protein modeling methods – Comparative and <i>De novo</i> methods. Model refinement and evaluation of model. Over view of SWISS PROT. Outline of computer aided drug designing. * <i>Systems biology – concept and applications.</i>	15
Unit IV	Cybersecurity: Overview of cyber security – confidentiality, integrity and availability – Threats – malicious software (viruses, Trojans, rootkits, worms, botnets) – memory exploits (buffer overflow, heap overflow. Integer overflow, format string) – cryptography – authentication – password system – windows security.	15
Unit V	Network security – network intrusion detection and prevention systems – firewalls – software security – vulnerability auditing, penetration testing, sandboxing, control flow integrity – web security – user authentication – legal and ethical issues – cyber crime, * <i>intellectual property rights, copyright, patent, trade secret, hacking and intrusion, privacy, identity threat.</i>	14

*Self study topics (Study material for cyber security is available in college website in the form of e-book.

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Text Books

1. Arthur Conklin W.M., and Greg White, 2016. Principles of computer security. TMH., McGraw-Hill Education; 4 edition
2. Rastogi, S. C., N. Mendiratta, and P. Rastogi, 2008. Bioinformatics - Methods and applications, Genomics, Proteomics and Drug discovery, PHI Learningpvt Ltd., New Delhi.
3. Baxeavanis and Quellette, 1998. Bioinformatics. A practical guide to analysis of genes and proteins.
4. Arthur M. Lesk, 2002. Introduction to Bioinformatics. Published by Oxford University Press.

Reference Books

1. Stuart M. Brown, 2000. Bioinformatics: A biologist's guide to biocomputing and the internet, Eaton publishers.
2. T. K. Attwood and Parry-Smith, 1999. Introduction to Bioinformatics, Pearson Education India Publishers.
3. S. Sundararajan and R. Balaji, 2002. Introduction to Bioinformatics. Himalaya Publishing House.
4. Chwan-Hwa (John) Wu, J. David Irwin, 2016. Computer networks and cyber security. CRC press.
5. Matt Bishop, 2018. Computer security art and science, second edn., Pearson/PHI. Publisher: Addison-Wesley Professional

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.slideshare.net/biinoida/bioinformatics>
2. <https://www.slideshare.net/pubudu/genomics>
3. <https://www.youtube.com/watch?v=vnW9kH0agcE>
4. <https://www.youtube.com/watch?v=5teoROLvijg>
5. <https://www.slideshare.net/vidhyakalaivani29/protein-structure-visualization-toolsrasmol>

PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO												
CO1	H	L	H	M	H	M	M	L	L	L	H	M
CO2	H	M	M	M	M	M	M	H	L	L	H	M
CO3	H	M	H	H	M	H	H	H	L	M	H	M
CO4	H	M	H	M	H	M	H	H	M	M	H	M
CO5	H	M	M	M	H	M	L	M	H	H	H	M

H-High M- Medium L -Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Name: Dr. A. M. Anandakumar	Name: Dr. R. Rakkimuthu	Name: Mr. K.Srinivasan	Name: Dr. R. Manicka Chezhan
Signature:	Signature:	Signature:	Signature:

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Programme Code:	M.Sc			Programme Title:		Master of Chemistry	
Course Code:	22PCY2E1			Major Elective –I: Green Chemistry, Research methodology and Cyber Security		Batch:	2022 - 2024
						Semester:	II
Lecture Hrs./Week	3	Tutorial	-	Total Hrs/Sem	45	Credits:	3
Course Objective							
* To stimulate students to have in-depth knowledge in green chemistry.							
* To acquire a clear idea about various synthesis of Nanomaterials and techniques.							
* To gain knowledge about the significance of research and scientific writing.							
* To apply the principles of Cyber Security and its attack.							

Course Outcomes

On the completion of the course the student will be able to

#	CO Statement	Knowledge Level
CO1	Understand the principles and tools of green chemistry.	K2, K3
CO2	Recollect the hazardous effect of chemicals and solvents used in laboratory.	K3
CO3	Ability to write a good research report.	K5
CO4	Get the idea about cyber security.	K3
CO5	Apply the ideas of legal and ethical issues for cybercrime and plagiarism.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate		

Units	Content	Hrs
Unit I	Green Chemistry Principles Definition, need of green chemistry, twelve basic principles of green chemistry- planning a green synthesis in a chemical laboratory- solvent-less reactions, selection of appropriate solvent, use of microwaves-fundamentals of closed-vessel heating and sonication. Atom efficient processes and atom efficiency, atom economy (with specific reaction).	9
Unit II	Greener Reactions Water as greener solvent- reactions in ionic-liquid, solvent free reaction- solid supported organic synthesis, phase transfer catalyst (PTC), use of microwaves and sonication (any four specific reactions with mechanism).	9

Unit III	Research Methodology Concepts of Research - Importance of research in science, Criteria of good research, Sources of a research problem. Types of research - Basic, applied, action, experimental, diagnostic and exploratory. Primary and secondary sources-N-list-journals, plagiarism, Intellectual property rights, patent, trade mark, Copyrights, Plagiarism. Web of science, Scopus, citations-Science citation index- H – Index, I-10 Index. Scientific Writing Nature and purpose, the components of dissertation and Research paper, Writing techniques. Types of scientific publications-magazines, journals, reviews, news, letters, Structure of Scientific paper. Various reference styles.	13
Unit IV	Over view of cyber security Confidentiality, integrity and availability Threats: Malicious software (viruses, Trojans, root kits, worms, and botnets), Memory exploits (buffer overflow, heap overflow, integer overflow, format string). Cryptography- Authentication, password system- windows security.	7
Unit V	Network security: Network intrusion detection and prevention system, firewalls. Software security: Vulnerability auditing, penetration testing, sandboxing, control flow integrity – web security: user authentication- Legal and ethical issues: trade secret, hacking and intrusion, privacy, identity theft- Legal and ethical issues and Cybercrime.	7
Total Contact Hrs		45

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

22PCY2E1

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ahluwalia. V.K,	Green Chemistry (Environmental benign Reactions)	Ane Books Pvt. Ltd	2006
2	Asim K. Das	Environmental Chemistry with Green Chemistry	Arunabha sen books and allied Pvt. Limited.	2012
3	Kothari. C.R	Research Methodology	New Age International (P) Limited.	2011

பாரதியார் பல்கலைக்கழகம் : கோயம்புத்தூர் - 641 046

எம்.ஃபில் - தமிழ்

(2018-2019Mk; fy;tpahz;L Kjy; Nrh;Nthh;f;FhpaJ)

தாள் 1 : ஆய்வியல் நெறிமுறைகள்

செய்யவேண்டியவை

அலகு : 1 - ஆய்வும் ஆய்வுப் பொருள் தேர்வும் :

ஆய்வு என்பதன் விளக்கம் - ஆய்வாளனுக்குக்குரிய தகுதிகளும் உளப்பாங்கும் - ஆய்வுக்குரிய களம் - ஆய்வு நோக்கினைச் சுட்டல் - ஆய்வுச் சிக்கல் - ஆராயும் பொருள் பற்றித் தெளிதல் - ஆய்வுப் பொருள் பற்றி அதுவரை செய்யப்பட்ட ஆய்வுகள் பற்றிய தொகுப்புரையும் மதிப்பீடும்.

