



**VINAYAKA MISSION'S  
RESEARCH FOUNDATION**  
(Deemed to be University under section 3 of the UGC Act 1956)

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# **VMRF (DU) Ph.D. PROGRAMME**

## **RESEARCH METHODOLOGY**

### **SYLLABUS**

**2020**



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# **ARTS AND SCIENCES**



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**ENGLISH**



**FACULTY OF ARTS PH.D PROGRAM**

**ENGLISH**

**RESEARCH METHODOLOGY- SYLLABUS**

**Total Hours :60**

**Credits : 04**

**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 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.

**Unit- III 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 – IVIntroduction to Theoretical Perspectives**

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

**Unit – V Research and Publication Ethics (Theory) (15 Hours)**

**PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.



**SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data

**PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

**RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

**OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

**PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

**DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.

**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
- Bird,A.(2006). Philosophy of Science. Routledge.
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- Resnik,D.B.(2011).What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
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- <https://doi.org/10.1038/489179a>
- Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7.<http://www.insaindia.res.in/pdf/EthicsBook.pdf>



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# **BIOCHEMISTRY**





**FACULTY OF SCIENCE PH.D PROGRAM**  
**BIOCHEMISTRY**  
**RESEARCH METHODOLOGY –SYLLABUS**

**Total 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 – IIMicroscopy 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,FTIR,Atomicabsorption,NMR,Massspectrometry,MALDIToF,IRspectrum, X-ray crystallography.

**Unit – III Bioinformatics**

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

**Unit – IV Biostatistics**

Principles and practice of statistical methods in biological research – Data collection,presentation of Data – Measures of central tendency – Mean,Median,Mode,Correlation coefficient,Standarddeviation,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.



## **Unit – V Research and Publication Ethics (Theory) (15 Hours)**

### **PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

### **SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

### **PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

### **RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)**

#### **OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

#### **PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

#### **DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.



## References

- Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
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- Ramadass, P. and A. Wilson Aruni 2009. Research and Writing - Across the Disciplines. MJP Publishers, Chennai – 600 005
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- Resnik, D.B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
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- <https://doi.org/10.1038/489179a>
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# **BIOSTATISTICS**



**FACULTY OF SCIENCE PH.D PROGRAM  
BIostatistics  
RESEARCH METHODOLOGY –SYLLABUS**

**Total 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 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 InterpretationsTechniques of Interpretation,Precautions in Interpretations, Data Processing;Coding, tabulations, classifications.

**Unit – III Bioethics&Statistical Analysis**

Bioethics: Introduction, Animal rights and animal laws in India, Prevention of cruelty to animals Act1960, 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 – IV Statistical Analysis**

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

**Unit – V Research and Publication Ethics (Theory) (15 Hours)**

**PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.



**SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

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**PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

**DATABASES AND RESEARCH METRICS:(7 Hours)**

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- <https://doi.org/10.1038/489179a>
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# **CHEMISTRY**





**FACULTY OF SCIENCE PH.D PROGRAM**

**CHEMISTRY**

**RESEARCH METHODOLOGY –SYLLABUS**

**Total 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 – IIMicroscopy 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, MALDIToF, IR spectrum, X-ray crystallography.

**Unit – III Separation Techniques**

Centrifugation-preparative and analytical,ultracentrifugation,densitygradientcentrifugation.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 – IV 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.



**Unit – V Research and Publication Ethics (Theory) (15 Hours)**

**PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

**SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

**PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

**RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

**OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

**PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

**DATABASES AND RESEARCH METRICS:(7 Hours)** (A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.



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- Macintyre, Alasdair (1967) A Short History of Ethics. London.
- P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865
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- Resnik, D.B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
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- <https://doi.org/10.1038/489179a>
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# **PHYSICS**



**FACULTY OF SCIENCE PH.D PROGRAM**

**PHYSICS**

**RESEARCH METHODOLOGY –SYLLABUS**

**Total 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 – IIMicroscopy 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, MALDIToF, IR spectrum, X-ray crystallography.

**Unit – IIIStatistical 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 – IV 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.



## **Unit – V Research and Publication Ethics (Theory) (15 Hours)**

### **PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

### **SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

### **PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

### **RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

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1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

### **PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

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- Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
- Arora, P.N. & Malhon, P.K. 1996. Biostatistics. Imalaya Publishing House, Mumbai.
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- <https://doi.org/10.1038/489179a>
- Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7. <http://www.insaindia.res.in/pdf/EthicsBook.pdf>



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# **COMPUTER SCIENCE**





**FACULTY OF SCIENCE PH.D PROGRAM  
COMPUTER SCIENCE  
RESEARCH METHODOLOGY –SYLLABUS**

**Total 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 Algorithms and Analysis**

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

**Unit – III 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- IV 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.

