ETHIRAJ COLLEGE FOR WOMEN (Autonomous)
Chennai – 600 008

Affiliated to the University of Madras
College with Potential for Excellence
Re-accredited with A Grade by NAAC

3.4.1

Inclusion of research ethics in the Research Methodology course work

M.PHIL- PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

SEMESTER 1

CORE PAPER I- RESEARCH METHODOLOGY

COURSE CODE: 10M18/REM **CREDIT-5**

COURSE OBJECTIVES:

To enable the students to

1. Understand the application of different types of microscopic techniques
2. Gain knowledge in general laboratory techniques of Biochemistry and Microbiology.
3. Provide insight in analytical separation techniques and their applications in Research.
4. Apply the fundamental concept of immunology to understand immunotechniques.
5. Impart the application of various statistical tools used in research and the significance of quality research publication.

UNIT 1 Microscopic technique:

Light microscope – Principle, construction and application –Dark field, Phase contrast, Fluorescence microscope, Polarization microscope and Confocal scanning microscope. Principle, construction, sample preparation and application of electron microscope – SEM , STEM, TEM.

UNIT II General Lab Technique:

pH Buffering mechanism. Choice and preparation of common buffers – Potassium Phosphate buffer and Tris Acetate Buffer. pH measurements. Methods of sterilization of media and Glassware. Media – Choice of media, isolation, purification and maintenance of Algae, Fungi and Bacteria.Methods of Determining microbial number – Batch culture, continuous culture. Application of Fermenters.

UNIT III Separation Technique:

Centrifugation:

Principle of sedimentation, Relative Centrifugal Force (G),Types and uses of Centrifuge –Bench top Centrifuge, Large capacity centrifuge, High Speed Refrigerated Centrifuge, Preparatory centrifuge and analytical centrifuge. Zonation and Isopycnic Centrifuge.

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Chromatography- Principle, procedure,applications-TLC,Column chromatography, Ion exchange chromatography,HPLC, HPTLC, GC-MS.

Electrophoresis-General principle-factors affecting electrophoresis samples, principle, procedure and applications-Agarose gel , PAGE and SDS- PAGE.

UNIT IV Immunotechnique:

Properties and type of Antibody and Antigen. Application and Production of Monoclonal antibodies and Polyclonal antibodies. Immunodiffusion, Immunoelectrophoresis, Immunolabelling – Biotin. ELISA.

UNIT V Statistical methods:

Presentation of data-methods. Measurement of dispersion – range, variance, standard deviation, standard error. Test of significance based on large sample-small sample – Student t-test – ANOVA and DMRT. Probability – Probability distribution – Binomial, Poisson, and Normal. Simple correlation and Regression. Computer application - SPSS package. Designing the research work- components of a research report-thesis-plagiarism. Scientific writing – Manuscript preparation, citation style-citation index-H-index, impact factor.

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V. Manimozhi

Mrs. V. MANIMOZHI M.Sc., M.Phil.,
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BUSINESS ECONOMICS

SEMESTER-III

RESEARCH METHODOLOGY AND COMPUTER APPLICATIONS IN ECONOMICS

TotalHours:75 **Course Code: 8P18/3C/RMC//3P18/3C/RMC**

Credits : 4 **LTP: 2/2/1**

COURSE OBJECTIVES

1. To understand the scientific research process.
2. To know and apply statistical tools
3. To learn computer applications in executing economic research.

COURSE OUTLINE:

UNIT I: The Scientific Approach – Aims of Social Sciences –Scientific Sciences – Scientific Revolution – Role of Methodology – Research Process – Conceptual Foundation of Research – Economic Theory and Methods – Axiomatic, Mathematical and Historical Methods – Theory, Models and Empirical Research – Basic Elements in Research – Identification of a Research Problem–Hypothesis Formulation and Testing–Research Process-Ethics in Research. (15Hours)

UNIT II: Principles and Process in Data Collection – Primary Data – Case Study Method– Survey Research – Sample Selection – Sampling Design – Preparation of Structure Interview Schedule – Construction of Questionnaire – Pilot Study – Classification and Tabulation – Diagrammatic Representation – Secondary Data – Sourcing of Data for India and Tamil Nadu – Census of India, NSSO, Economic Survey, RBI Report, Agricultural Census, Annual Survey of Industries. (15Hours)

UNIT III: Concept of Data, Record and File – Type of Data and Data Structure – Data – File handling and operations – Data storage and retrieval – Data Operations – Algorithms like Sorting , Merging, Joining and Bifurcation – Data Base Concept and Operation on Data Base.