அலகு : 2 - ஆய்வுப் பகுப்பும் தொகுப்பும்/கள ஆய்வு :

முதன்மைக் கூறுகள் (Primary Sources), துணை நிலைக் கூறுகள் (Secondary Sources) இவற்றைத் தொகுத்தலும் பகுத்தலும் - பல்வேறு தொகுப்பு முறைகள் - நேர்காணல் - வினாத்தொகுதி (Questionnaire), மாதிரிகள் (Samples) முதலியவை பற்றிய விளக்கம்.

கள ஆய்வு வகைகள் - மக்கள் இன, பண்பாட்டு ஆய்வு - கள ஆய்வுக்குத் தேவையான பொருட்கள் - கள ஆய்வில் ஈடுபடுவோர் தகுதிகள் - களக்குறிப்புகள் - உள இயலும் கள ஆய்வும் - நேர்காணல், வினா நிரல் ஆகியவற்றின் விளக்கம் - நேர்காணலின் வகைகள் - உற்று நோக்கல் - உற்று நோக்குவோரின் அணுகுமுறைகள் - எழுத்து, பட ஆதாரம் - புகைப்படம், திரைப்படம், நாடா ஒலிப்பதிவு, ஒவியம், அரும்பொருள்கள் - இணையம் - இதழ்கள் ஆகியவற்றைப் பயன்படுத்தும் முறைகள்.

அலகு : 3 - ஆய்வு அணுகுமுறைகள் :

ஆய்வுநெறிமுறைகளின் வகைகள் - அளவையியல் முறை(Logical Method)>அறிவியல் முறை (Scientific Method), அமைப்பு முறை (Systems Method), வரலாற்று முறை (Historical Method).ஒவ்வொரு குறிப்பிட்ட துறை,பொருளுக்கேற்ப ஆய்வு நெறிமுறையை அமைத்தல்.

அலகு : 4 - ஆய்வேட்டின் உருவாக்கம் :

ஆய்வேட்டை உருவாக்கும் பல்வகை நிலைகள், மாதிரி வரைவு - பொறியாளர், அறிஞர்களின் கருத்தறிதல் - கலந்துரையாடல், மாதிரி வரைவை மறுபார்வை செய்தல் - திருத்தல் - செம்மையாக்கல் - ஆய்வேட்டின் அமைப்பு - பகுதிகள் - இயல் பிரிப்பு - சுருக்கக் குறியீடு, அடிக்குறிப்புகள், அட்டவணை, விளக்கப் படங்கள், பின்னிணைப்பு முதலியன - ஆய்வேட்டின் கட்டமைப்பும் புறத்தோற்றமும்.

அலகு : 5 - தற்கால தமிழாய்வுப் போக்குகள் :

உருவவியல் -அமைப்பியல் - குறியியல் - தொல் படிமவியல் - இலக்கிய வகை நிலையியல் - தத்துவவியல் - நவீனத்துவம் - மார்க்சியம் - பெண்ணியம் - தலித்தியம் முதலான தற்கால ஆய்வுப் போக்குகள்.

ஆழ்ந்து கற்க வேண்டிய நூல்கள் :

- 1) ஆய்வியல் அறிமுகம் - டாக்டர் தமிழண்ணல், டாக்டர் எம்.எஸ். இலக்குமணன்.
- 2) இலக்கிய ஆராய்ச்சி முறைகள் - டாக்டர் முத்துச் சண்முகம், டாக்டர் சு. வேங்கடராமன்.
- 3) ஆய்வியல் நெறிகள் - கு.வெ. பாலசுப்பிரமணியம்.

பார்வை நூல்கள் :

- 1) ஆய்வுக் கட்டுரை எழுதும் முறை - டாக்டர் முத்துச் சண்முகம், டாக்டர் சு. வேங்கடராமன்.
- 2) நாட்டார் வழக்காற்றியல் கள ஆய்வு - தே. லார்து
- 3) கள ஆய்வில் சில அனுபவங்கள் - டாக்டர் சரசுவதி வேணுகோபால்
- 4) Thesis and Assignment Writing - Anderson and other Willey Eastern Pvt. Ltd., New Delhi.
- 5) Form and Style in Thesis writing - Comp bell & N.G. London, European Limited.
- 6) Literary thesis a guide to Research - Watson, George Horlowlonmans.
- 7) Introduction to Research Theory - K M P Variar, Madras.
- 8) திறனாய்வுக்கலை : தி.சு. நடராஜன் (என்.சி.பி.எச். வெளியீடு)
- 9) ஆராய்ச்சி முறைமைகள் - முனைவர் எச்.சித்திரபுத்திரன், முனைவர் ஆ.சண்முகம்.
- 10) நாட்டுப்புறவியல் - கள ஆய்வு - முனைவர் இரா. சந்திரசேகரன் மற்றும் பலர்.
- 11) இலக்கியமும் திறனாய்வு கோட்பாடுகளும் - க. பஞ்சாங்கம்.

BHARATHIAR UNIVERSITY – COIMBATORE – 641 046

M.Phil./Ph.D. – ENGLISH

PART I – SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PAPER I – RESEARCH METHODOLOGY

Objectives

1. To initiate scientific approach to research
2. To develop historical perspectives on research
3. To enhance learners' understanding of the methods and mechanics of Research Writing

Unit I Identification of a research problem and the choice of subject, norms, conventions and format of Thesis.

Unit II Introduction- Research Methods for English Studies – Gabriel Griffin- 1- 18
Chapter 5- Visual Methodologies- 69-92
Chapter 7- The Uses of Ethnographic, Methods in English Studies 113- 132

Unit III The Mechanics of Writing

Unit IV Documentation – works cited

Unit V Presentation of research

The Mechanics of Writing, Proof Reading, Citation Parenthetical Referencing, Title, aim, objectives, e-resources quoting and in-text citations using standard research findings and style sheet.

Prescribed Text

Gibaldi, Joseph. MLA Handbook for writers of Research Papers, New Delhi: EWP, 2016 (8th edition).

Research Methods for English Studies – Gabriel Griffin- Eduiburg Press.

Suggested Readings

1. Parsons C.J. Thesis and Project Work.
2. Anderson, Jonathan, B.H. Durston and M.Pcole. Thesis and Assignment Writing, New Delhi: Wiley Eastern, 1970.
3. Thorpe, ed. Aims and Methods of Scholarship.
4. Watson, G. The Literary Thesis.
5. Bateson, F.W. The Scholar Critic.
6. Ananda Kumar Raju. ABC of Literature.
7. Kothari, C.R. Research Methodology: Methods and Techniques, Delhi: New Age International Ltd.1985.
8. Rengachari, S. & Rengachari, Sulochna. Research Methodology for English Literature, Bareilly: Prakash Book Depot,
9. Sinha, M.P. Research Methods in English.
10. Winkler, Anthony C. & Accuen, Jo Roy. Writing the Research Paper: Thomson Heinle, 2003.

