



LALIT NARAYAN MITHILA UNIVERSITY

Kameshwaranagar, Darbhanga
(Examination Department)

350)

Date:- 08.10.2021

Meeting of the Committee notified Vide Memo No. 21178-84/21 dated-04-10-2021 is being held today, The following members are present.

1. Dean, Faculty of Science, LNMU, Darbhanga - Member
2. Dean, Faculty of Humanities, LNMU, Darbhanga - Member
3. Dean, Faculty of Social science, LNMU, Darbhanga - Member
4. Dean, Faculty of Commerce, LNMU, Darbhanga - Member
5. Dr. Avni Ranjan Singh, Dept. of Economics, C. M. College, DBG - Member
6. Controller of Examination - Convenor

Agenda : To devise uniform standard/model for Ph.D Course work Examinations including syllabus in the light of Ph.D. Regulation notified by Governor's Secretariat BSU- 512010-2684/GS(I) dated- 21.09.17 by BSU (Regulation) 05/2010-3230 GS (I) dated 18.12.2018.

Resolution: The Regulation was discussed and deliberated. The Committee unanimously resolved the following.

(1) The Ph.D. Course work examinations shall comprise two papers, each of 100 marks.

(2) Each paper shall be of 2 hours duration and shall consist of 3 parts:

PART-A

(a) Objective/ Multiple choice questions- (5 in numbers each carrying 2 marks).

PART-B.

(b) Short questions 5 in number of which 3 to be answered and each will carry 10 marks.

PART-C

(c) 3 Long answer questions to be set, out of which two are to be answered and each will carry 30 marks.

(3) Regarding Conduct of the syllabus for Ph.D. Course work, it was resolved-

(a) The First-Paper shall be common to all faculties and will consist of courses on Research Methodology, Quantitative Methods, Computer Applications and other Techniques/Methods.

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- (b) The second paper will include subject specific Research Methods/Techniques/Reviewing the Literature, Developing Bibliography and References.
- (4) The Committee further resolved that Dr. Avni Ranjan Singh, Head Dept. of Economics, C. M. College, Darbhanga be authorised to frame detailed contents of Paper I.
- (5) The University departments be authorised to develop the course contents of Paper-II of the subjects concerned.
- (6) It was also resolved that the uniform pattern of Ph.D. course work examination shall be effective from PAT-2021 onwards.
- (7) Each answer book of a particular subject would be evaluated by three examiners (one for Part-A, one for Part-B and one for Part-C). Another (4th examiner) would be for transcription and totalling of the marks awarded. All the four examiners will be paid equal remuneration per answer book at the rate fixed by the Examination Board.

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Paper-I

Research Methodology

Full Marks: 100

Duration of Examination: 2 Hours

Questions shall consist of 3 parts:

Part-A : Short Questions (06 in number of which 04 to be answered, each carrying 10 marks) = 40

Part-B : Long Answer Question (04 to be asked of which 02 to be answered, each carrying 30 marks) = 60

1. Introduction to Research: What is Research; Why is Research Conducted; Stages in Research; Changing Nature and Expanding Scope of Research; Why Research Methodology.
2. Introduction to Major Research Methods: Natural Observation; Historical Research; Ethnographic Research; Cross-Sectional Study; Longitudinal Study; Cohort Study; Case Study; Correlational Research; Action Research; Quantitative and Qualitative Research; theoretical research, applied research and empirical research; Experimental Research: Cause and Effect Relationships, Hypothesis in Experiments, Principles of Experimentation, Classification of Experiments, Experimental Design, Requirements of a Good Experiment; Reasoning in Research : Introduction to Logical Terms; Evidences; Inductive and Deductive Reasoning; Fallacious Reasoning; Formal and Informal Fallacies; Common Fallacies.
3. Research Design: Study designs in quantitative research; Study designs in qualitative research; Other commonly used philosophy-guided designs; Choice of Variables; Constructing hypotheses, Mechanisms and Design for Data Collection; Collection of Primary Data: Observation, Interview, questionnaire and schedule Sample Surveys and Designed Experiments, Estimation without Sampling, Methods of data collection in qualitative research; Collection of Secondary Data; Data Integration; Using Publications and the Library; Using Academic Databases: Search Engines, Citation Indexes and Citation Analysis, Government of India Initiatives for

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Knowledge Management- INFLIBNET: e-ShodhSindhu, Shodhganga, ShodhGangotri, and N-List Projects.