(15 Hours)

UNIT IV: Series – Group tables – Groups and objects – Time and Frequency Series – Regression Methods and Techniques – Regression Analysis – Trends and Forecasting – Report writing – Plan of Research report – Style & Mechanics of writing Research report.

(15Hours)

UNITV: Application of Software to Economic Research – (Practical Classes).

(15 Hours)

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ZOOLOGY

III SEMESTER

SELF STUDY PAPER

RESEARCH METHODOLOGY

SYLLABUS

UNIT-I **(15Hrs)**

Life Science - Basic concepts, Definition, Laws, Characteristics, knowledge, Information and Data, Pseudoscience. Units of measurements, Concepts of Research - Meaning, Objectives, Motivation and Approaches, Types of Research (Descriptive / Analytical, Applied / Fundamental, Quantitative / Qualitative, Conceptual / Empirical, Research Methodology.

UNIT-II **(15Hrs)**

Research Formulation-Observation and Facts, Prediction and explanation, Induction, Deduction. Defining and formulating the research problem, Selecting the problem and necessity of defining the problem. Literature review - Importance of literature reviewing in defining a problem, Critical literature review, Identifying gap areas from literature review, Hypothesis - Null and alternate hypothesis and testing of hypothesis.

UNIT-III **(15Hrs)**

Research Designs-Basic principles, Meaning, Need and features of good design, Important concepts, Types of research designs, Development of a research plan -Exploration, Description, Diagnosis, Experimentation, determining experimental and sample designs, Data collection techniques.

UNIT-IV **(15Hrs)**

Project proposal writing, Research report writing (Thesis and dissertations, Research articles, Oral communications). Presentation techniques - Assignment, Seminar, Debate, Workshop, Colloquium, Conference. Information Science, Extension and Ethics, Sources of Information -Primary and secondary sources, Library - books, journals, periodicals, reference sources, Abstracting and indexing sources, Reviews, Treatise, Monographs, Patents, Internet - Search engines and software, Online libraries, e-Books, e-Encyclopedia, TED Talk, Institutional Websites.

UNIT-V **(15Hrs)**

Intellectual Property Rights - Copy right, Designs, Patents, Trademarks, Geographical indications. Safety and precaution - ISO standards for safety, Lab protocols, Lab animal use, care and welfare, animal houses, radiation hazards. Extension: Lab to Field, Extension communication, Extension tools, Bioethics: Laws in India, Working with man and animals, Consent, Animal Ethical, Committees and Constitution.

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MICROBIOLOGY
SEMESTER II
ANALYTICAL TOOLS AND RESEARCH METHODOLOGY

TOTAL HOURS: 60 **COURSE CODE: 16SP18/2C/ARM**
CREDITS: 4 **LTP: 3-1-0**

COURSE OBJECTIVES:

1. Learn principles and applications of types of spectrometry
2. Explain principles and applications of types of centrifuge and chromatography techniques
3. Discuss principles of Electrophoresis, PCR, Scintillation counter, biosensors and microbial identification systems.
4. Learn the Art of report and thesis writing
5. Provide insights on importance of scientific communication, ethical issues in research, plagiarism and IPR.

COURSE OUTLINE:

UNIT I **12 Hours**

Principles of analytical instrumentation –Techniques and applications of Colorimetry and Spectrophotometry- Beer lamberts Law, Turbidimetry, UV-Vis Spectroscopy, Fourier Transform Infrared Spectroscopy, Fluorescence spectroscopy, NMR spectroscopy, Mass Spectroscopy, Circular Dichroism and Optical Rotatory Dispersion (ORD).

UNIT II **12 Hours**

Centrifugation- Basic Principles, Instrumentation, types of Centrifuges and Methods of Centrifugation. Chromatography- Principles and types- Column, Thin layer, Paper, Adsorption, Gas liquid, Ion Exchange, Affinity, HPLC working and applications

UNIT III **12 Hours**

Electrophoretic techniques- Native, SDS and 2D. Gel documentation system. PCR principle and applications. Detection and measurement of radioactivity –liquid and solid scintillation counters, Biosensors - Definition, Components of Biosensors, Types –Electrochemical, Enzyme, Environmental Biosensors and Application of Biosensors. Microbial identification systems (API).