BHARATHIARUNIVERSITY, COIMBATORE - 641 046

M.Phil / Ph.D. - PHYSICS

PART - 1 SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PAPER – I

- Research Methodology

PAPER - II

- Advanced Physics

PAPER – III

- 1. Physics of Nanomaterials and device**
- 2. Plasma Physics**
- 3. Thin Film Technology**
- 4. Molecular quantum mechanics**
- 5. Nuclear Physics**
- 6. Principles and Methods of Crystal Growth**
- 7. Nonlinear Dynamics**
- 8. Solar Energy and its Utilization**
- 9. Electrochemical Energy Devices**
- 10. Computational fluid dynamics**
- 11. Atmospheric Physics**
- 12. Astronomy, Astrophysics and Cosmology**

PAPER – I RESEARCH METHODOLOGY**Unit - 1 Data Analysis**

Approximate numbers and Significant Figures – Rounding of Numbers – Absolute, Relative and Percentage errors – Relation between Relative error and the significant figures – The general formula for errors – Formulas to the fundamental operations of arithmetic and logarithms – Accuracy in the evaluation of a Formula – Accuracy in the Determination of arguments from a tabulated functions – Accuracy of Series approximations – Errors in Determinants - Errors of Observations and Measurement – The law of accidental errors – Examples and exercises for data analysis

Unit – 2 Monte Carlo Method

Random variables – Discrete random variables - Tossing of a coin, Throwing of a die – Continuous random variables - normal random variables – The central limit theorem – General scheme of Monte Carlo method – generating random variables on a computer – tables of random numbers – generators of random numbers – Pseudorandom numbers – transformation of random variables – modelling of discrete random variable – modelling of continuous random variable – von Neumann's method for modelling a continuous random variable – modelling normal variables – evaluating a definite integral - method of computation – sampling – numerical examples – error estimates

Unit – 3 (Theory and Problems)

Least squares approximation of functions: Linear regression – Polynomial regression – Fitting exponential and trigonometric functions

Interpolation: Newton's method for equal and unequal intervals - Cubic spline (CS) methods – Minimizing property – Error in CS and its derivatives – Surface fitting by CS - Inverse interpolation - Double difference - Double interpolation

Numerical optimization: Minimization of a function - finding extreme values of a function – minimization using derivatives – steepest descent method (gradient method)

Integration: Gauss quadrature – double integration

Unit – 4 (Theory and Problems)**Ordinary Differential equation:**

Predictor – Corrector method: Adams–Moulton method – Milne's method - Boundary value problem; Finite difference method – shooting method

Solution of Partial differential equations: Types of equations – Derivation of difference equation – Solving of elliptic, parabolic and hyperbolic equations – Explicit, Implicit, Crank Nicholson methods - Boundary conditions: Dirichlet, Neumann, conditions

Finite element method: Introduction – functional – base functions - methods of approximation – Galerkin method – Finite element method for one dimensional problems

Unit – 5

Fortran programming: Character Set - Constants - Variables – Subscripted variables – Dimension, Common, Parameter statements – Arithmetic, character, and logical operations – List directed and formatted input and output statements – File processing - Control statements (Do, If, Goto structures) - Subprograms – Function subprogram – Subroutine subprogram - **Simple programs:** Ordering of numbers – matrix manipulation – roots of quadratic equation - least square curve fitting

Python: Basic syntax – variables and data types – operators- Control statements: if, if-else, nested if-else – loops (for, while); nested loops – break – continue – pass - Strings and text files; manipulating files and directories – Defining a function - Calling a function – Types of functions – Function arguments – Importing module – math module – Input-Output: printing on screen – reading data from keyboard, opening and closing file – reading and writing files.

Books for study and reference

1. NumericalMathematicalAnalysis, Scarborough J.B
2. Computer Applications in Physics - Suresh Chandra, Mohit Kumar Sharma – Narosa, 3rd edition (2014)
3. Introductory methods of numerical analysis – S.S. Shastry, PHI Learning Ltd, (2010)
4. Ilya M. Sobal , A primer for the montecarlo method, CRC Press.
5. Numerical methods for mathematics, science and engineering, John H. Matthews, PHI 2nd edition (2000)
6. Programming with Fortran 77, Ram Kumar, Tata McGraw Hill, (1994)
7. Fundamentals of Python: First Programs Author: Kenneth Lambert Publisher: Course Technology, Cengage Learning, 2012 ISBN-13: 978-1-111-82270-5
8. Making Use of Python, Rashi Gupta, Wiley Publishing, Inc., New York, 2002

PAPER-II- ADVANCED PHYSICS**UNIT-I: Optical, Non-Linear and Electro-Optical Effects of Crystals**

Double refraction - Optical indicatrix – Effect of crystal symmetry on optical indicatrix – Wave surface: Uniaxial and Biaxial crystals

Non-Linear Optics: Harmonic generation – Second Harmonic Generation – Phase matching – Third Harmonic Generation – Optical Mixing - Sum and difference frequencies – Parametric generation of light – Self-focusing of intense light beams

Electro-Optic Effect: Phase retardation – Longitudinal electro-optic modulators: Amplitude modulation – Phase modulation of light – Transverse electro-optic modulators – Electro-optic beam deflection.

BHARATHIAR UNIVERSITY::COIMBATORE – 46

M. Phil / Ph.D. - CHEMISTRY

PART I - SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PART I: PAPER – I: RESEARCH METHODOLOGY

PAPER – II: PHYSICAL METHODS IN CHEMISTRY

PAPER – III: SPECIAL PAPERS

1. Environmental Chemistry
2. Polymer Chemistry
3. Organic Chemistry
4. Solid state chemistry.
5. Organometallic chemistry of transition metals.
6. Photochemistry-photophysical studies.
7. Physical organic chemistry
8. ElectroChemistry
9. Chemistry of advanced materials.
10. Organic Synthetic Methodology and Conformational Analysis

Note:

1. The syllabus for the above papers (Paper I, II and III Special Paper 6: Environmental Chemistry and Paper 10 : Polymer Chemistry) be the same as prescribed for the academic year 2009-10.
2. The syllabus for Paper I, II and III Special Paper 6: Environmental Chemistry and Paper 10 : Polymer Chemistry is furnished below.

PAPER – I: RESEARCH METHODOLOGY

UNIT - I

Dissertation: Nature and purpose, components and preparation- Writing techniques: Introduction, word processing and page layout, writing and formatting with a computer- Figures: general considerations, line art, drawing with a computer and halftones- Tables: logic behind a table, significance of a table, form of a table, components of a table - Worksheets, lists and databases. Plagiarism.

Collection and Citation of Literature:

Acquisition of information, building up of own literature collection, citation techniques, forms of citation, web of science, SCI, Scopus, H index and I10 index.

Publication of Journal Articles:

Concept, electronic publication, types of journals, impact factor, decision prior to publication, components of a journal article, preparation of the manuscript, from manuscript to publication and online submission.

Submission of Research Proposals:

Leading funding agencies in India, Submission of research project proposals with prescribed formats.

UNIT - II Data

Analysis:

Errors – classification of errors - precision - accuracy – improving accuracy of analysis – significant figures – mean, standard deviation – comparison of results: “t”test, “f” test and “chi” square test – rejection of results – presentation of data.

Sampling – introduction – definitions – theory of sampling – techniques of sampling – statistical criteria of good sampling and required size – stratified sampling vs random sampling – minimization of variance in stratified sampling –transmission and storage of samples.

UNIT - III

Atomic Spectroscopy and Flame emission

Spectroscopy

Types of atomic spectroscopy – emission methods – absorption methods – fluorescence methods – atomizers for atomic spectroscopy: flame atomizers, Electrothermal atomizers – inductively coupled plasma sources of radiation – Instrumentation - Applications of atomic emission spectroscopy – flames and flame spectra.

