



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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DATE :

INCLUSION 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.



Principal

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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 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	Dr.P.Archanaa	Prof.K.Srinivasan	Dr.R.Manickam Chethan
Signature:	Signature:	Signature:	Signature:

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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 Chezian
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

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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)	Anc 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