



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

Faculty of Engineering & Technology

Ph.D Program

ENGINEERING & TECHNOLOGY

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits: 4

UNIT I –Objectives and types of research

Definition of Research – Importance, limitations - Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptivevs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical,concept of applied and basic research process, criteria of good research.

UNIT II - Research Formulations and Design

Defining and formulating the research problem, selecting the problem, necessity of defining theproblem, importance of literature review in defining a problem, literature review-primary andsecondary sources, reviews, monograph, patents, research databases, web as a source, searchingthe web, critical literature review, identifying gap areas from literature and research database,development of working hypothesis.

UNIT III – Data Collection and Analysis

Computer and its role in research, Effective use of Internet, Execution of the research - Observation andCollection of data - Methods of data collection – Sampling Methods- Data Processing andAnalysis strategies - Data Analysis with Statistical Packages (Sigma STAT,SPSS for student t-test, ANOVA, etc.), - Hypothesis-testing -Generalization and Interpretation.

UNIT IV –Research Ethics, IPR and Scholarly Publishing

Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rightsand patent law, commercialization, copy right, royalty, trade related aspects of intellectualproperty



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rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability

UNIT-V - Reporting and thesis writing

Structure and components of scientific reports -Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables- Bibliography, referencing and footnotes - Oral presentation – Planning – Preparation –Practice – Making presentation – Use of visual aids - Importance of effective communication.

REFERENCES

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, EssEss Publications. 2 volumes.
4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
5. Wadehra, B.L. 2000. Law relating to patents, trademarks, copyright designs and geographical indications. Universal Law Publishing.

Additional reading

1. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
2. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.
3. Coley, S.M. and Scheinberg, C. A., 1990, "Proposal Writing", Sage Publications.



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4. Day, R.A., 1992. How to Write and Publish a Scientific Paper, Cambridge University Press.
5. Fink, A., 2009. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications
6. Leedy, P.D. and Ormrod, J.E., 2004 Practical Research: Planning and Design, Prentice Hall.
7. Satarkar, S.V., 2000. Intellectual property rights and Copy right. ESS Publications
8. Epidemiology in medicine, Charles H. Hennekens and Jules E. Burling. (1987)
9. Oxford Text Book of Public Health (5th Edition), volume Oxford University press. (2011)
10. Essentials of Medical Statistics by Berty R. Kirkwood. (2011)
11. An Introduction to biostatistics by P.S.S. Sundar Rau. (2006)
12. National Ethical Guidelines for Biomedical & Health Research involving human participants ICMR, New Delhi 2017
13. Guidelines for care and use of animals in scientific research. Indian National Science Academy, New Delhi.
14. Research Methodology, methods and techniques by C.R. Kothari. (2009)
15. Basic epidemiology, 2nd Edition, R Bonita, R Beaglehole and T Kjellstrom (2007)
16. Statistical methods in medical research, 4th edition, P Armitage, G Berry and JNS Matthews. (2001)
17. Biostatistics: A foundation for analysis in health sciences, 9th edition, Wayne W Daniel (2008)
18. Computer fundamentals Pradip K. Singha and Priti Singha (BPB Publication)
19. The Internet: A users guide K. L. James (PHI publication)
20. Internet Research skill (SAGE publication) Niall O Dochartaigh
21. How to keep your Research Project on Track- Keith Town send - 2018
22. Microsoft office system (PHI publication)



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

**Faculty of Medicine, Faculty of Dentistry, Faculty of Pharmacy, Faculty of Homeopathy,
Faculty of Physiotherapy, Faculty of Nursing & Faculty of Allied Health Sciences**

Ph.D Program

HEALTH SCIENCES

**(MEDICINE, DENTISTRY, PHARMACY, HOMEOPATHY, PHYSIOTHERAPY, NURSING & ALLIED
HEALTH SCIENCES)**

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits: 4

Unit-I Research Methods

Meaning of Research-Objectives of Research-Motivation in Research – Types of Research – Significance of Research –Research and Scientific Method– Criteria of good Research – Problem Encountered by Researchers in India – What is Research Problem? Selecting the Problem – Defining the Problem – Technique involved in Defining the Problem- 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-Research metrics and Indexing.

