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.

Estd : 1957

NGMC EXPANSION WITH EXCELLENCE

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DATE : 21/8/21

INCLUSTION OF RESEARCH ETHICS

An Ethics Committee (EC) 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, including courses or modules specifically focused on research ethics. Topics on paper publication, articles writing, thesis writing etc., have been included in PG 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 established to prevent dishonest or intentional plagiarism. The university has URKUND software that identifies the originality in research work. 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 licensed 'plagiarism checker X' tool for post-graduate students, research scholars and faculty members to carry out their research work ethically.

NALLAMUTHU GOUNDER MAHALINGAM COLLEGE POLLACHI

Principal

PRINCIPAL
N.G.M. COLLEGE, POLLACHI

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

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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

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22UCC6AL

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

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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.

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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 Formulae.	
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	Name and Signature	Name and Signature	Name and Signature
Dr.P.Gomathi Devi Signature:	Dr.P.Archanaa Signature:	Prof.K.Srinivasan Signature:	Dr.R.Manicka Chezhian Signature:

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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 Exposion 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

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BHARATHIAR UNIVERSITY – COIMBATORE - 641046.
M.PHIL. / PH.D. –EDUCATIONAL TECHNOLOGY

PART – I SYLLABUS
(For the candidates admitted from the academic year 2018-19onwards)

PAPER I: RESEARH METHODS AND ADVANCED STATISTICS

OBJECTIVES

1. To enable students to understand advance research methods and statistical tools in education
2. To enable students to understand the principles of evaluation, research and statistics
3. To help students in preparing model research proposals for research studies

UNIT I: RESEARCH METHODS

Research – Nature, types and scope – Research Trends in Education – Qualitative Research Techniques – Historical case study, Participatory and Ethnography Research Methods – Quantitative Research Techniques – Survey, Experimental, Action, Longitudinal Research Methods – Tools for data collection: Observation, Interview schedule, Checklist Questionnaire, Achievement test and attitude scale – Design, Construction and Standardization of tools – Research Design.

UNIT II: SAMPLING TECHNIQUES AND MEASUREMENT

Sampling Method – Purposive sampling, simple random sampling, systematic sampling, stratified sampling, cluster sampling, stage sampling – Theories of Probability – levels of confidence – Degrees of freedom – Hypothesis formulation and testing statistical significance, one tailed and two tailed tests – correlated and uncorrelated data – Scales of Measurement – Nominal sale, Ordinal scale, Interval scale and Ratio scale.

UNIT III: INTRODUCTION TO STATISTICS

Introduction to statistics – meaning, scope, importance and limitations of statistics – concept of statistics, source of data, populations, parameters, samples and statistics – descriptive and inferential statistics, parametric and non-parametric statistics, variables – discrete and continuous variables, independent and dependent, intervening and manipulating variables – classifying and presenting the data, frequency table, presentation of data, Bar graphs, Histogram, Frequency polygon, smoothed frequency polygon, Cumulative frequency graph (or) Ogive and pie graph

UNIT IV: ADVANCED STATISTICAL TECHNIQUE

Univariate Analysis: mean, median, mode – measures of central tendency, normal curve, practical application of normal probability curve, characteristics of normal probability curve – range– variance – percentile, standard scores (or) 'Z' scores – Type I and Type II error, sampling error,statistical significance–Bivariate analysis: Correlation methods – Chi-square, T-test, ANOVA and MANOVA

UNIT V: COMPUTER APPLICATION AND REPORT PREPARATION

Computer Application: Statistical Package for Social Sciences (SPSS), Computer packages: word processing and graphs – Preparation of Research Documents: Preparation of Research

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proposals, writing of the report of the research studies, preparation of review of related studies, preparation of the review of research proposals and reports.

References

1. Kerlinger H Fred. (1964) Foundations of Behavioural Research: Educational Psychological Inquiry.
2. Goode & Hatt. (1952) Methods in Social Research
3. Paulin Young. (1961) Scientific Social Survey and Research
4. John Best. (1975) Fundamentals of Social Research
5. Edwards A L (1966) Experimental Design in Psychological and Education
6. Covers, P.S. (1980) Computer Programming In Basic, Madras Allied Publisher (p) ltd.

PAPER II: ADVANCED EDUCATIONAL TECHNOLOGY

OBJECTIVES

1. To study how audio, video, and computer technologies can best be exploited in teaching and learning
2. To study the principals involved in the production of media related materials

UNIT I: MODERN COMMUNICATION TECHNOLOGY IN EDUCATION- MEANING, SCOPE AND CHOICE

Systems approach to instruction and instructional designs
Audio visual technology: projected and non-projected aids
Individualized instruction: Kellar Plan, PSI, CAI, CMI & PLM
Advanced Techniques In Education: Multimedia, interactive video, teleconferencing, tele-bridge, teletext and videotex

UNIT II: TECHNOLOGY IN LANGUAGE TEACHING

Principles of Language teaching
Approaches to Language teaching
Different methods of teaching English as a second language
Audio-video media in English language teaching
Meaning and Need for Language Laboratory