#### **Unit – V Research and Publication Ethics (Theory)(15 Hours)**

##### **PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

##### **SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

##### **PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

##### **RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

##### **OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

##### **PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,



## **DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.

### **References**

- Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
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- P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865
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# **MATHEMATICS**



**FACULTY OF SCIENCE PH.D PROGRAM**  
**MATHEMATICS**  
**RESEARCH METHODOLOGY –SYLLABUS**

**Total 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 Optimization**

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

**Unit – III 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.

**Unit – IV Computational Methods**

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

**Unit – V Research and Publication Ethics (Theory)(15 Hours)**

**PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

**SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,



### **PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

### **RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

#### **OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

#### **PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

#### **DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.

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- Numerical Methods for Mathematics, Science and Engineering –J. W. Mathews-PHI.
- Introductory Methods of Numerical Analysis –S. S. Sastry –PHI.
- Numerical Solution of Partial Differential Equations –G. D. Smith.
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- <https://doi.org/10.1038/489179a>
- Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7.<http://www.insaindia.res.in/pdf/EthicsBook.pdf>



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# **MICROBIOLOGY**





**FACULTY OF SCIENCE PH.D PROGRAM**  
**MICROBIOLOGY**  
**RESEARCH METHODOLOGY –SYLLABUS**

**Total 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 – IIMicroscopy 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.

**Unit – III Separation Techniques**

Centrifugation-preparative and analytical,ultracentrifugation, density gradientcentrifugation.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 – IV Biostatistics**

Principles and practice of statistical methods in biological research – Data collection,presentation of Data – Measures of central tendency – Mean,Median,Mode,Correlation coefficient,Standarddeviation,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.



**Unit – V Research and Publication Ethics (Theory) (15 Hours)**

**PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

**SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

**PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

**RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

**OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

**PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

**DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.



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# **ZOOLOGY**



**FACULTY OF SCIENCE PH.D PROGRAM  
ZOOLOGY  
RESEARCH METHODOLOGY –SYLLABUS**

**Total 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 – IIMicroscopy 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.

**Unit – III Histological Techniques**

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

**Unit – IVBiostatistics**

Principles and practice of statistical methods in biological research – Data collection,presentation of Data – Measures of central tendency – Mean,Median,Mode,Correlation coefficient,Standarddeviation,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.

**Unit – V Research and Publication Ethics (Theory) (15 Hours)**

**PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.



**SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

**PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

**RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

**OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

**PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

**DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.

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- Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
- Arora, P.N. & Malhon, P.K. 1996. Biostatistics. Imalaya Publishing House, Mumbai.
- John G Webster. 2004. Bioinstrumentation .Student edition, John Wiley & sons, Ltd.



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- Resnik, D.B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
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# **COMMERCE AND MANAGEMENT**





**COMMERCE & MANAGEMENT**  
**RESEARCH METHODOLOGY –SYLLABUS**

**Total 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**

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.

**Unit – III**

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,Clusteranalysis,MDS,Discriminate Analysis Correlation and Regression analyses – Statistical Packages and its Applications – Other Tools of Model Building.

**Unit – IV**

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.

**Unit – V Research and Publication Ethics (Theory) (15 Hours)**

**PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.



**SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

**PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

**RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

**OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

**PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

**DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.

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# **ENGINEERING AND TECHNOLOGY**



**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 goodresearch.

**UNIT II - Research Formulations and Design**

Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the 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 and Collection of data - Methods of data collection – Sampling Methods- Data Processing and Analysis strategies - Data Analysis with Statistical Packages (Sigma STAT,SPSS for student t-test, ANOVA, etc.), - Hypothesis-testing -Generalization and Interpretation.

**UNIT-IV - 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.

**UNIT – V Research and Publication Ethics (Theory) (15 Hours)**

**PHILOSOPHY AND ETHICS:(3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

**SCIENTIFIC CONDUCT: (5 Hours)**

Ethics with respect to science and research 2.Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant



publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

#### **PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

#### **RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

#### **OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

#### **PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools,

#### **DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.

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- National Ethical Guidelines for Biomedical & Health Research involving human participants ICMR, New Delhi 2017
- Guidelines for care and use of animals in scientific research. Indian National Science Academy, New Delhi.
- Research Methodology, methods and techniques by C.R. Kothari. (2009)
- Basic epidemiology, 2nd Edition, R Bonita, R Beaglehole and T Kjellstrom (2007)
- Statistical methods in medical research, 4th edition, P Armitage, G Berry and JNS Matthews. (2001)
- Biostatistics: A foundation for analysis in health sciences, 9th edition, Wayne W Daniel (2008)
- Computer fundamentals Pradip K. Singha and Priti Singha (BPB Publication)
- The Internet: A users guide K. L. James (PHI publication)
- Internet Research skill (SAGE publication) Niall O'Dochartaigh
- How to keep your Research Project on Track- Keith Town send -2018
- Microsoft office system (PHI publication)



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**MEDICINE, DENTISTRY,  
HOMEOPATHY AND ALLIED HEALTH  
SCIENCES**





## HEALTH SCIENCES

### (MEDICINE, DENTISTRY, PHARMACY, HOMEOPATHY & ALLIED HEALTH SCIENCES)

#### RESEARCH METHODOLOGY -SYLLABUS

**Total 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 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.RT PCR,HPLC,GCMS instruments .