Unit – II Research Ethics & IPR

Perspective of Ethics, Personal vs professional ethics: Moral Reasoning – Ethical theories, Deontological, Utilitarianism – Ethical leadership (integrity and ingenuity) – framework for ethical decision making – Michael Macdonald model & Storch model, Plagiarism software.CDSCO, CPCSEA Guidelines. ICMR Guidelines 2017, ICH-GCP guidelines, GLP guidelines, Research Misconduct.

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)



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Unit – III Microscopy and Analytical Instrumentations

Principle, structure and applications of Bright field, Darkfield, Phase contrast, Fluorescent, Electron microscopy (TEM & SEM), Confocal microscope and Foldscope. Atomic force microscope (AFM). pH meter-determination of pH, Colorimetry, Spectroscopy techniques – UV – Visible, Fluorescence, FT – IR, Atomic absorption, NMR, Mass spectrometry, MALDI ToF, IR spectrum, X-ray crystallography. RT PCR, HPLC, GCMS instruments .

Unit – IV Clinical Trials

Introduction, composition, procedures & records, Informed consent, responsibility & rules applicable to investigators and sponsors, reporting of adverse events and other related ethical issues. Clinical Trial Guidelines. Biosafety and Bioequivalence studies.

Unit – V Biostatistics

Principles and practice of statistical methods in biological research – Data collection, presentation of Data – Measures of central tendency – Mean, Median, Mode, Correlation coefficient, Standard deviation, student 't' test, chi-square test. Analysis of variance (ANOVA) and its uses. Basics of computers – types, servers, operating systems – Windows, UNIX and Linux. Finding scientific articles – Pubmed. Outline of SPSS and Mathematica. Parametric and Non parametric test, Qualitative analysis, Questionnaire designing and validation, Interview, FGD.

REFERENCES

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Arora, P.N. & Malhon, P.K. 1996. Biostatistics. Imalaya Publishing House, Mumbai.
4. Jogdand SN. 2004. Gene Biotechnology Published by Himalaya Publishing House, Mumbai.
5. Baxevanis, A.D. & Ouellette, B.F.F. 2001. Bioinformatics: A practical guide to the analysis of genes and proteins – Wiley Inter science – New York.
6. John G Webster. 2004. Bioinstrumentation .Student edition, John Wiley & sons, Ltd.
7. Kleinsmith, L. J. & Kish, V.M. 1995. Principles of Cell and Molecular Biology. 2nd edn., McLaughlin, S., Trost, K., Mac Elree, E. (eds.), Harper Collins Publishers, New York.
8. Keith Wilson & John Walker. 2003. Practical Biochemistry Principles & techniques. 5th edition, Cambridge university press.
9. Palanivelu P. 2001. Analytical biochemistry and separation Techniques A Laboratory manual. 2nd edition, Published by Tulsi Book Centre, Madurai, Tamilnadu.
10. Ramadass, P. and A. Wilson Aruni 2009. Research and Writing - Across the Disciplines. MJP Publishers, Chennai – 600 005.



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

Faculty of Arts

Ph.D Program

English

RESEARCH METHODOLOGY-SYLLABUS

Total Lecture Hours : 60

Credits: 4

Unit-I Research Methods

Meaning of Research-Objectives of Research-Motivation in Research – Types of Research – Significance of Research –Research and Scientific Method– Criteria of good Research – Problem Encountered by Researchers in India – What is Research Problem? Selecting the Problem – Defining the Problem – Technique involved in Defining the Problem- 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-Research metrics and Indexing.

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Perspective of Ethics, Personalvs professional ethics: Moral Reasoning – Ethical theories, Deontological, Utilitarianism –Ethical leadership (integrity and ingenuity) – framework for ethical decision making – Michael Macdonald model &Storchmodel, 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-III Mechanics of Writing

Spacing,indentation and margin – Methodology in Bibliographical entries – names of persons,common and Latin abbreviations – Use of Acronyms and Alphabetism in the body-punctuations – Titles of works – Direct and in direct quotations – Ellipsis marks –Significance of round and square brackets,and underlining Use of (sic) in quotations.



