



**Mahatma Gandhi University  
of  
Medical Sciences & Technology  
Sitapura, Jaipur**

**Syllabus**

**Ph.D. Course Work  
(Six Months Duration)**

**Department of Microbiology**

### **Notice**

1. The University reserves the right to make changes in the Rules/Regulations/Syllabus/Books/Guidelines/Fees-Structure or any other information at any time without prior notice. The decision of the University shall be binding on all.
2. The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

**Mahatma Gandhi University of Medical Sciences and Technology**

**Ph.D. Course Work**

Scheme of Ph. D Course Work

<b>Paper</b>	<b>Title</b>	<b>Teaching Hrs</b>	<b>Max. Marks</b>	<b>Minimum passing marks in aggregate</b>	<b>Credits</b>
I	Research Methodology	100	100	55	4
II	Biostatistics, Ethics and Computer Application in Research	100	100	55	4
III	Research and Publication ethics	50	50	28	2
IV	***Recent advances and research in Microbiology	50	50	28	2

**\*\*\*Paper IV to be examined and evaluated on the basis of seminar, classroom presentations**

## **PAPER- I**

### **Paper-I : Research Methodology**

#### **SECTION A: CONCEPT OF RESEARCH**

- Research – meaning and importance of research, Scientific method, Introduction, scope, characteristics, types, aims and objectives Scope and limitations, Structure of research project.
- Review of literature: methods of preparing literature review; methods of making systematic review
- Research Question – Formulation of Research Problem: Problem identification, formulation and statement of the problem, criteria of selecting a research problem, limitations and delimitations.
- Introduction and scope of research - Definition (objectives, advantage, disadvantage and steps of various Research designs in health sciences
- Various types of epidemiological studies
  - a. Observational studies (descriptive studies, cross sectional studies, longitudinal studies, case study, case control studies, cohort study – retrospective – prospective)
  - b. Experimental research: randomised controlled trial; brief introduction to clinical testing (phase 1,2,3,4) Meaning and Nature of Experimental Research
- Applied research tool construction.

Sample – Introduction, type of sampling, advantage and disadvantage of various types of sampling.

Calculation of sample size

#### **SECTION B: DEVELOPMENT OF RESEARCH PROPOSAL**

- Steps in research proposal
- Selection and statement of problem
- Review of literature
- Hypothesis formulation
- Research design
- Material and methods

- Sample size calculation
- Criteria of subject selection – inclusion and exclusion criteria
- Sample selection
- Statistical analysis: tests of significance
- Sample subject allocation
- Informed consent
- Measurement variables – dependent and independent variables
- Protocol of intervention
- Pilot study
- Statistical analysis: tests of significance

### SECTION C: CONDUCT OF RESEARCH

- Literature review: need, importance, steps of performing a good literature review  
identification of types of literature, search strategy, data base, levels of evidence, primary & secondary research.
- Sampling & Data collection: types of data – primary, secondary; presentation of data; tools of data collection: brief description, method of construction, validity, reliability advantage and disadvantage of following.
- Methods Of Data Collection:- Schedule, Questionnaire, Interview, content analysis Observation, case study, use of instruments, case study, self reports other.
- Measurement Scales –Nominal, Ordinal, Interval, Ratio scale
  - Criteria for good measurement
  - Attitude measurement (Likert, Semitic, comparatives, non comparatives scale, Thurstone equal appearing Interval Scale
  - Ranking and rating scales
  - Development of scale – Reliability, Validity, Pilot studies
  - Formation and standardization of scales / tools / questionnaire
- Sampling – Types, Frames, Sample size, Sample errors
- Sampling selection Methods – Random, Non-Random, Otherwise
- Qualitative and quantitative methods (Observation, Focused group discussion, case studies, content analysis, Narrative, Ethnography

Data collection in experimental research: outcome measures, intervention, experimental protocol, steps of establishing a research laboratory – instrumentation and documentation, standard operating protocol