4. Data analysis: Statistical analysis; Thematic analysis; Analysing narrative; Discourse analysis; Content analysis; Grounded Theory; Using computers in data analysis.
5. Ethics and Related Issues in Research: Concepts in Ethics in Research; Intellectual Property Rights; Scientific Values: Needed a Code of Conduct; Fraud and Misconduct in Science; Plagiarism: What is Plagiarism, Acknowledge Sources Appropriately, Paraphrasing, Direct and Indirect Quotations, Plagiarism Checking: ShodhShuddhi, UGC (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulations, 2018, LNMU Plagiarism Policy and Regulations-2018.
6. Writing a Research Proposal: Introduction; The research problem; Objectives of the study; Hypotheses to be tested; Study design; Measurement procedures; Analysis of data; Structure of the report; Problems and limitations.
7. The Structure of a Thesis: Thesis Vs Dissertation; Parts of a Thesis; Preliminary Pages of a Thesis: Title Pages, Certificate Pages, Acknowledgements, Table of Contents, List of Tables, List of Figures, Dedication; The Subject Proper: Introduction, Review of Literature, Materials and Methods, Results, Analysis/Discussion, Summary/Conclusion, References, Appendixes; The Abstract; Formatting Requirements of a Thesis: Margins, Page Numbering, Design and Formatting of Chapters, Numbering the Sections, Lay-Out of Tables, Language and Style, Typeface and Fonts, Paper and Text Spacing; Thesis Editing.

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Lalit Narayan Mithila University
Kameshwaranagar, Darbhanga-846004
University Department of Zoology
Ph. D. Course Work Syllabus

Paper 2: Techniques in Biological Research

Introduction to Scientific Research

- Defining scientific questions and categorizing them as basic and applied
- Formulating clear cut aims based on scientific questions and planning objectives according to the aim.
- Concept of hypothesis generation and basic methods of hypothesis testing

Reading and Reviewing Scientific Literature

- Introduction to various literature archives such as PubMed, PubMed Central (PMC) and other NCBI Literature Resources such as MeSH and Bookshelf.
- Looking for scientific papers of interest amidst the vast resources available.
- Introduction to Indian e- resources such as Shoshanga, Shondhsindhu etc
- Concept of peer-reviewed journals.
- Authorship concerns, acknowledgement of contribution, Intellectual Property Rights (IPR).
- Scientific ethics and Plagiarism.

Scientific Communication

- Poster and oral presentations
- Writing scientific papers and review articles
- Referencing

Analytical & Preparative Biochemical Techniques and Instrumentation

- pH measurement
- Concept of stoichiometry, preparation of buffers, reagents and solutions
- Basic biochemical tests for identification of biomolecules (Starch, Sugar and Proteins).
- Physicochemical analysis of water and soil.
- Concepts of Colorimetry and Spectrophotometry
- Principle and types of Centrifugation
- Principle and types of Gel Electrophoresis
- Principle of Chromatography
- Immunological techniques
- FACS

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Microscopy and Image Analysis

- a. Concepts of Bright field; Dark Field, Phase Contrast, fluorescence and Confocal microscopy
- b. SEM and TEM
- c. Photomicrography and Grid Preparation
- d. Software Tools for Molecular Microscopy

Genetical and Molecular Biological Techniques

- a. Aseptic technique and preparation of media
- b. Types of cell culture
- c. Cloning and sequencing of genes
- d. DNA Amplification through Polymerase Chain Reaction
- e. DNA fingerprinting, VNTR Profiling, STR Profiling, mitochondrial DNA profiling and SNP Profiling
- f. Genome expression analysis: Blotting Techniques and Microarray
- g. Metagenomics and Epigenomics
- h. Gene targeting, Genome Editing and its applications