Fluorometric analysis:

Types of Fluorescence and phosphorescence – factors affecting fluorescence and Phosphorescence – quenching – relation between intensity of fluorescence and concentration – measurement of fluorescence – applications.

UNIT - IV

Gas Chromatography:

Theory of chromatography – column efficiency and column equation – sample injection – sampling system for capillary columns and packed columns – detectors – gas flow control system – high resolution gas chromatography/mass spectrometry.

HPLC:

Principles of high performance liquid chromatography – Instrumentation - Pumps: types of pumps - requirements – Column packing : gradient elution, isocratic elution – Detectors for liquid chromatography – the mobile phase in HPLC – solvent degassing – column technology – column selection – quantitative analysis by HPLC-Applications.

UNIT-V Electroanalytical methods:

Redox potentials – definition – Methods of determination – applications – ion selective electrodes. Current – voltage relationships – polarography – instrumentation –Types of polarography– characteristics of DME – diffusion current – half wave potentials. Amperometric titrations - constant current coulometry – constant potential coulometry, cyclic voltammetry – basic principles and applications.

REFERENCES:

1. The art of Scientific Writing – H.F. Ebel, C. Bliefert and W.E. Russey 2nd ed Weinheim; Wiley-VCH (2004) .
2. R.C. Kapoor and B. S. Aggarwal - Principles of polography, 1st edition, Wiley (1991).
3. G. W. Ewing -Instrumental methods of chemical analysis, 4th edition McGraw-Hill (1975).
4. Analytical electrochemistry- Joseph Wang, 2nd edition wiley (2001).
5. Instrumental methods of analysis – H. Willard, L. Merritt Jr. and A. Dean. 4th Edn (1996)
6. Instrumental methods of chemical analysis – B.K. Sharma., GOEL PUBLISHERS 28TH EDITION (2012).
7. Fundamentals of analytical chemistry – D.A. Skoog and D. M. West. 7th Edu, Saunders College Pub (1996)
8. Analytical chemistry – J.D. Dick. American Chemical Society (2007)
9. Basic concepts of analytical chemistry – S.M. Khopkar. New Age International, 1998.
10. Vogel's Textbook of Qualitative chemical analysis-5th edition.
11. Introduction of instrumental analysis (R. D. Braun,)(2009)
12. Principles of fluorescence spectroscopy – Joseph R. Lakowicz., 3rd edition Springer (2006).

BHARATHIAR UNIVERSITY: COIMBATORE – 641 046

M.Phil. /Ph.D. - BOTANY

PART I: SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PAPER I – RESEARCH METHODOLOGY

UNIT 1:

Principals and methodology of spectrophotometer, dialysis and Lyophilization, centrifugation, (high speed and ultra), Microscopy (SEM, TEM and Fluorescent).

UNIT II:

Principles and methodology of chromatography- GC, HPLC, & GCMS. Electrophoresis - Agarose, SDS – PAGE, Western blot. Phytochemistry – extraction, isolation, characterization and identification of alkaloids and flavanoids.

UNIT III:

Nucleic acids - Isolation and purification of DNA, PCR & RTPCR. Genome mapping; molecular markers – RFLP, AFLP, RAPD. Southern and Northern hybridization techniques, Colony hybridization. ,

UNIT IV:

Culture techniques – Media preparation; (PDA, Nutrient Agar, CHU-10); Isolation, purification and maintenance of microorganisms, Plant tissue culture – MS medium, Gamborg medium; Sterilization techniques- (physical and chemical). Cytological techniques – pretreatment, fixatives and stains. Microtomy.

UNIT V:

Field Techniques – Herbarium preparation Vegetation analysis (floristic, physiognomic and phytosociology (transect, quadrat, point or pointless and loop); Forest mapping and change detection using remote sensing and GIS. Thesis writing-Manuscript preparation, Citation style: Introduction to SPSS. (Statistical package for social science).

References:

1. Bhattacharyya, 2006, D. K, Research Methodology, Excel Books India, PP 1-414
2. Gupta, P.K., 1994, Elements of Biotechnology, Rastogi, Meerut
3. Kothari C. R., 2004, Research Methodology: Methods and Techniques, New Age International, pp- 1- 401
4. N. Gurumani, 2006, Research Methodology: For Biological Sciences, MJP Publishers, ISBN 9788180940163, PP 1- 753
5. Sam Daniel P., Aroma G. Sam, 2011, Research Methodology, Gyan Publishing House, PP 1-254
6. Trease G.E. and Evans W.C. 1978 – Pharmacognosy Bailliere Tindal, London

BHARATHIAR UNIVERSITY: COIMBATORE - 641 046.

M.Phil / Ph.D. - COMMERCE (FT / PT)

PART - I –SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PAPER - I RESEARCH METHODOLOGY

UNIT - I

Nature and Scope of Research in Business- Types of Research - Significance - Research Process- Characteristics of Good Research- Problems faced by researchers in India.

UNIT - II

Problem Identification and Selection – Review of Literature – Need for review of Literature - Research Design - Meaning, Need, Features of Good Design - Different types of Research Design - Developing a Research Plan -Hypothesis-Meaning-Significance-Testing-Types-Type I/ II Errors.

UNIT - III

Sampling Design, Procedures, Types - Errors - Scaling Techniques, Rating Scales – attitude scales- Likert, Thurstone and Guttman Scales.

UNIT - IV

Methods of Data Collection - Primary and Secondary Data - Sources: Questionnaire, Interview, Observation, Mail and E-Mail Surveys - Pilot Study and Pre-testing- Role of Computers in Research -Role and Functions of SPSS in Research – Internet Sources - Data Base - Web Sites available for Data Collection.

UNIT - V

Analysis and Interpretation- Significance – Points to be noted in Analysis and Interpretation - Report Writing - Layout of the Report - Types of Report - Steps in writing the Report – Foot Note – Bibliography.

Note: The Question Paper shall cover 100% theory.

Reference Books:

1. Emory, Business Research Methods, Home Wood, R.D. Irwin; Georgetown,
2. C.R.Kothari, Research Methodology - Methods and Techniques, New Age International Publishers
3. Wilkinson & Bhandarkar, Research Methodology in Social Sciences, Himalaya Publishing House.
4. Rummel & Ballaine: Business Research Methods, Joanna Cotler Books.
5. Bajabai- Business Research Methods, Pearson Education, Second Edition.
6. Dr. Amarchand - Research Methods, Emerald Publishers.
7. Saravanavel – Research methodology, Kitab Mahal Publishers.
8. O.R.Krishnasamy- Methodology of Research in Social Sciences, Himalaya Publishers.
9. Young, Pauline V. Scientific Social Surveys in Research, Prentice Hall, Englewood Cliffs, NF.
10. Anderson –Thesis and Assignment Writing, Johan Wiley & Sons inc;

BHARATHIAR UNIVERSITY: COIMBATORE 641046

M. Phil. / Ph.D. – COMPUTER SCIENCE

PART I – SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PAPER I - RESEARCH METHODOLOGY

PAPER II - ADVANCED TECHNOLOGIES IN COMPUTER SCIENCE

- PAPER III
1. DATA WAREHOUSING AND MINING.
 2. DIGITAL IMAGE PROCESSING.
 3. ADVANCED NETWORKING.
 4. NATURAL LANGUAGE PROCESSING.
 5. DATA COMPRESSION.
 6. AGENT BASED COMPUTING.
 7. SOFT COMPUTING.
 8. SOFTWARE TESTING AND QUALITY ASSURANCE.
 9. KNOWLEDGE MANAGEMENT AND BUSINESS INTELLIGENCE.
 10. GRID AND CLOUD COMPUTING.
 11. ARTIFICIAL INTELLIGENCE AND ROBOTICS.
 12. BIOINSPIRED COMPUTING.
 13. CONCURRENT ENGINEERING INFORMATION SYSTEM.
 14. SPEECH PROCESSING.
 15. INFORMATION SECURITY.