### **Section D: Element of scientific writing**

- Structure & components of scientific writing area, types of report, different steps in thesis and synopsis preparation
- Art of scientific writing – difference between ordinary writing and scientific writing language uses, steps for better writing, organization of material, pre-writing consideration.
- Citation and referencing: citation system – note system – Parenthetical referencing introduction to different citation styles – Harvard style, Vancouver style, judging the quality of publication by citation index, H index, impact factor, ISBN ISSN
- Structure of various scientific communications for publication: abstract, original article, structure of reports and proposals – research proposal for grants, technical report, progress report, inspection report, feasibility report
- Writing review paper, evaluation of quality of published paper
- Presentation of research – poster presentation, platform presentation, graphical presentation, pictorial presentation

Common reason of paper publication rejections

### **Suggested reading:**

1. Research methodology – methods and techniques CR Kothari, new age international publishers.
2. Clinical research made easy – Bhandari M Sancheti P, Jaypee Brothers.
3. Medical ethics – Francis Jaypee Brothers.
4. Park text book of social and preventive medicine.
5. Essentials of research methodology and dissertation writing – Yelkar Jaypee Brothers.

## PAPER - II

### **Paper-II : Biostatistics, Ethics and Computer Application in Research**

#### Data analysis/statistics in research

- Measurement of central tendency – mean, mode, median, arithmetic mean, geometric mean
- Statistical test of significance
- Correlation, validity, reliability testing
- Normal distribution curve
- Measure of dispersion
- Parametric statistical testing – Pearson correlation, paired t-test, unpaired t-test, ANOVA, coefficient of variation
- Non- parametric statistical testing – Mann Whitney U test, Wilcoxon sign test, Kruskal Wallis test, Friedman test, Chi square test
- Hypothesis testing – null hypothesis, alternate hypothesis, acceptance/ rejection of null hypothesis
- Probability Theories – Conditional Probability
- Correlation and regression analysis

#### Ethics and administration

- Importance of Ethics – Ethical issues in research, general principles & importance of governing research with human and essentiality, informed consent confidentiality, compensation, competence, accountability, transparency, responsibility, risk minimization, special groups as research subjects.
- Features of Helsinki declaration, ICMR code for biomedical research
- Mechanism for ethical regulation of research – ethical review committee – constitution, function
- Legal aspects of research: brief introduction to intellectual property rights, - patent, copyright, design, trademarks, plagiarism
- International frame work of patency, citation & acknowledgement, reproducibility and accountability, Reproduction of published material

### Computer applications and Statistics

- Use of word processing,
- spread sheet and database software
- plotting of graphs
- Internet and its application: e mail, Web browsing, acquiring technical skills,
- Drawing inferences from data,
- Database searches on internet and compilation platforms for literature search
- MS-Excel – data entry in spread sheets, graph / histogram/linear graph making,
- Mean, mode, median calculation in MS-Excel, making comparative graphs using MS- Excel
- Presentation of data:- bar diagram, pie-chart, histogram, line diagram, scatter diagram



## **PAPER - III**

### **Paper-III : Research and Publication ethics**

- **Research and Publication Ethics (RPE)**-Course for awareness about the publication ethics and publication misconducts.

#### **Overview**

- This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on-sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

#### **Pedagogy:**

- Class room teaching, guest lectures, group discussions, and practical sessions.

#### **Evaluation**

- Continuous assessment will be done through tutorials, assignments, quizzes, and group discussions. Weightage will be given for active participation. Final written examination will be conducted at the end of the course.

### **THEORY**

#### **Philosophy and ethics**

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

#### **SCIENTIFIC CONDUCT**

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 (7hrs.)**

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 contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

## **PRACTICE**

### **OPEN ACCESS PUBLISHING**

1. Open access publications and initiatives
2. SHERPA/ RoMEO online resource to check publisher copyright and 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 Suggester , etc.

### **PUBLICATION MISCONDUCT**

#### **A. Group Discussion**

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**

#### **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, IPP, Cite Score
2. Metrics: h- index, g index, i10 index, altmetrics

## **PAPER - IV**

### **Paper-IV : Recent advances and research in Microbiology**

To be examined and evaluated on the basis of seminar, classroom presentations