UNIT III: EDUCATIONAL TECHNOLOGY FOR FORMAL, INFORMAL AND NONFORMAL SYSTEMS IN LEARNING: CONCEPT AND SCOPE

Role, experience and applications of Educational Technology in school education and higher education
Role, experience and applications of Educational Technology in Special groups: Special education and distance education
Interpersonal approach: IEC, Social Marketing Approach, Participatory Communication approach
Media approach: development communication approach, development support communication approach and media forum

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Paper – I: RESEARCH METHODOLGY

Unit-I Introduction to Research Methodology

What is Research? Basic and applied research, Essential steps in research, Defining the research problem, Research/ Experimental design, Literature collection, Literature collection, Literature citation, Research report: components, Format of thesis and dissertation, Manuscript /Research article, Review monographs, Bibliography and Reference, Significance of research-Software for manuscript draft.

Unit-II Bio-statistical Methods

Measures of central tendency and dispersal; probability distributions (Binomial, Poisson and normal); sampling distribution; difference between parametric and non-parametric statistics; confidence interval; errors; levels of significance; regression and correlation; t-test; analysis of variance; X^2 test; basic introduction to Muetrovariate statistics, etc.,

Unit-III Applied Bio-statistics

R Language and its simple applications – Computation of Probabilities and cumulative Probabilities using Binomial and Poisson models. Evaluation area and ordinate under normal distribution using R Software, SPSS.

Unit-IV Research Ethics & IPR

Perspective of Ethics, Personal vs professional ethics: Moral Reasoning – Ethical theories,Deontological, Utilitarianism – Ethical leadership (integrity and ingenuinity) - framework for ethical decision making- Michael Macdonald model & Storch model, Plagiarism software

Introduction to intellectual property and intellectual property rights Types, patents, copy rights, trade marks, design rights, geographical indications – importance of IPR – patentable and non patentables – patenting life – legal protection of biotechnological inventions – world intellectual property rights organization (WIPO)

Unit-V Biosafety guidelines

Introduction to biosafety Biosafety issues in biotechnology – risk assessment and risk management – safety protocols: risk groups – biosafety levels – biosafety guidelines and regulations (National and International) – operation of biosafety guidelines and regulations – types of biosafety containment; Depository regulation- National & International centers; Biological databases.

References:

- C.R. Kothari, IInd edition (2004) Research methodology, Methods and techniques, New Age Internation (P) Ltd, Publishers, New Delhi.
- Jenod H. Zar (1999) Biostatistical analysis by, Prentice Hall International, Inc. Press, London.

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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. Freumd J E, 1967: Modern elementary statistics, Prentice Hall, Inc. Englewood cliffs, N J.
8. Malter K, 1972: Statistical analysis in Biology, Chapmen 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

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PAPER I: RESEARCH METHODOLOGY

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6. Wonnacott and Wonnacott – Econometrics

PAPER I- RESEARCH METHODOLOGY

Unit I

Research- meaning and objectives –problem identification and design- planning and execution . Sampling Methods: Probability sampling, random sampling, systematic sampling, stratified sampling, cluster sampling and multistage sampling. Non-probability sampling: convenience sampling, judgement sampling, quota sampling. Types of data- primary and secondary data. Research funding agencies- national and international.

Unit II

Scientific documentation: Methods of literature collection. Preparation of scientific documents, general articles, research papers, review articles, editing of research papers, methods of citation, collection of literatures - web based methods. Thesis writing – components of thesis and bibliography. Presentation techniques, effective communication skills- Intellectual Property Rights – Patenting.

Unit III

Principle and application of: pH meter, conductivity meter, nephelometer, centrifuge, ion selective electrode, flame photometry, total organic carbon analyser. Spectroscopy- UV-VIS-NIR spectroscopy, AAS, ICP-MS, air sampler, automated weather station, noise meter, lux meter, anemometer.

Unit IV:

Principle and application of: FTIR, Scintillation counter, HPLC, GC-MS, LC-MS, NMR, SEM and TEM. Molecular techniques- PCR, Electrophoresis – agarose and SDS –PAGE, Fluorescent microscopy.

Unit V

Applications of Computer in Environmental Science and Management – Data Analysis using packages (SPSS and R).Test of significance –Analysis of variance – one way ANOVA- two way ANOVA, Descriptive statistics, Multivariate Analysis, Correlation, Regression, Cluster analysis, Factor Analysis -PCA, Graph Plotting, Computational databases and environmental management.

REFERENCES

1. Statistics for Environmental Science and Management, Second Edition.Bryan F.J. Manly. 2008. CRC Press.
2. Research Methodology. Sameer S. Phanse. 2016. Oxford University Press
3. Statistical Methods. Gupta S.P.2014. Sultan Chand & Sons.
4. An Introduction to Statistical Analysis in Research: With Applications in the Biological and Life Sciences. Kathleen F. Weaver, Vanessa Morales, Sarah L. Dunn,Kanya Godde,Pablo F. Weaver. 2017. John Wiley & Sons.
5. Principles and Techniques of Biochemistry and Molecular Biology. Keith Wilson and John Walker. 7th Edition. 2010. Cambridge University Press.
6. Biophysical Chemistry. Upadhyay, Upadhyay and Nath. (2010).Himalaya Publishing House .
7. Laboratory Experiments in Microbiology. Case, C.L. and Johnson, T.R. (1984). The Benjamin / Cummings Publishing Co., London.
8. Environmental Instrumentation. Fritschen, L.J and Gay, L.W (1979). Springer-Verlag, New York.