PAPER I - RESEARCH METHODOLOGY

UNIT – I RESEARCH METHODS

Meaning of Research- Objectives of Research- Motivation in Research- Types of Research- Research Approaches- Significance of Research-research methods versus Methodology-Research and Scientific Method- Importance of Knowing How Research is done- Research Process – Criteria of good Research –Problem Encountered by Researchers in India- What is Research Problem? Selecting the Problem- Necessity of Defining the Problem- Technique involved in Defining the Problem- Meaning of Research Design- Need for Research Design- Features of a Good Design- Important Concepts Relating to Research Design- Different research design- Basic principles of Experimental Designs- Significance of Report Writing- Different Steps in writing Report- Layout of the Research Report- Types of Reports- Oral Presentation Mechanics of Writing a Research Report- Precautions for Writing Research Reports.

UNIT – II ALGORITHMS AND ANALYSIS

Elementary data Structures, Greedy method: Knapsack problem-job sequencing with deadlines- Optimal merge patterns, Dynamic Programming: Multistage graphs-Optimal binary search trees- 0/1 knapsack- Reliability design- The traveling salesperson problem- Flow shop scheduling, Basics search and traversal techniques: The techniques Code Optimization- Biconnected components and depth- first search. Backtracking: The 8 – Queen s problem- Sum of subsets – Hamiltonian cycles-Knapsack Problem.

UNIT – III COMPILER DESIGN

Introduction to compiling- The Phases of a Compiler- Lexical Analysis- The role of the lexical analyser-Specification &Recognition of tokens- Finite Automata-Conversion of Regular Expression to NFA – Syntax Analysis- The Role of the Parser-Context Free Grammar- Top-Down Parsing: Predictive Parser- Bottom- Up Parsing: SLR Parser Syntax- Directed Translation- Type Checking- Specification of a simple type checker -Type Conversion- An algorithm for Unification- Symbol tables- Intermediate Code Generation-Code Generation- Issues in the design of code generator- Basic Blocks and Flow Graphs- Code Optimization- The Principal sources of optimization-optimization of basic blocks.

UNIT – IV OBJECT ORIENTED ANALYSIS, DESIGN AND DEVELOPMENT

Object Oriented Design Fundamentals: The Object Model - Classes and Objects - Complexity - Classification - Notation - Process - Pragmatics – binary and entity relationship - object types - object state - OOSD life cycle. Object Oriented Analysis: Overview of object analysis - Shatter/Mellor, Coad/Yourdon, Rumbaugh, Booch - UML – Use case model– Conceptual model - behavior - class - analysis patterns - overview - diagrams - aggregation. Object Oriented Design Methods: UML - diagrams - collaboration - sequence - class - design patterns and frameworks - comparison with other design methods. Managing Object Oriented Development: Managing analysis and design - Evaluation testing - coding - Maintenance - Metrics. Object Oriented Development: Design of Foundation class libraries - Object Oriented Databases - Client/Server Computing - Middleware.

UNIT – V SOFTWARE ENGINEERING

Software Engineering Process paradigms - Project management - Process and Project Metrics – software estimation - Empirical estimation models - planning - Risk analysis - Software project scheduling. Requirements Analysis and Design: Prototyping - Specification - Analysis modeling - Software design - Abstraction - Modularity - Software Architecture - Effective modular design - Cohesion and Coupling - Architecture design and Procedural design - Data flow oriented design- design patterns. User interface design - Human Computer Interface design - Interface design - Interface standards. Programming languages and coding - Language classes - Code documentation – Code efficiency - Software Configuration Management – real time systems- Reverse Engineering and Re-engineering-CASE tools - Projects management, tools - analysis and design tools - Programming tools - integration and testing tools – clean room software engineering.

REFERENCE BOOKS:

1. C.R.Kothari,"Research Methodology Methods & Techniques" 2nd Edition, Wishwa Prakashan Publishers.
2. Dr.Rajammal P. Devadas,"A. Handbook on Methodology of Research-Sri Ramakrishna Mission Vidyalyaya College of Rural Higher Education".
3. Alfre V. Aho, John E. Hpcroft, Jeffrey D. Ullman," Data structures and Algorithms", Addison- Wesley Publishing Company, 1987.
4. Ellis Harowitz, Sartaj Sahini, "Compute Algorithms", Galgotia Publications (P) Ltd., 1993.
5. Alfre V. Aho, Ravi Sethi and Jeffrey D. Ullman," Compiler Principles, Techniques and Tools", Addison Wesley Publishing Co,1986.
6. Jean Paul, Tremblay, Paul G. Sorenson, "The Theory and Practices of Compiler Writing" Mc. GrawHill Inc, International Student Edition, 1985.
7. Craig Larman, "Applying UML and patterns ", Addison Wesley, 2000.
8. Grady Booch, James Rumbaugh, Ivar Jacobson," The Unified Modeling Language
9. User Guide ", Addison-Wesley Long man, 1999.
10. Ali Bahrami, "Object Oriented System Development ", McGraw Hill International Edition, 1999.
11. Erich Gamma, "Design Patterns ", Addison Wesley, 1994.
12. Roger Pressman.S., " Software Engineering : A Practitioner's Approach ", 3rd Edition, McGraw Hill, 1997.
13. P Fleeger, "Software Engineering ", Prentice Hall, 1999.
14. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli "Fundamental of Software Engineering ", Prentice Hall of India 1991.

M.Phil/Ph.d in HISTORY

Research Course Work Syllabus

2022 – 2023



DEPARTMENT OF HISTORY AND TOURISM

BHARATHIAR UNIVERSITY

**(A State University, Accredited with “A” grade by NAAC and
13th Rank among Indian Universities by MHRD-NIRF)**

COIMBATORE – 642 046 TAMILNADU, INDIA

BHARATHIAR UNIVERSITY-COIMBATORE-641-046

DEPARTMENT OF HISTORY

Paper-I RESEARCH METHODOLOGY

Objectives:

- To learn the meaning, value and classification of history
- To study the forerunners of Historiography.
- To impart knowledge on historical writings in India
- To train the students on the art of writing history
- To inculcate historical research and methodology fervour among the students

UNIT-I:

Meaning of History-Definition of History-Scope and Purpose of History- Important Study of History Uses and Abuses of History-History and Allied Subjects

UNIT-II:

Ancient Graeco Roman Tradition-Herodotus-Thucydides-Livy-Tacitus- Medieval Western Historiography- Eusebius St Augustine-Modern Historiography- I.V.Ranke- Hegel-A.J.Toynbee-Indian Tradition-Kalhana- Alberuni- J.N.Sarakar- V.A.Smith- R.C.Majumdar-K.M.Panikkar-D.D.Kosambi-RomilaThapar-S.Krishnawamy Iyengar- K.A.Nilakanta Sastri-SadasivaPandarathar-R.Sathianather

UNIT-III:

Theological Orientalist-Annals-Positivism-Imperialist-Nationalist-Marxist-Subaltern- Post Modernism-Cyclical Theory-Progressive Theory-Deterministic Theory- Structuralism-Post Structuralism

UNIT-IV:

Selection of a Research Topic- Importance of Sources-Primary and Secondary Sources- Requisites of a Researcher- Historical Method Objectivity- Internal and External Criticism.