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Unit- IV Format of Empirical Thesis

Experimental and Practical research-Purpose and significance of Empirical thesis –Choosing a field-Formulation of hypothesis – If experimental,at laboratories – new findings remaining unknown – If practical,preparing questionnaire on the basis of hypothesis – Collection of data through on the spot study – Findings by applying statistics – Arriving at a conclusion – Suggestions and recommendations.Computer applications in language research.

UNIT V: Introduction to Theoretical Perspectives:

Background to Contemporary Literary Theory, Russian Formalism, New Criticism, Feminism, Structuralism, Marxism, Modernism, Post-Modernism and Post-Colonialism

References:

- Nunan, D. (1992) Research Methods in Language Learning. CUP.
- Bachman, L.F. (2004) Statistical Analysis for Language Assessment.CUP.
- Kothari, C.P. (2009) Research Methodology: Methods and Techniques. New Delhi: New Age Publications.
- Mackay, A & S. M. Gass (2005) Second Language Research Methodology and Design.Mahwah, N. J : Lawrence Erlbaum.
- Sharma, B.A. V, Prasad, D. R. and Satya Narayan, P. (1983) Research Methods in Social Sciences. New Delhi: Sterling Publications Pvt. Ltd



VINAYAKA MISSION'S RESEARCH FOUNDATION

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Faculty of Science

Ph.D Program

BIOCHEMISTRY

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits: 4

Unit-I Research Methods

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Unit – III Microscopy and Analytical Instrumentations

Principle, structure and applications of Bright field, Darkfield, Phase contrast, Fluorescent, Electron microscopy (TEM & SEM), Confocal microscope and Foldscope. Atomic force microscope (AFM). pH meter-determination of pH, Colorimetry, Spectroscopy techniques – UV – Visible, Fluorescence, FT – IR, Atomic absorption, NMR, Mass spectrometry, MALDI ToF, IR spectrum, X-ray crystallography.



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Unit – IV Bioinformatics

Biological data bases – DNA sequence data bases & protein sequence data bases. Genome database – Mouse genome database. SRS-Similarity searching pairwise sequence alignment – BLAST, FASTA. Dynamic programming – local and global alignment, Needleman alignment. Multiple sequence alignment – Phylogeny. Structure database – Secondary structure prediction, Choufeatpassman, Neural network methods. Predicting 3 dimensional folds (Threading), Homology modeling, Molecular docking.

Unit – V Biostatistics

Principles and practice of statistical methods in biological research – Data collection, presentation of Data – Measures of central tendency – Mean, Median, Mode, Correlation coefficient, Standard deviation, student 't' test, chi-square test. Analysis of variance (ANOVA) and its uses. Basics of computers – types, servers, operating systems – Windows, UNIX and Linux. Finding scientific articles – Pubmed. Outline of SPSS and Mathematica.

References

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Arora, P.N. & Malhon, P.K. 1996. Biostatistics. Imalaya Publishing House, Mumbai.
4. Jogdand SN. 2004. Gene Biotechnology Published by Himalaya Publishing House, Mumbai.
5. Baxevanis, A.D. & Ouellette, B.F.F. 2001. Bioinformatics: A practical guide to the analysis of genes and proteins – Wiley Inter science – New York.
6. John G Webster. 2004. Bioinstrumentation .Student edition, John Wiley & sons, Ltd.
7. Kleinsmith, L. J. & Kish, V.M. 1995. Principles of Cell and Molecular Biology. 2nd edn., McLaughlin, S., Trost, K., Mac Elree, E. (eds.), Harper Collins Publishers, New York.
8. Keith Wilson & John Walker. 2003. Practical Biochemistry Principles & techniques. 5th edition, Cambridge university press.
9. Palanivelu P. 2001. Analytical biochemistry and separation Techniques A Laboratory manual. 2nd edition, Published by Tulsi Book Centre, Madurai, Tamilnadu.
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Faculty of Science

Ph.D Program

BIOSTATISTICS

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits : 4

Unit-I Research Methods

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Unit-III Data Collection Techniques and Interpretation:

Collection of Data : Primary Data –Meaning,Secondary data –Meaning–Relevance's, limitations and cautions. □Data Collection methods: Interview;Observation; Questionnaire ,Developing tools –Validity (internal & external),Reliability of the tools.Meaning of Interpretations; Techniques of Interpretation,Precautions in Interpretations, Data Processing;Coding, tabulations, classifications.