#### **Unit –III Clinical Trials**

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

#### **Unit – IV Biostatistics**

Principles and practice of statistical methods in biological research – Data collection,presentationof Data – Measures of central tendency – Mean, Median, Mode, Correlation coefficient, Standarddeviation,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,Qualitativeanalysis,Questionnaire designing and validation ,Interview,FGD.



**Unit – V Research and Publication Ethics (Theory) (15 Hours)**

**PHILOSOPHY AND ETHICS: (3 Hours)**

1.Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

**SCIENTIFIC CONDUCT: (5 Hours)**

1.Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

**PUBLICATION ETHICS:(7 Hours)**

1.Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

**RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

**OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

**PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, iThenticate and other open source software tools,

**DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.



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# **NURSING**



## NURSING

### RESEARCH METHODOLOGY - SYLLABUS

**Total 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

#### **Research Problem**

Selecting the Problem, Defining the Problem, Techniques involved in Defining the Problem

#### **Literature search using databases**

#### **Research Design**

Different research designs: Quantitative, Qualitative and Mixed Method designs. Basic principles of Experimental Designs.

#### **Construction and Validation of Scales and Tools**

**Data Collection Methods:** Quantitative, Qualitative and Mixed methods.

**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 Systematic Reviews, Scoping Reviews, Meta-Analysis & Meta Synthesis**

Meaning and its significance, Steps of conducting reviews, Protocol for writing and reporting.

#### **Unit-III Clinical Trials**

Introduction, Composition, Procedures & records, Informed consent, Responsibility and rules applicable to investigators and sponsors, Reporting of adverse events and other related ethical issues. Bio safety and Bioequivalence studies.

#### **Unit- IV Biostatistics**

Principles and practice of statistical methods in biological research: Data Compilation / Coding, Presentation of Data

#### **Quantitative and Qualitative data Analysis**

**Descriptive Statistics:** Measures of central tendency, Measures of Variability

**Inferential Statistics:** Parametric and Non-Parametric Test.



**Basics of computers:**

- Types
- Servers
- Operating systems: Windows, UNIX & Linux.

**Data Analysis Software** - Outline of SPSS, MAXQDA and Mathematica

**Unit – V Research and Publication Ethics (Theory) (15 Hours)**

**PHILOSOPHY AND ETHICS: (3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

**SCIENTIFIC CONDUCT: (5 Hours)**

Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

**PUBLICATION ETHICS: (7 Hours)**

Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals.

**RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

**OPEN ACCESS PUBLISHING: (4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

**PUBLICATION MISCONDUCT: (4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Tumin, Urkund and other open source software tools,

**DATABASES AND RESEARCH METRICS: (7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics.



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# **PHYSIOTHERAPY**





**PHYSIOTHERAPY**  
**RESEARCH METHODOLOGY – SYLLABUS**

**Total 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 Analytical Instrumentation**

Electromyography, Nerve conduction studies, Somatosensory evoked potentials, Strength duration curve, Goniometry, Balance master, Computerised treadmill, Bicycle ergometry, Hand grip dynamometer, Biofeedback, Pulmonary function tests, Ultrasonography, Pelvic inclinometer, Blood lactate analysis, Pulse oximetry, Physical fitness tests, Sphygmomanometer, Body fat analyser, Isokinetic machine, Peak flow meter.

**Unit –III 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 – IV 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.



## **Unit – V Research and Publication Ethics (Theory) (15 Hours)**

### **PHILOSOPHY AND ETHICS: (3 Hours)**

1. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

### **SCIENTIFIC CONDUCT: (5 Hours)**

1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) 4. Redundant publications: duplicate and overlapping publications, salami slicing 5. Selective reporting and misrepresentation of data,

### **PUBLICATION ETHICS:(7 Hours)**

1. Publication ethics: definition, introduction and importance 2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5. Violation of publication ethics, authorship and contributorship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals

## **RESEARCH AND PUBLICATION ETHICS (PRACTICE)(15 HOURS)(INTERNAL)**

### **OPEN ACCESS PUBLISHING:(4 Hours)**

1. Open access publications and initiatives 2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

### **PUBLICATION MISCONDUCT:(4 Hours)**

(A) Group Discussions: 1. Subject specific ethical issues, FFP, authorship 2. Conflicts of interest, 3. Complaints and appeals: examples and fraud from India and abroad (B) Software tools: Use of plagiarism software like Turnitin, iThenticate and other open source software tools,

### **DATABASES AND RESEARCH METRICS:(7 Hours)**

(A) Databases: 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. (B) Research Metrics: 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score 2. Metrics: h-index, g index, i10 index, altmetrics. Introduction to philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgments and reactions.



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- Palanivelu P. 2001. Analytical biochemistry and separation Techniques A Laboratory manual. 2nd edition, Published by Tulsi Book Centre, Madurai, Tamilnadu.
- Ramadass, P. and A. Wilson Aruni 2009. Research and Writing - Across the Disciplines. MJP Publishers, Chennai – 600005.