UNIT-V:

Collection of Data-Analysis and Compiling- Hypothesis-Documentation-Footnotes-
Bibliography-Thesis Arrangement

TEXT BOOKS:

1. Rajayyan.K., History in Theory and Method, Madurai Pubmishing House, Madurai, 1977
2. Venkatesan, G., Historiography, V.C. Publications, Rajapalayam, 1994 3.
3. Sreedharan E., A Text Book of Historiography, Orient Black Swan, New Delhi, 2009
4. Carr.E.H., What is History? Macmillan & Co.Ltd, London, 1961
5. Subramanian.N., Historical research Methodology, Ennes Publication, Madurai, 1980
6. Collingwood.R.G., The Idea of History, Oxford, 1949
7. Sheik Ali.B., Its Theory & Method, Macmillan Indian Ltd, Madras 2019.

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1. Carlyle., On Heroes Hero worship and the Heroic in History, New York, 1928
2. Bury J.B. The Ides of Progress, New York, 1955
3. Buckard J., Hudgements in History and Historians, Landon, 1958
4. Durant, Will and Ariel, The Lessons of History, New York, 1968
5. Fischer.D.H., Historian's Fallacies, London, 1971
6. Gooch.G.P. History and the Historians in the 19 century, London, 1961 7.
Grant.A.J., Engisih Historian, London, 1906
7. Majumdar.R.C., Historiography in Modem India, Bombay, 1970
8. Sastri K.A.N. Historical Method in Relation to Indian History. Mysore, Madras, 1991
9. Manickam S. Theory of History and Methods of Research (Select Themes),
Madurai 2000

BHARATHIAR UNIVERSITY: COIMBATORE- 641 046

M.Phil. / Ph.D. - ECONOMICS

PART-I SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PAPER I : RESEARCH METHODOLOGY

PAPER II: ECONOMIC ANALYSIS

PAPER III: Special Papers

1. **AGRICULTURE ECONOMICS**
2. **INDUSTRIAL ECONOMICS**
3. **PUBLIC ECONOMICS**
4. **ENVIRONMENTAL ECONOMICS**
5. **MONETARY ECONOMICS**
6. **INTERNATIONAL ECONOMICS**
7. **ECONOMICS OF HUMAN RESOURCES**
8. **ECONOMICS OF SERVICE SECTOR**
9. **RURAL DEVELOPMENT**

PAPER I: RESEARCH METHODOLOGY

UNIT-I

Economic Research: Significance of Economic Research – Types of Research – Formation of Research Problem –Formulation of Hypothesis – Sources of Data – Methods of Data Collection – Sampling design: Random and Non-random.

UNIT-II

Data analysis: Measuring of central Tendency and Dispersion – Tests of Hypothesis – Types of Errors – Parametric and Non-Parametric test: „t“ Test – „z“ Test – „F“ Test and ANOVA – Chi-square Test

UNIT-III

Correlation: Meaning – Types of Correlation: Simple, Partial and Multiple Correlation – Regression: Meaning – Linear Regression – Difference between Correlation and Regression.

UNIT-IV

Index Numbers: Their concept as Weighted Averages –Problems in the Construction of Index Numbers – Chain Index – Cost of Living Index Number (different formulae) - Wholesale Price Index and Cost of Living Index in India – Uses of Index Numbers.

Time Series Analysis: Meaning – Components of Time series – Measurement of Trend: Method of Least Square – Measurement of Seasonal Variation: Ratio – to Moving Average Method.

UNIT-V -Research paper writing – content-structure-types – ranking

Thesis and Report Writing – Different stages in writing Report – Layout of the Research Report – Types – Precautions in writing Research Reports – Foot notes – Bibliography.

(Note: Question Pattern: Theoretical aspects 70% and Problem 30%. In either or question pattern, questions 2(b), 3(b) and 4(b) may be problem solving)

References

1. C.R.Kothari – Research Methodology, methods and Techniques – Willy Eastern Ltd., 1988.
2. A.Koutsoyiannis – Theory of Econometrics – An Introductory Exposition of Econometrics Methods - Macmillan Ltd., 1987.
3. M.Cohen and E.Nagal – An Introduction to logic and Scientific method, New York 1962
4. William J Goode & Paul K Hatt – Methods in Social Research, 1972
5. Pauling V.Young – Scientific Social Survey's and Research, Prentice Hall – (Dorsey Press), New York.
- 6.Wonnacott and Wonnacott – Econometrics

BHARATHIAR UNIVERSITY – COIMBATORE – 641 046.

M.Phil. / Ph.D. – PHYSICAL EDUCATION

PART I - SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PAPER I

Research Methods and Advanced Statistics

PAPER II

Modern Trends in Physical Education

PAPER III

- 1. Sports Physiology**
- 2. Sports Training**
- 3. Sports Psychology**
- 4. Sports Medicine**
- 5. Yoga and Health**
- 6. Measurement and Evaluation in Physical Education**
- 7. Sports Physiotherapy and Rehabilitation**
- 8. Sports Management in Physical Education**
- 9. Fitness and Wellness**

PAPER-I - RESEARCH METHODS AND ADVANCE STATISTICS

Unit.I Fundamental Concepts:

- 1.1 Research - meaning and identification of research problem - statement of research problems - criteria for selection of problem.
- 1.2 Types of research – basic – action- applied, Methods of research - historical, longitudinal, experimental, philosophical, surveys - case study.
- 1.3 Variables meaning and identification, independent, dependent, control, intervening variables.
- 1.4 Hypothesis – types of Hypothesis – formulation of hypothesis – Testing hypothesis – Type I and Type II Error.
- 1.5 Areas of research - bio-mechanics, kinesiology, exercise physiology, motor learning, sports medicine, sports psychology, sociology, sports, growth and development etc. Agencies promoting research and new trends in Physical Education- ministry of education, U.G.C., Universities, state Governments. SAI and AIU etc.

Unit- II: Research Tools:

- 2.1. Data – Types - Identification of data - Methods of collecting data - observation, Interview, questionnaires and experimentation.
- 2.2 Establishing of research laboratory Instrumentation.
- 2.3 Concepts and measurement- reliability- validity- Norm's construction.

Unit III: The Research Design:

3. 1. Research design – Types of research design – Need and Importance of research design.
- 3.2. Steps in designing the research proposal - statement of the problem – hypothesis- identification of variables - samples selection of tool- plan of analysis time budget cost resources personnel.
- 3.3. Preparation of the research report - tables - figures - footnotes -- bibliography – follow up with publication.
- 3.4. Introduction to the use of calculators and computers in analysis of data.