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Unit- IV

Bioethics: Introduction, Animal rights and animal laws in India, Prevention of cruelty to animals Act 1960, Biodiversity Act 2003. Concept of 3 R – conservation (Refined- to minimize suffering, Reduced –to minimize animals, Replaced – modern tools and alternate means) Animal use in research and education, Laboratory animal use, care and welfare, animal protection initiatives- animal welfare board of India, CDSCO, CPCSEA, ethical commitment. Working with human: consent, harm, risk and benefits.

Unit- V

Statistical analysis using MS office -Excel, SPSS, Epi –info, R Software, online softwares, Research management tools like Zotero/Mendeley.

References

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.]
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Faculty of Science

Ph.D Program

CHEMISTRY

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits: 4

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Unit – III Microscopy and Analytical Instrumentations

Principle,structure and applications of Bright field,Darkfield,Phasecontrast,Fluorescent,Electron microscopy (TEM & SEM),Confocalmicroscope and Foldscope.Atomic force microscope (AFM).pH meter-determination of pH,Colorimetry,Spectroscopy techniques – UV – Visible,Fluorescence,FT – IR,Atomicabsorption,NMR,Massspectrometry,MALDIToF,IRspectrum,X-ray crystallography.



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Unit – IV Separation Techniques

Centrifugation-preparative and analytical,ultracentrifugation,density gradient centrifugation.Principles and applications of gel – filtration,Ion-exchange,affinitychromatography;Thin layer and gas chromatography;High pressure liquid (HPLC) Chromatography,HPTLC,GC-MS,LC-MS.Electrophoresis – Principle,types and applications – PAGE (proteins),Agarose Gel Electrophoresis (Nucleic acids),Pulse field Gel Electrophoresis (PFGE),Two dimensional electrophoresis (IEF).

Unit – V Introduction to Computing and Networking

Introduction to computers and computing – hardware,Basic organization of a computer,CPU,Mainmemory,Secondarystorage,I/O device,Software,System and application software.

Online search of Chemistry databases,e- journals,search engines for chemistry,chemweb.

References

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Arora, P.N. & Malhon, P.K. 1996. Biostatistics. Imalaya Publishing House, Mumbai.
4. Jogdand SN. 2004. Gene Biotechnology Published by Himalaya Publishing House, Mumbai.
5. K.Balagurusamy, Fortran for Beginners Tata McGrawhill, New Delhi 1990
6. K.V.Raman Computer in Chemistry, Tata McGrawhill, New Delhi 1990
7. K.Balagurusamy C++ Tata McGrawhill, New Delhi 1995
8. Sanjay Saxena, MS Office XP for Everyone, 1/e Vikas Publishing 2000
9. Manual of M.S Office Microsoft Inc.



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Faculty of Science

Ph.D Program

PHYSICS

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits: 4

Unit-I Research Methods

Meaning of Research-Objectives of Research-Motivation in Research – Types of Research – Significance of Research –Research and Scientific Method– Criteria of good Research – Problem Encountered by Researchers in India – What is Research Problem? Selecting the Problem – Defining the Problem – Technique involved in Defining the Problem- 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-Research metrics and Indexing.

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Unit – IIIMicroscopy and Analytical Instrumentations

Principle,structure and applications of Bright field,Darkfield,Phasecontrast,Fluorescent,Electron microscopy (TEM & SEM),Confocalmicroscope and Foldscope.Atomic force microscope (AFM).pH meter-determination of pH,Colorimetry,Spectroscopy techniques – UV – Visible,Fluorescence,FT – IR,Atomicabsorption,NMR,Massspectrometry,MALDIToF,IRspectrum,X-ray crystallography.