Paper – I: RESEARCH METHODOLGY

Unit-I Introduction to Research Methodology

What is Research? Basic and applied research, Essential steps in research, Defining the research problem, Research/ Experimental design, Literature collection, Literature collection, Literature citation, Research report: components, Format of thesis and dissertation, Manuscript /Research article, Review monographs, Bibliography and Reference, Significance of research-Software for manuscript draft.

Unit-II Bio-statistical Methods

Measures of central tendency and dispersal; probability distributions (Binomial, Poisson and normal); sampling distribution; difference between parametric and non-parametric statistics; confidence interval; errors; levels of significance; regression and correlation; t-test; analysis of variance; X^2 test; basic introduction to Muetrovariate statistics, etc.,

Unit-III Applied Bio-statistics

R Language and its simple applications – Computation of Probabilities and cumulative Probabilities using Binomial and Poisson models. Evaluation area and ordinate under normal distribution using R Software, SPSS.

Unit-IV Research Ethics & IPR

Perspective of Ethics, Personal vs professional ethics: Moral Reasoning – Ethical theories,Deontological, Utilitarianism – Ethical leadership (integrity and ingenuinity) - framework for ethical decision making- Michael Macdonald model & Storch model, Plagiarism software

Introduction to intellectual property and intellectual property rights Types, patents, copy rights, trade marks, design rights, geographical indications – importance of IPR – patentable and non patentables – patenting life – legal protection of biotechnological inventions – world intellectual property rights organization (WIPO)

Unit-V Biosafety guidelines

Introduction to biosafety Biosafety issues in biotechnology – risk assessment and risk management – safety protocols: risk groups – biosafety levels – biosafety guidelines and regulations (National and International) – operation of biosafety guidelines and regulations – types of biosafety containment; Depository regulation- National & International centers; Biological databases.

References:

- C.R. Kothari, IInd edition (2004) Research methodology, Methods and techniques, New Age Internation (P) Ltd, Publishers, New Delhi.
- Jenod H. Zar (1999) Biostatistical analysis by, Prentice Hall International, Inc. Press, London.

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 – Queer 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.

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 - **biblioscape-plagiarism* – project proposal writing – dissertation writing –*paper presentation (oral/poster)* – E- learning tools- monograph – introduction and writing- monograph for *Aloe vera* and *Ocimum sanctum* –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**

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 ——— CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
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 Signature:	Name: Dr. R. Rakkimuthu Signature:	Name: Mr. K.Srinivasan Signature:	Name: Dr. R. Manicka Chezhian Signature:

Programme code	M.Sc.	Programme Title : Master of Science in Botany		
Course Code: 22PBY414		Title : Core – 14 Bioinformatics and Cyber security	Batch	2022-2024
			Semester	IV
Hrs/Week:	6		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 *insilico*	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, *ab initio,* 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 *De novo* methods. Model refinement and evaluation of model. Over view of SWISS PROT. Outline of computer aided drug designing. **Systems biology – concept and applications.*	**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, **intellectual property rights, copyright, patent, trade secret, hacking and intrusion, privacy, identity threat*.	**14**

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

Power point Presentations, Group discussions, Seminar, Assignment and online demonstration

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. Baxevanis 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 / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Name: Dr. A. M. Anandakumar Signature:	Name: Dr. R. Rakkimuthu Signature:	Name: Mr. K.Srinivasan Signature:	Name: Dr. R. Manicka Chezhian Signature:

BHARATHIAR UNIVERSITY, COIMBATORE 641 046

M.Phil – Part-I: Paper I

Research Methodology

UNIT – I

Research Problem - Research problem Identification - Review of Literature - Research process - Research design –Experimental and non experimental designs- Exploratory – Diagnostic.

UNIT – II

Sampling - Population –Census - Sample – Types – Probability – Non Probability sampling – Sampling size – Sampling process – Hypothesis and its formulation.

UNIT- III

Data Collection Tools -Case studies - Interview – Questionnaire -Schedule - observation- Scaling techniques – Scale Construction – Rating scales.

UNIT – IV

Hypothesis testing – Parametric and non parametric tests - Coding – Editing – Tabulation – Analysis – Interpretation.

UNIT V

Report Writing - Layout– Contents of Report-Style of the report - Steps in Report writing – Forms of Reports.

Reference

1. B. Somekh & C. Lewin, (2005), Research methods in the social sciences, Vistaar Publications, New Delhi

2. S. N. Hesse – Biber, (2007), Handbook of Feminist Research, Sage Publications, London

3. Crotty, M. (1998), The Foundation of Social Research: Meaning and Perspective in the Research Process, Sage Publications, London

4. Blaikie, N. (2000), Beginning Social Research, Polity Press, Cambridge

5. V. Desai & R. B. Potter, (2006), Doing Development Research, Sage Publications, New Delhi.