Unit IV. Statistics - Parametric

- 4.1. Use and Abuse of statistics - Data nominal- ordinal- internal- Ratio- Normal Probability- Normality of data parametric- Meaning- Applications Testing significance of mean difference: 't'- test: paired 't'- Independent 't'. Analysis of Variance: One way- Two way- Three way- Analysis of covariance : Concepts - applications Testing- relational structures- Pearson product moment- Multiple correlation-Partial correlation- Multivariable Analysis: concepts- Multivariate Analysis of Variance- Multivariate Analysis of Co-variance- Multivariate Linear Regression Analysis=Factor Analysis-Applications in sports.

Unit V. Non parametric

- 5.1. Non- Parametric statistics - meaning- Applications- Testing the significance of Association- Chi-Square: Meaning- Applications: One way chi-square- Two way chi-square. Testing the significance of mean difference: Sign test - Mann-Whitney test- Friedman test- Kruskalvallis test.
- 5.2. Testing the significance of relationship: Rank order correlation-Biserial correlation – Point Biserial correlation- Tetra choric correlation applications. Logistic regression: Concepts- Applications.

Reference

1. David H. Clarke, H. Clarke:Advanced Statistics; with Applications to Physical Education Prentice Hall (1972),ISBN 10: 0130138479
2. David H. Clarke; H. Harrison Clarke.Application of Measurement to Physical Education Published by Prentice Hall PTR ISBN 10: 013039520X
3. *Lund Research Ltd.* "Descriptive and Inferential Statistics". *statistics.laerd.com*. Retrieved 2014-03-23.
4. Hays, William Lee, (1973) Statistics for the Social Sciences, Holt, Rinehart and Winston, p.xii, ISBN 978-0-03-077945-9
5. David W. Stockburger, Introductory Statistics: Concepts, Models, and Applications, 3rd Web Ed. Missouri State University.
6. DeGroot and Schervish. "Definition of a Statistic". Probability and Statistics. International Edition. Third Edition. Addison Wesley. 2002. ISBN 0-321-20473-5
7. Ralph B. D'Agostino (1986). "Tests for the Normal Distribution". In D'Agostino, R.B.; Stephens, M.A. Goodness-of-Fit Techniques. New York: Marcel Dekker. ISBN 0-8247-7487-6.
8. Henry C. Thode, Jr. (2002). Testing for Normality. New York: Marcel Dekker, Inc. p. 479. ISBN 0-8247-9613-6.
9. J.P VERMA and Mohammad Ghufuran ... *Statistical Methods for Sports and Physical Education* , Amazon.com
10. Box, George; Hunter, William; Hunter, J. Stuart. *Statistics for Experimenters*. pp. 66–67. ISBN 978-0471093152.
11. Clarke, David H., Clarke, H. Harrison.Research Processes in Physical Education ,Published by Prentice Hall College Div (1984) ,ISBN 10: 0137745133
12. Geisser, S.; Johnson, W.M. (2006) Modes of Parametric Statistical Inference, John Wiley & Sons, ISBN 978-0-471-66726-1
13. Corder; Foreman (2009) Nonparametric Statistics for Non-Statisticians: A Step-by-Step Approach, John Wiley & Sons, ISBN 978-0-470-45461-9.



BHARATHIAR UNIVERSITY, COIMBATORE – 641 046

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE

M.Phil./Ph.D. Library and Information Science

Subject Code	Papers	Name of the Subjects
18LISRC01	PAPER: I	RESEARCH METHODS IN LIBRARY AND INFORMATION SCIENCE
18LISRC02	PAPER: II	EMERGING TRENDS IN LIBRARY AND INFORMATION SCIENCE
	PAPER: III	SPECIAL PAPERS
18LISRS01		BIBLIOMETRICS AND SCIENTOMETRICS
18LISRS02		USERS STUDIES
18LISRS03		INFORMATION COMMUNICATION TECHNOLOGY APPLICATION IN LIBRARY AND INFORMATION SCIENCE

PAPER: I RESEARCH METHODS IN LIBRARY AND INFORMATION SCIENCE

Subject Code : 18LISRC01

Objectives:

- *To identify appropriate research topics*
- *To select and define appropriate research problem and parameters , and*
- *To write a research report and thesis*

Unit – I Basic of Research

Research : Concept, Need & Purpose, Characteristics - Types – Pure and Applied, Action and Inter Disciplinary Research – Historical – Case Study – Experimental etc., - Logic and Scientific method, Literature Search and Review of Literature.

Unit – II Research Design

Research Design: Definition, Types and Characteristics, – Identification, Selection and Formulation of a Research Methods and Research Problem, Formulation of Objectives and Hypothesis.

Unit - III Data Collection Methods

Data Collection – Definition, Types and Relevance —Sampling –Data Sources –Primary, Secondary and Tertiary Data; Data Collection Methods – Questionnaire / Schedule, Observation, Survey etc.,

Unit – IV Data Analysis

Data Analysis : - Data Processing, Analysis and Interpretation– Statistical Tools and Techniques –Measure of Central Tendency, Frequency Distribution, Regression and Correlation; Testing of Hypothesis – ANOVA, Chi-Square and t Test etc., and Statistical packages SPSS etc.

Unit – V Report Writing

Research Report Writing – Types, Structure and Presentation – Article, Thesis and Dissertation,– Style Manual – APA, MLA – Application of IT in Research.

Select Text & References :

- 1.Busha,C.H. (1990). Research Methods in Librarianship. New York: Academic Press
- 2.Slater, M Ed.(1990). Research Methods in Library and Information Science. London: LAP
- 3.Young, Pauline. (1982). Scientific Social Surveys and Research. New York: PHI
- 4.Kothari, C. (1995). Methodology. New Delhi: Eastern Wiley
- 5.Goswami,K (1995). Research Methodology in LIS. New Delhi: Commonwealth,
- 6.Krishna Kumar. (1999). Research Methods in LIS. New Delhi: Har-Anand Publ.

BHARATHIAR UNIVERSITY: COIMBATORE – 641 046

M. Phil./ Ph. D. – SOCIAL WORK

PART I – SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PAPER I – RESEARCH METHODOLOGY

PAPER II – ADVANCED APPLICATION OF SOCIAL WORK

- Paper-III:**
- 1. Community Development**
 - 2. Organizational Behaviour and Organizational Development**
 - 3. Disability Management**
 - 4. Human Resources Management**
 - 5. Medical Social work.**
 - 6. Mental Health**
 - 7. Labour Welfare and Industrial Relations**
 - 8. Public Health**
 - 9. Geriatric Social Work**
 - 10. Welfare of the Women, Children and Youth**

PAPER I

RESEARCH METHODOLOGY

Learning Outcome

To facilitate the student to learn the fundamental of Research Methodology, basic statistics including sampling so as to apply them while carrying out Research in Social Work Profession. To develop a practical knowledge in identifying solution to research problem

Course objectives

On successful completion of the course the student should enrich their knowledge about

- The fundamentals of Research process,
- Research designs and Sampling
- Methods of and tools for data collection
- Data analysis and Report writing
- Basic Statistics and its application to Social Work Research.

UNIT-I: Basics of Research

Research -Meaning -objectives -characteristics -purpose and qualities of good research. Introduction to Social Work Research, Research Review in Social Work, Research Process, Formulation of Research Problem

UNIT -II: Introduction to Methods of Research in Social Work

Research Methods I: Descriptive, Exploratory Diagnostic, Evaluation and Action Research, Research Methods II: Experimental Research, Research Methods III: Qualitative Research.