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Unit – IV Statistical Methods

Interpolation – significance of interpolation – methods of interpolation – Binomial method – Newton's method – Newton's forward form – Newton's backward form – Finite differences – Lagrange's method – theoretical distribution – Binomial – Poisson – hypergeometric and normal distributions – data fitting-principle of least squares – fitting a straight line – curve fitting – Chi square test – conditions for applying Chi square test – uses and limitations.

Unit – V Introduction to Computing

Introduction to computers and computing – hardware, Basic organization of a computer, CPU, Main memory, Secondary storage, I/O device, Software, System and application software. Programming in C: Constants – Variables – Data types – Operators and Expressions – Input/Output Statements – Control statements – Functions – Arrays – One, two, multidimensional array declarations and initializations.

References

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Arora, P.N. & Malhon, P.K. 1996. Biostatistics. Imalaya Publishing House, Mumbai.
4. K. Balagurusamy, Fortran for Beginners Tata McGrawhill, New Delhi 1990
5. K.V. Raman Computer in Chemistry, Tata McGrawhill, New Delhi 1990
6. Sanjay Saxena, MS Office XP for Everyone, 1/e Vikas Publishing 2000
7. Manual of M.S Office Microsoft Inc.



VINAYAKA MISSION'S RESEARCH FOUNDATION

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Faculty of Science

Ph.D Program

Computer Science

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits: 4

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Unit-III 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.



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Unit- IV 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.

Unit- V Analytical Methods (Omit Theorem and Proof)

Introduction – types of correlation – scatter diagram method – correlation graph method – coefficient of correlation – Spearman's Rank correlation coefficient – coefficient of concurrent deviation – correlation coefficient by the method of least square – Error of the coefficient of correlation – coefficient of determination.

Introduction – graphic methods for studying regression – algebraic method of studying regression – Regression equation in case of correlation table – standard error of estimate – ratio of estimate.

References

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.]
3. K. R. Gupta, Statistics – Volume 1, Atlantic Publishers and Distributers, 2014. (Chapters 8 and 9)
4. Roger Pressman. S Software Engineering “ A practitioner Approach 3rd Editon McGraw Hill, 1997
5. P Fleegeer “Software Engineering’ Prentice Hall, 1999
6. Carlo Ghezzi, Mehdi, Jazayari, Dino Mandrioli “Fundamental of Software Engineering’ Prentice Hall of India, 1991.



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Faculty of Science

Ph.D Program

COMMERCE & MANAGEMENT

RESEARCH METHODOLOGY -SYLLABUS

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Unit – II Research Ethics & IPR

Perspective of Ethics, Personal vs professional ethics: Moral Reasoning – Ethical theories, Deontological, Utilitarianism – Ethical leadership (integrity and ingenuity) – 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, world intellectual property rights organization (WIPO)

Unit – III

Sampling design – Meaning – Concepts – Steps in sampling – Criteria for good sample design – Types of sample designs – Probability and Non-Probability samples – Sample size determination – Data collection – Data collection: Types of data – Sources – Tools for data collection – Constructing Questionnaire – Reliability and Validity – Pilot study – Data Pre-Processing : Coding and Editing data analysis: Exploratory, Descriptive and Inferential Analyses.



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

Unit – IV

Test of significance: Parametric and Non-Parametric tests. Parametric tests – t test, F test and Z test – Non Parametric tests – U Test, Kruskal Wallis, Sign test – Multivariate Analysis – Factor analysis, Cluster analysis, MDS, Discriminate Analysis Correlation and Regression analyses – Statistical Packages and its Applications – Other Tools of Model Building.

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.

References:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Arora, P.N. & Malhon, P.K. 1996. Biostatistics. Imalaya Publishing House, Mumbai.
4. Ramadass, P. and A. Wilson Aruni 2009. Research and Writing - Across the Disciplines. MJP Publishers, Chennai – 600 005
5. William G. Zigmund, “Business Research Methods”, Cengage Learning India Pvt Ltd, 2006.
6. Rao K.V. Research “Methods for Management and Commerce”, Sterling Publishers, 1993.
7. O.R. Krishnasamy – Methodology of Research in Social Sciences, Himalaya Publishers.
8. Young, Pauline V. Scientific Social Surveys in Research, Prentice Hall, Englewood Cliffs, NF.