UNIT IV **12 Hours**

Objectives of Research- Problem identification and formulation, Approaches, design- exploratory descriptive and experimental, steps and Criteria of good research. Writing the research Report-Title, Authors, Address, Abstract, Keywords, Introduction, Review of literature, Materials and Methods, Results, Discussions, Summary, Acknowledgement and Bibliography, Research report- Tables, Figures and Formatting.

UNIT V **12 Hours**

Importance of Scientific communication- Types and modes of scientific communications. Journals in Microbiology, Impact factor of Journals, When and Where to publish . Ethical issues related to publishing, Data fudging, Plagiarism and self plagiarism, software to detect plagiarism. 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 inventions – world intellectual property rights organization (WIPO). Comparison of IPR in India and foreign countries.

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CHEMISTRY

Core 1-SCIENTIFIC RESEARCH METHODOLOGY

Teaching hours: 15 x 4 = 60 Hrs **Course Code: 6M18/SRM**
Credits: 5

Objectives:

1. To impart knowledge to do literature survey
2. To learn the experimental techniques for research work
3. To analyze and interpret research data using statistical Techniques
4. To impart knowledge in conventions of thesis and assignment writing
5. To introduce modern teaching methodologies

COURSE OUTLINE:

UNIT I: Introduction to Research: Importance of research- Aims, objectives, Selection of research problems-Survey of scientific literature-Primary and secondary sources. Funding agencies
12 hrs

UNIT II: Conduct of Research Work: Physical properties useful in analysis and method of separation prior to analysis-Isolation techniques-Extraction, crystallization, sublimation, distillation, - High vacuum distillation techniques - cyclic distillation, analytical distillation, thermal hazards of these techniques- chromatography-column, paper , thin layer, gas chromatography - reaction techniques to include high dilution, vacuum line reaction, reactions aided by azeotropic distillation, recycling, pyrolysis, Soxhlet extraction, continuous reactions, reactions at low temperatures, reactions in non aqueous media and molten salts, micro quantity handling and use of globe box . Special methods in modern chemistry-methods for vaccum sublimation and quasi sublimation, technique and apparatus for reactions in inert atmosphere and at under low temperature, working with compressed gases, heating under pressure, chemistry of working with hazardous materials- air / water sensitive, corrosive, toxic explosive and radioactive materials.
12 hrs

UNIT III: Statistical treatment of Analytical Results: Precision and Accuracy-ReliabilityDeterminate and random errors-Distribution of random errors-Normal distribution curve. Statistical treatment of finite samples - the student's T test and F test-criteria for rejection of an observation Q test. Significant figures and computation rules. Data plotting - Least square analysis-significance of correlation coefficient. 12 hrs

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ECONOMICS
SEMESTER – I
RESEARCH METHODOLOGY

Total Hours: 90
Credits: 5

Course Code: 3M18/RMY
LTP: 3/2/1

COURSE OBJECTIVES

1. To understand the research process and research design
2. To apply mathematical and statistical tools to arrive at conclusion

COURSE OUTLINE:

UNIT-I: Meaning of Research- Qualities of a Research Worker - Pure and Applied Research- Scientific Method of Research- Definition- Stages - Steps- Logical- Inductive- Deductive Methods- Ethics in Research. (20 hrs)

UNIT-II: Purpose of Research- Functions of Research - Research Problem - Research Design- Research Process - Statistical Unit- Sampling Methods- Observation- Case Study- Experimental- Interview- Questionnaire- Pilot Study- Planning of Survey.(20 hrs)

UNIT-III: Statistical Tools- Descriptive Statistics- Correlation- Partial- Multiple- Regression- Forecasting- Fitting a Trend Line- Formulation of Hypothesis- Testing of Hypothesis - Z test- t test-Anova- Chi square- Use of Excel and SPSS- Uni-variate– Bi-variateAnalysis. (20 hrs)

UNIT-IV: Sources of Data- Determination of Sample Size- Collection- Classification- Tabulation- One Way- Two Way-Presentation- Analysis - Application of Statistical Tools- Interpretation of Results. (20 hrs)

UNIT-V: Preparation and Writing of Research Report- Styles of Writing- MLA Style- Front Matter- Title Page- Table of Contents- List of Tables and Figures- Foot Notes- Back Matter- Appendices- Glossary-Bibliography. (10 hrs)

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UNIT IV: Thesis writing: Conventions of writing - General format-page and chapter format use of quotations and footnotes-preparation of tables and figures-referencing appendices-revising, editing and evaluating the final material-proof reading meanings and examples of commonly used abbreviations .Plagiarism ,importance control and checking of Plagiarism through software tools