UNIT-III: Social Survey

Social Survey-concept, scope, advantages and disadvantages. Social Survey and Social Research. Universe and Methods of Sampling. Content analysis. Case study.

Research Tools: Questionnaires, Rating Scales, Attitudinal Scales and Tests, Interview, Observation, Documents and Focus group discussion.

UNIT -IV: Methods of analysis

Methods of analysis: editing; coding tabulating and interpreting data. Statistics-definition, importance and uses of statistics -Uses of computers for statistical analysis, SPSS and R Software, Measures of central tendency: measures of dispersion. Correlation, chi-square test, Tests of significance.

UNIT -V: Research Reporting

Research Reporting: Types, Guidelines for reviewing draft, report format, reference and typing instruction. Qualities of good report. Preparing a Research Proposal

Text Books:

- Allen Rubin and Earl R. Babbie, 2010 Research Methods for Social Work, Cengage Learning.
 - Krishnamoorthy O.R and Ranganathan, Methodology of Research in Social Sciences, Himalya Publishing House, Mumbai.
 - Lal Dass D.K., 2000. Practice of Social Research, Rawat Publications, New Delhi.
 - Paneerselvam R, 2008. Research Methodology, Prentice Hall of India, New Delhi.
- References:

- Ajai S. Gowr : Statistical Methods for Practise and ResearchSanjaya S. Gowr (2009) – A Guide to Data Analysis using SPSS. Response New Delhi.
- Black, James A. and Champion, Dean J.1976, Methods and issues in Social Research, John Wiley, New York.
- Cochran W.C., 1953 Sampling Techniques, John Wiley, New York.
- Festinger, L. and D. Katz Research Methods in BehaviouralSciences; TheDyden Press, 1953 New York.
- Gideon Sjoberg (1992) : A Methodology for Social Research, Rawat Roger Nett Publications, Jaipur and New Delhi
- Good W. J., and H. K. Hatt Methods in Social Research, McGraw Hill, Tokyo. 1952
Gupta S.P., Statistical Methods.
- Hans Raj 1992 Theory and practice in Social Research, Surjeet Publications, New Delhi.
- Kerligner, F. N., 1983 Foundation of Behavioural Research,Surjeet Publication, N.D.
- Matt henn, 2006 Mark Weinstein Nick Foard, A Short introduction of Social Research, Vistaar Publication New Delhi.
- McMillen, Wayne Statistical Methods for Social Research, Robert McGraw Hill, New York.
- Nicholas Walliman (2005): Your Research Project, Vistaar Publications, 2ndEdition New Delhi.
- Ram Ahuja, 2001: Research Methods, Rawat Publications Moser, C. A Survey Method for Social Workers, Heinemann,London.
- Ramachandran, P. 1990 Issues in Social Research in India,TISS, Mumbai.
- Sharma, R. A., 2000 Essentials of Scientific Behavioral Research, Surya Publications, Meerut.

PAPER II

ADVANCED APPLICATION OF SOCIAL WORK

Learning Outcome

To facilitate the student on major theories and models for social work applications, recent developments in Social Work profession and Social Work education in India and contemporary trends in Social Development.

Course objectives

- To familiarize the students on major theories and models for social work applications
- To know about the development in the methods of Social Work Practice.
- To make the students understand the new paradigms and critically appreciate the changing perspectives in social work profession.
- To orient on contemporary trends in Social Development

Unit –I: SOCIAL WORK PROFESSION

Categories of Social Work Practice: Macro, Mezzo, Micro Social Work; Professional Ethics and Values; Skills required for a Professional Social Worker in the digital era.

Unit - II: MAJOR THEORIES AND MODELS IN SOCIAL WORK

Social Work Theories: Behavioral, Cognitive, Psychodynamic, Humanistic, Empowerment, Socio-cultural theories in Social Work; Social Work Models: Task Centered Case Work, Problem Solving, Solution focused therapy, Crisis Intervention, Ecological model, Development model; Macro Social Work Practice models.

BHARATHIAR UNIVERSITY: COIMBATORE – 641 046
M.Phil. / Ph.D. - ZOOLOGY (Full-Time / Part-Time)

PART - I: SYLLABUS

(For the candidates admitted from the academic year 2018-19 onwards)

PAPER I – Research Methodology

PAPER II – Recent Advances in Biology

PAPER III -

1. Crustacean Endocrinology and Reproduction
2. Human Genetics
3. Pollution Biology
4. Environmental Physiology
5. Limnology
6. Advances in Insect Biology and Pest Management
7. Insect Pests Control and Toxicology
8. Eco Toxicology
9. Aquaculture and Fisheries
10. Proteomics and Molecular Cell Physiology
11. Conservation Biology
12. Toxicology
13. Vertebrate Endocrinology
14. Advances in Nematology

PAPER I: RESEARCH METHODOLOGY

UNIT I: BIOINSTRUMENTATION

Principle & Applications of pH meter – Ultracentrifuge – UV visible spectrophotometer, FTIR, Atomic absorption spectrophotometer – XRD- NMR – MALDI TOF -Electron microscope (SEM & TEM) – FRET Microscopy.

UNIT II: ANALYTICAL TECHNIQUES

Principles and Procedure of Chromatography: Thin layer chromatography - High performance liquid chromatography, Gas Chromatography, Electrophoresis: Agarose & PAGE. Blotting techniques: Southern, Northern & Western, PCR – ELISA.

UNIT III: HISTOLOGICAL TECHNIQUES

Processing tissue samples for light and electron microscopy, Immunochemical localization- Cryostat Sectioning - Flow cytometry - FISH and GISH - Microarray.

UNIT IV: DATA PROCESSING AND ANALYSIS

Biostatistics: Correlation Co-efficient; Simple linear regression, Student's 't' test; Chi -square test, 'F' test; ANOVA – one way; two way – Multiple/Post Hoc comparison in ANOVA

Bioinformatics: Generalized and specialized data bases with examples –BLAST - Multiple Sequence Alignments. Molecular Divergence & Phylogenetic trees.

UNIT V: RESEARCH METHODS AND THESIS WRITING

Identification of research problems – Methods of literature collection and review – Planning and execution of investigation – Thesis writing – Preparation of research papers- Ethics in thesis writing.

REFERENCES*

1. Anderson, Durston & Polle 1970: Thesis and assignment, writing Wiley Eastern Limited.
2. Bier, 1959: Electrophoresis, theory, methods and applications, Academic Press, London, New York.
3. Block, R. I. Durram E.K. and Eweig, G, 1956: A manual of paper chromatography and electrophoresis, Academic press, New York.
4. Chayan J & Butcher R.G, 1973: Practical histochemistry, Willey Interscience Publication, London.
5. Clark G.L, 1961: The Encyclopedia of microscopy, Reinhold publishing corporation, New York.
6. Fisher R.A, 1950: Statistical methods of research workers.
7. Freund J E, 1967: Modern elementary statistics, Prentice Hall, Inc. Englewood cliffs, N J.
8. Malter K, 1972: Statistical analysis in Biology, Chapman Hall, London.
9. Campbej R C, 1975: Statistics for Biologists II nd Ed. Cambridge University Press, London.
10. Haftman E, 1967: Chromatography, Reinhold publishing corporation, New York.
11. Jones R M 1966: Basic microscopic techniques University of Chicago Press, Chicago.
12. Lenhoff E, 1966: Tools in Biology, Macmillan Co., New York.

*Refer recent edition