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

Faculty of Science

Ph.D Program

MATHEMATICS

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits: 4

Unit-I Research Methods

Meaning of Research-Objectives of Research-Motivation in Research – Types of Research – Significance of Research –Research and Scientific Method– Criteria of good Research – Problem Encountered by Researchers in India – What is Research Problem? Selecting the Problem – Defining the Problem – Technique involved in Defining the Problem- 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-Research metrics and Indexing.

Unit – II Research Ethics & IPR

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Introduction to intellectual property and intellectual property rights Types, patents, copy rights, trade marks, design rights, geographical indications – importance of IPR, world intellectual property rights organization (WIPO)

Unit III Optimization

Direct and gradient based methods for constrained and unconstrained optimization problems.

UNIT IV Methods of Applied Mathematics

Fundamental properties of eigen values and eigen functions for symmetric kernels, Hilbert Schmidt theorem and some immediate consequences, solutions of integral equations with symmetric kernels.



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

UNIT V Computational Methods :

Numerical solution of linear and nonlinear ordinary differential equations, numerical solution of linear partial differential equations.

References:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Ramadass, P. and A. Wilson Aruni 2009. Research and Writing - Across the Disciplines. MJP Publishers, Chennai – 600 005
4. Leigh, D.C., Non-linear Continuum Mechanics, MGH.
5. Eringen, A.C., Non-linear Theory of Continuous Media, Academic Press, 1962.
6. Sokolnikoff, I. S., Mathematical Theory of Elasticity, MGH.
7. Chandrasekhariah, D. S. and Debnath, L., Continuum Mechanics, Academic Press.
8. Chang Edwin, K.P. and Zak, S., An Introduction to Optimization, John Wiley & Sons Inc., 2004.
9. Aokie, M., Introduction to Optimization Techniques : Fundamentals and Applications of Nonlinear Programming, Macmillan, 1971.
10. Sun, W. and Yuan, Y., Optimization Theory and Methods : Nonlinear Programming, Springer, 2006.
11. Bazaraa, M.S., Shreali, H.D. and Shetty, C.M., Nonlinear programming : Theory and Algorithms, John Wiley & Sons., 2004.
12. Tricomi, F.G., Integral Equations, DoverPub., 1985.
13. Kress, R., Linear Integral Equations, Springer-Verlag, 1999.
14. Mikhlin, S.G., Integral Equations, Pergaman Press, 1964.
15. Hochstadt, H., Integral Equations, Wiley, 1973.
16. Numerical Methods for Mathematics, Science and Engineering –J. W. Mathews-PHI.
17. Introductory Methods of Numerical Analysis –S. S. Sastry –PHI.
18. Numerical Solution of Partial Differential Equations –G. D. Smith.



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

Faculty of Science

Ph.D Program

Microbiology

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits: 4

Unit-I Research Methods

Meaning of Research-Objectives of Research-Motivation in Research – Types of Research – Significance of Research –Research and Scientific Method– Criteria of good Research – Problem Encountered by Researchers in India – What is Research Problem? Selecting the Problem – Defining the Problem – Technique involved in Defining the Problem- 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-Research metrics and Indexing.

Unit – II Research Ethics & IPR

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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 – IIIMicroscopy and Analytical Instrumentations

Principle,structure and applications of Bright field,Darkfield,Phasecontrast,Fluorescent,Electron microscopy (TEM & SEM),Confocalmicroscope and Foldscope.Atomic force microscope (AFM).pH meter-determination of pH,Colorimetry,Spectroscopy techniques – UV – Visible,Fluorescence,FT – IR,Atomicabsorption,NMR,Massspectrometry,MALDIToF,IRspectrum,X-ray crystallography.



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

Unit – IV Separation Techniques

Centrifugation-preparative and analytical,ultracentrifugation,density gradient centrifugation.Principles and applications of gel – filtration,Ion-exchange,affinitychromatography;Thin layer and gas chromatography;High pressure liquid (HPLC) Chromatography,HPTLC,GC-MS,LC-MS.Electrophoresis – Principle,types and applications – PAGE (proteins),Agarose Gel Electrophoresis (Nucleic acids),Pulse field Gel Electrophoresis (PFGE),Two dimensional electrophoresis (IEF).Microbial Identification System (MIS).