12 hrs

UNIT V: Modern Teaching methodology: Methods of teaching chemistry: Inductive, deductive, analytic, synthetic, heuristic, project problem solving and lab methods. Chemistry Curriculum: i. Organisation-logical psychological, topical, spiral and integrated approaches correlating with life, nature, other disciplines and different branches in chemistry. ii. Individualized techniques-homework assignments, programmed instruction and computer aided instruction (CAI), Group methods-Seminar, Symposium, and Workshop. Working style in teaching and learning-giving and getting feedback, relationship of learning to education-liberal, progressive and humanistic. Learning resources and equipment - Textbook, workbook, library, audio-visual aids, mass media, chemistry club activities. 12 hrs

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HUMAN RIGHTS AND DUTIES EDUCATION

SEMESTER III

RESEARCH METHODOLOGY AND REPORT WRITING FOR SOCIAL SCIENCES

Teaching hours: 90 hrs
Credit: 4

Course Code : 9SP18/3C/RMR
LTP: 3 3 0

COURSE OBJECTIVES:

- To provide a basic understanding of research methodology .
- To equip the learners with the ability to select research topic and make project proposals
- To endow the students with knowledge of research methods
- To describe the data collection techniques
- To demonstrate and provide sufficient practice in data analysis techniques
- To explain the basic statistical techniques used for date analysis

COURSE OUTLINE:

Unit I Nature and definition of research; Human rights as an object of inquiry; Selecting a research problem; literature review; Framing a research proposal 15 hrs

Unit II Variables, Objectives, Research questions and Hypothesis; Research methods - descriptive, analytical, comparative, survey, case study. 15 hrs

Unit III Data collection: types of data, methods of data collection - observation, interview; Research tools - questionnaires, schedules and scales; Sampling: probability - simple random, systematic, stratified, multi stage; Non probability - snowball, purposive; pilot study; reliability and validity 20 hrs

Unit IV Data analysis - Report writing, interpretation of results, quantitative and qualitative analysis, documentation, chapterization, references, Problems, Ethics and Confidentiality in human rights research,. 20 hrs

Unit V Statistics - Measures of Central Tendency - Mean, median and mode – Measures of variability: Range, quartile deviation, standard deviation and coefficient – Correlation, Inferential statistics, 't' test, Chi-square test, F-test, Analysis of variance, SPSS 20hrs

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BIOCHEMISTRY

SEMESTER II

ELECTIVE - RESEARCH METHODOLOGY

TEACHING HOURS: 60 **COURSE CODE: 15SP18/2E/RMT**

CREDITS: 3 **LTP: 3 1 0**

COURSE OBJECTIVE

1. To introduce students to research and thesis writing.
2. To introduce the various approaches to biochemical investigations.
3. To expose students to the preparation of plant extracts.
4. To impart knowledge on different cell line cultures used in research.
5. To impart knowledge on various types of spectroscopy.

COURSE OUTLINE:

Unit I : **(12 HRS)**

Types of Research - Fundamental & Applied, Descriptive & Analytical, Quantitative & Qualitative. Research funding agencies , Fellowships, Grants Thesis writing- Introduction, Review of Literature, Aim and scope, Materials and Methods, Results and Discussion, Summary and Conclusion, Bibliography- Harvard and Vancouver systems, Scientific writing for journals - Preparation of Abstract, Impact factor of journals, H Index, , Intellectual property rights- Introduction , Patent , Basis of patentability , Non patentable inventions , Methods to apply for patents.

Unit II : **(12 HRS)**

General approaches to Biochemical Investigations - Whole animal studies -Ethical Committee clearance-IAEC, CPCSEA. Maintenance of animals , Control and experimental groups , Experimental design- CRD, RBD and latin square design..Experiments with animals models- Metabolism of xenobiotics, Toxicity studies, Experimental Induction of diseases. Organ perfusion and tissue slice techniques. Experiments with human volunteers -, Ethical clearance, Institutional Ethical committee., Consent form, Stages of drug development, Clinical trials

UnitIII : **(12 HRS)**

Preparation of plant extracts-Solvents used. Methods for extraction- Maceration,Infusion, Percolation, Digestion ,Decoction, Hot continuous extraction (Soxhlet), Ultrasound extraction (sonication). Plant secondary metabolites- Tannins, Flavanoids& Alkaloids - Isolation and Characterization Free radicals, Free radical induced damages , Lipid peroxidation , Antioxidants , Enzymic and Non enzymic antioxidants, Phytochemicals as antioxidants, Methods to assess Antioxidant activity- FRAP, ABTS,DPPH.

