MOHAMMAD ALI JAUHAR UNIVERSITY,RAMPUR

SYLLABUS FOR PHD ENTRANCE

BIOTECHNOLOGY

Research Methodology (Compulsory)

1. Basic concept of research problem • Rationale of research • Identification of research problem • Research objective • Types of research- fundamental/ applied/ action/ quantitative/ qualitative etc and research process.

2. Review of literatures • Primary source • Secondary source • Searching e- resources, using search engines • Searching data base • Writing literature review

3. Methods of research • Concept and formulation of hypothesis • Survey method Experimental method (variable, designs) • Historical methods.

4. Sampling of data • Concept of sampling • Probability sampling techniques Non probability sampling techniques • Sampling error.

5. Collection of data • Primary data generation • Secondary data collection Methods of data generation/ collection- by experiments, questionnaire, interview schedule & focus groups.

6. Analysis of data • Statistical analysis techniques • Qualitative analysis techniques Application of computer in research data analysis**.**

7. Report preparation • Structure and component of research report • Organization of data • Indexing of journal and research output • Citation, references, bibliography Copyright, plagiarism, originality of research work and basic of statistics / Statistical Inferences.

Biotechnology (core)

I. **Biochemistry, Molecular & Cell Biology Genomics** Biomolecules**,** Metabolism, Membrane transport, Structure and regulation of prokaryotes and eukaryotes genes, Transcription, Translation, Post-transcriptional and Translational modifications, Molecular interaction, Phyllogenetics, Molecular markers,

II. **Genetic and physical mapping, Gene interaction;** Population genetics, Genetic engineering; Cloning and expression vectors, rDNA technology, Gene cloning approaches, Whole genome sequencing & annotation, High throughput gene expression and Function elucidation technologies, PCR, Blotting techniques, Gene transfer technologies, Protein-protein interactions, Mass spectrophotometry, Signal transduction pathways and their elucidation, Primary and secondary metabolic pathways, Systems biology frameworks for metabolic engineering,
Nanobiotechnology, Genomics and proteomics.

III. **Microbial & Plant Biotechnology:** Microbial taxonomy and diversity (bacteria, fungi, virus); Microbial nutrition, growth and control; Microbial metabolism; Microbial genetics; Microbial production and purification of fermented food and food products, recombinant proteins, industrial enzymes; Free and immobilized enzyme kinetics; Types of bioreactors; Bioseparation techniques; Concept of plant cellular totipotency; Clonal propagation; Organogenesis and somatic embryogenesis, artificial seed, somaclonal variation, embryo culture, in vitro fertilization; Plant products of industrial importance; Plant-microbe interactions.

IV. **Medical Biotechnology Infectious diseases**: Microbial (viral, bacterial, fungal) , Life style diseases, Cell & developmental biology, Cancer biology, Immunotechnology, Antigen antibody interactions, Antibody engineering, vaccines and the associated manufacturing processes, molecular and immuno diagnostics methods and their applications, Cell culture technologies, Regenerative medicine & transplantation technology, Hypersensitivity and autoimmune diseases, tolerance, animal biotechnology, Animal cell preservation, Stem cells and healthcare, Clinical trials

V. **Environmental Biotechnology Biotransformation and biodegradation;**

Biofertilizers; Biosensors – living biosensors for the management and manipulation of microbial consortia; Role of biotechnology in energy production.

VI. **Bioinformatics/Statistics:** Major bioinformatics resources (NCBI, EBI, ExPASy); Sequence and structure databases and analysis, Sequence analysis, Phylogeny, Comparative genomics; Molecular modeling and simulations. Overview and functions of a computer system; Basics of database management system- Conceptual Schema, ER diagrams, normalisation and SQL. Basics of programming; Statistics: Descriptive statistics, Correlation and regression, Hypothesis Testing, Probability theory.