Unit – V Biostatistics

Principles and practice of statistical methods in biological research – Data collection,presentation of Data – Measures of central tendency – Mean,Median,Mode,Correlation coefficient,Standard deviation,student 't' test,chi-square test.Analysis of variance (ANOVA) and its uses.Basics of computers – types,servers,operating systems – Windows,UNIX and Linux. Finding scientific articles – Pubmed.Outline of SPSS and Mathematica.

References

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Arora, P.N. & Malhon, P.K. 1996. Biostatistics. Imalaya Publishing House, Mumbai.
4. Jogdand SN. 2004. Gene Biotechnology Published by Himalaya Publishing House, Mumbai.
5. John G Webster. 2004. Bioinstrumentation .Student edition, John Wiley & sons, Ltd.
6. Kleinsmith, L. J. & Kish, V.M. 1995. Principles of Cell and Molecular Biology. 2nd edn., McLaughlin, S., Trost, K., Mac Elree, E. (eds.), Harper Collins Publishers, New York.
7. Keith Wilson & John Walker. 2003. Practical Biochemistry Principles & techniques. 5th edition, Cambridge university press.
8. Palanivelu P. 2001. Analytical biochemistry and separation Techniques A Laboratory manual. 2nd edition, Published by Tulsi Book Centre, Madurai, Tamilnadu.
9. Ramadass, P. and A. Wilson Aruni 2009. Research and Writing - Across the Disciplines. MJP Publishers, Chennai – 600 005



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

Faculty of Science

Ph.D Program

ZOOLOGY

RESEARCH METHODOLOGY -SYLLABUS

Total Lecture Hours : 60

Credits: 4

Unit-I Research Methods

Meaning of Research-Objectives of Research-Motivation in Research – Types of Research – Significance of Research –Research and Scientific Method– Criteria of good Research – Problem Encountered by Researchers in India – What is Research Problem? Selecting the Problem – Defining the Problem – Technique involved in Defining the Problem- 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-Research metrics and Indexing.

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Unit – III Microscopy and Analytical Instrumentations

Principle, structure and applications of Bright field, Darkfield, Phase contrast, Fluorescent, Electron microscopy (TEM & SEM), Confocal microscope and Foldscope. Atomic force microscope (AFM). pH meter-determination of pH, Colorimetry, Spectroscopy techniques – UV – Visible, Fluorescence, FT – IR, Atomic absorption, NMR, Mass spectrometry, MALDI ToF, IR spectrum, X-ray crystallography.



VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

Unit – IV Histological Techniques

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

Unit – V Biostatistics

Principles and practice of statistical methods in biological research – Data collection, presentation of Data – Measures of central tendency – Mean, Median, Mode, Correlation coefficient, Standard deviation, student 't' test, chi-square test. Analysis of variance (ANOVA) and its uses. Basics of computers – types, servers, operating systems – Windows, UNIX and Linux. Finding scientific articles – Pubmed. Outline of SPSS and Mathematica.

References:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Arora, P.N. & Malhon, P.K. 1996. Biostatistics. Imalaya Publishing House, Mumbai.
4. John G Webster. 2004. Bioinstrumentation .Student edition, John Wiley & sons, Ltd.
5. Kleinsmith, L. J. & Kish, V.M. 1995. Principles of Cell and Molecular Biology. 2nd edn., McLaughlin, S., Trost, K., Mac Elree, E. (eds.), Harper Collins Publishers, New York.
6. Keith Wilson & John Walker. 2003. Practical Biochemistry Principles & techniques. 5th Edition, Cambridge university press.
7. Palanivelu P. 2001. Analytical biochemistry and separation Techniques A Laboratory manual. 2nd edition, Published by Tulsi Book Centre, Madurai, Tamilnadu.
8. Ramadass, P. and A. Wilson Aruni 2009. Research and Writing - Across the Disciplines. MJP Publishers, Chennai – 600 005