UnitIV : **(12 HRS)**

Different Cell lines and Current research using cell lines, MTT assay.Cell sorting and Cell counting - Flow cytometry (FACS and Coulter counter). Experiments with Cell isolates - Sequence analysis-DNA and Amino acid sequencer, Comet Assay Nanotechnology – Classification, Preparation using biological material, Charecterisation- Zeta potential, AFM, DLS and Biological applications – Drug delivery (Dendrimers, Liposomes)

Unit V: **(12 HRS)**

Spectroscopy – Principle, Instrumentation and applications of -ESR , NMR spectroscopy X ray diffraction , Circular Dichorism and Mass Spectroscopy

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CLINICAL NUTRITION AND DIETETICS

SEMESTER II

APPLIED STATISTICS AND RESEARCH METHODOLOGY

CORE - 5

TOTAL HOURS: 75 hours **COURSE CODE: 13SP18/2C/SRM**

CREDITS: 4 **L-T-P: 3-2-0**

COURSE OUTLINE

UNIT I: (10 HOURS)

Meaning of research, Purposes of research, Types of research; Selecting a research problem and preparing a research proposal-The academic research problem, using the library, sending related literature, Note taking; Preparation of a research proposal for getting funds for the research; Ethical Issues- Ethical importance of consent in research, Regulations and Guidelines for research on human subjects; Intellectual Property Rights Experimental and quasi experimental research- Principles of experimental research experimental and control groups, variables, controlling extraneous variables, experimental validity, experimental designs,pre, post,true and quasi experimental design, Factorial design, Theory and hypothesis, experimental control

UNIT II: (10 HOURS)

Sampling and Sample Designs-Census and sample methods-Theoretical basis of sampling, law of statistical regularity, law of inertia of large numbers, essentials of sampling.

Sampling from infinite population-concept of sampling distribution and standard error, relationship between sample size and standard error; Standard errors of sample mean. Sample variance, sample standard deviation and sample mean, sample standard deviation and sample proportion and the differences in these values

Methods of sampling Non-probability sampling methods, advantages, Limitation of probability sampling; Probability sampling methods –Types, Selection of appropriate method of sampling, size of sample, merits and limitations of sampling, sampling and non-sampling errors.

UNIT III: (10 HOURS)

Collection of Data-Primary and secondary data, sources, published and unpublished sources, Editing primary and secondary data, and precautions in the use of secondary data.

Organization of data collection –Limitations and sources of error, Tools of research-Quantitative and Qualitative studies.Observation, Questionnaire, Opinionnaire- various methods and techniques; Reliability and validity of research tools

Classification and tabulation of Data-Meaning and objectives of classification, objects of classification, Types of classification, formation of frequency distribution, types symmetric and asymmetric distribution considerations in the construction of frequency distribution

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Tabulation of data-Difference between classification and tabulation of data, Role of tabulation Parts of the table, general rules of tabulation Review of a table types of tables, machine tabulation. Editing and coding of data records.

Diagrammatic and graphical representation Significance of diagrams and graphs, comparison of tabular and diagrammatic presentation types of diagrams. Graphs-Techniques of constructing graphs, graphs of time series or line graphs Rules for constructing the line graph or natural scale, types of graphs, graphs of frequency distribution-Histogram, frequency polygon, smoothed frequency curve, cumulative frequency curves or gives, limitations of diagrams and graphs.

UNIT IV: (35 HOURS)

Meaning of statistics, scope and limitations of statistic as a tool for decision making under uncertainty

Measures of central tendency –mean, median, mode and their relative merits finding combined mean, weighted mean, finding median and mode graphically.

Measures of variation-absolute and relative measures-range standard deviation of mean, combined standard deviation given the SD's of two distribution, coefficient of variation, percentiles and their applications

Correlation methods-meaning, product moment, coefficient of correlation, rank correlation, scatter diagram and regression lines and their uses. Concepts of partial and multiple correlations

Test of significance-hypothesis testing, tests involving normal distribution, tests for large and small samplest tests-A tests to compare means of population and sample means of two independent samples c means of two dependent samples ,F tests-comparison of SD's of two samples ,analysis of variance , non-parametric tests-chi square test.

UNIT V: (10 HOURS)

Report Writing -style manual, format of the research report ,The thesis or dissertation- style of writing, typing a report, reference form (Bibliography)-Pagination, tables, figures-Evaluating a research report-Foot notes plagiarism, Technical and popular reports

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