Histological and Histochemical Techniques

- a. Tissue fixation, sectioning and staining
- b. Histochemical techniques for detection of various biomolecules: carbohydrates, proteins and lipids
- c. Enzyme histochemistry

Recombinant DNA Technology

- a. Enzymes, Vectors, Cloning Strategies
- b. Construction and screening of DNA libraries
- c. Applications of recombinant DNA Technology

Bioinformatics

- a. Concept of Information Technology
- b. Concept of dry experiments and digital laboratory
- c. Introduction to data archiving systems: FASTA format, Accession, and GI-Number
- d. Introduction to various literature archives such as PubMed, PubMed Central (PMC) and other NCBI Literature Resources such as MeSH and Bookshelf.
- e. Databases (DNA and Protein) search and retrieval: NCBI, Swiss-prot, PIR, PDB, KEGG, PubMed 5.
- f. Concept of homology: BLAST, Clustal-W and their applications
- g. Protein structure bioinformatics: Protein visualization, structure comparison, homology modelling

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Biostatistics

- a. Concept of parametric and non parametric tests.
- b. Depiction of continuous frequency distribution table in the form of histogram, frequency polygon and ogive
- c. Calculations of mean, median and mode from hypothetical data
- d. Calculation of variance, standard deviation, standard error and coefficient of variation from hypothetical data.
- e. Chi-square test
- f. Student t-test
- g. One -way and Two-way ANOVA and post-hoc tests
- h. Introduction to various statistical softwares such as Microsoft Excel, SPSS, MATLAB etc.

Model systems, Model Organisms, Animal Handling and Ethics

- a. Pre-requisites of a model system; in vitro systems;
- b. Prokaryotic model organisms
- c. Eukaryotic model organisms
- d. Maintenance of animals
- e. CPCSEA guidelines; Institutional ethics committees
- f. Ethical consideration in research on human beings

Suggested Readings:

1. Alberts et al, 2008, Molecular Biology of the Cell, Garland.
2. Boyer, 2005, Modern Experimental Biochemistry and Molecular Biology, Benjamin
3. Brown, 1995, Gene Cloning, Stanley
4. Brown, 2007, Genomes
5. Drluca, 2003, Understanding DNA and Gene Cloning, Wiley
6. Futuyma, 2005, Evolution, Sinauer.
7. Gardner et al, 2006, Principles of Genetics, John Wiley.
8. Glick & Pasternak, 1994, Molecular Biotechnology, ASM press
9. Hartl & Clark, 2007, Principles of Population Genetics, Sinauer.
10. Hartl & Jones, 2009, Essential Genetics: A Genomic Perspective, Jones & Bartlett
11. Lesk, 2006, Bioinformatics 2/e. Oxford
12. Lewin, 2011, Genes X, Jones & Bartlett
13. Micklos & Freyer, 1990, DNA Science, CSHL
14. Mount, 2006, Bioinformatics 2/e. CBS
15. Nelson et al, 2007, Lehninger's Principles of Biochemistry, 5th Edition, MacMillan
Worth
16. Primrose & Twyman, 2006 Principles of Gene manipulation and Genomics,
Blackwel.

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17. Sambrook et al, 2001, Molecular Cloning: A Laboratory Manual (Vol I, II, III), CSHL
18. Snedecor & Cochran, 1968, Statistical Methods, Oxford & IBH
19. Snustad & Simmons, 2010, Principles of Genetics, John Wiley.
20. Sokal & Rohlf, 2000, Biometry, Freeman.
21. Steel & Torrie, 1980, Principles and Procedure of Statistics: A Biometrical Approach, McGraw Hill Book Co.
22. Strachan & Read, 2011, Human Molecular Genetics, Wiley.
23. Voet & Voet, 2004, Biochemistry, 4th Edition, John Wiley.
24. Watson et al., 2004, Molecular Biology of the Gene, Pearson Education.
25. Westhead et al, 2003, Bioinformatics Instant Notes. Viva Books (Indian ed)
26. Wilson & Walker, 2006, Principles of Biochemical and Molecular Biological Techniques, Cambridge Univ. Press.
27. Zar, 2003, Biostatistical Analysis, Pearson

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