



**Centre for Biodiversity Studies**  
**School of Biosciences & Biotechnology**  
**Baba Ghulam Shah Badshah University,**  
**Rajouri – J&K. Pin-Code. 185 234**

Ref.No. BGSBU/CBS/17/244

Dated: 03-05-2017

**The Deputy Registrar (Academic Affairs)**  
**BGSB University**  
**Rajouri**

Madam,

Enclosed please find herewith the syllabi for Pre-Ph.D courses in Biotechnology and Zoology for the session 2017, as per the details given below:

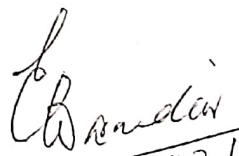
1. Pre-Ph.D in Biotechnology: Candidates - (Kaiser Ahmed Bhat, Nadia Gul, and Yasir Rafiq Mir)
2. Pre-Ph.D in Zoology: Candidates – (Rawhat un Nisa, Shahnaz Anjum, and Nazia Kouser)

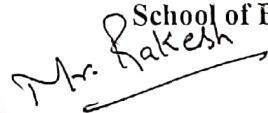
It may please be noted that the Paper-I is common to all the candidates in Biotechnology and Zoology, whereas Paper-II is as shown in the syllabus with each.

The syllabi have been duly approved by the DRC held on 02.05.2017. This is for further necessary action at your end.

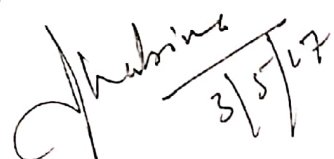
Thanking you,

Yours sincerely

  
Dean 03/5/17

  
School of Biosciences and Biotechnology

Encls: Pre-Ph.D syllabi (Paper I & II) for six candidates.

Pl. Put up  
for seeking approval  
of H.V.C  
  
3/5/17

**Syllabus for Pre-Ph.D Examination-2017**  
**Paper II (Biotechnology)**

**Title of the Paper: Basics of Nanobiotechnology and Molecular Nematology**

**Duration: 3 hrs**

**Credits: 04**

**Name of the Candidate: Kaisar Ahmad Bhat**

**Maximum Marks: 100**

**Unit I. Nematodes characteristics and morphology**

- 1.1 Definition of nematodes. Body size, color and shape and body wall.
- 1.2 Labial region of nematodes. En face view and sensory structures. Feeding apparatus.
- 1.3 Pharynx, pharyngo-intestinal junction, intestine rectum, anus and tail.
- 1.4 Excretory system, nervous system and reproductive system.

**Unit II. Techniques for studying nematodes**

- 2.1 Principles of sampling for nematodes. Collection, storage and care of soil samples, Sampling tools and methods, principle and procedure of nematode extraction from samples.
- 2.2 Principles of killing , fixing, dehydration and mounting of nematodes. Staining of nematodes for microscopic studies. Chemical composition and properties of fixatives.
- 2.3 Preserving and staining nematodes in plant tissues.
- 2.4 Preparation of nematodes for light microscopy and electron microscopy.

**Unit III. DNA barcoding and phylogentic analysis**

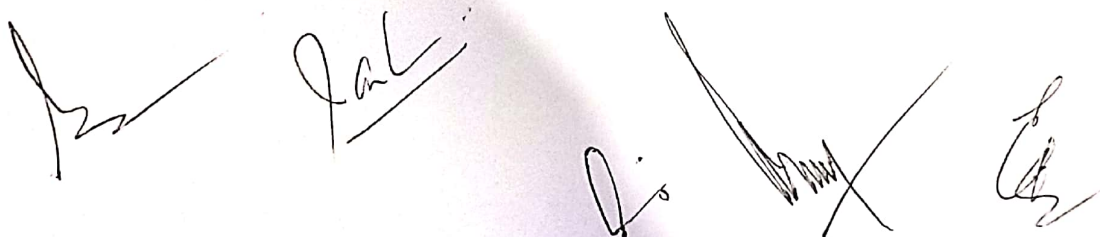
- 3.1 DNA barcoding: concept of MOTU (molecular operational taxonomic units) and their application in nematode taxonomy.
- 3.2 Molecular markers: general characteristics of DNA based molecular markers; comparative account of different DNA based markers.
- 3.3 Markers used in DNA barcoding: Internal transcribed Spacer sequences (ITS) and mitochondrial cytochrome oxidase C subunit 1.
- 3.4 Molecular phylogenetics: concept of phylogenetic tree, analysis of phylogenetic trees and tree building methods and software's used for constructing phylogenetic trees.

**Unit IV. Introduction to nanotechnology**

- 4.1 Introduction to nanotechnology and nanobiotechnology.
- 4.2 Nanoparticles- Definition, overview of nanomaterial properties and types.
- 4.3 Preparation of nanoparticles- Top down, bottom up, biological and chemical synthesis of nanoparticles.
- 4.4 Classifications of nanomaterials - Zero dimensional, one-dimensional and two dimensional nanostructures.

**Unit V. Characterization and applications of nanoparticles**

- 5.1 Characterization of nanoparticles by different spectroscopic and microscopic techniques.
- 5.2 Fundamental techniques for characterization- Flourescence, DLS and zeta potential ( $\zeta$ ) studies, TEM, SEM, and AFM.
- 5.3 Applications of nanoparticles- Agriculture and nanomedicine.
- 5.4 Supramolecular nanoparticles for molecular diagnostics and therapeutics.





**Syllabus for Pre-Ph.D Examination-2017  
Paper I (Zoology & Biotechnology)**

**Title of the Paper : Research methodology**

**Credits: 04  
Maximum Marks: 100  
Duration: 3 hrs**

**Unit I : Literature survey and scientific writing**

- 1.1 Library and Research Documentation – Methods of literature collection, online Internet and Website.
- 1.2 Technical papers, Reviews, Monographs and Abstract services, Information storage and retrieval, Plagiarism-concept and its consequences.
- 1.3 Preparation and presentation of research papers for Journals, Symposia and Conferences-Impact factor-citation index- refereed journals.
- 1.4 Experimental approach – Designing of Methodology – Planning and Execution of Investigations – Methods of Editing and Abstracting, Preparation of Manuscript and Proof Reading – Thesis Writing.

**Unit II : Microscopy**

- 2.1 Microscopy: Light Microscopy, Bright field, Phase contrast, DIC, Fluorescence Microscopy.
- 2.2 Confocal Microscopy, SEM & TEM, Histology, and Histochemistry.
- 2.3 Different fixation and staining techniques for EM, freeze-etch and freeze fracture methods for EM.
- 2.4 Live cell imaging and its applications.

**Unit III : Centrifugation and Electrophoresis**

- 3.1 Centrifuges: Types of centrifuge - Differential & density gradient centrifugation.
- 3.2 Chromatography: TLC and Paper chromatography; Reverse-phase and Affinity chromatography and HPLC.
- 3.3 Electrophoresis: Agarose gel electrophoresis; isoelectric focusing, Pulsed field gel electrophoresis, SDS PAGE and their Applications.
- 3.4 ELISA and Radioimmunoassay, FISH and GISH.

**Unit IV : Radiation Biology and Spectroscopy**

- 4.1 Isotopes half life, GM counter, autoradiography.
- 4.2 Principles and Applications of Tracer Techniques in Biology, Brief idea of radiation dosimetry.
- 4.3 Spectroscopy: Basic principles, instrumentation and use of UV and IR.
- 4.4 Mass spectroscopy: LC-MS, GC-MS and MALDI-TOF.

**Unit V : Nucleic acid isolation and Biostatistics**

- 5.1 Genomic and plasmid DNA isolation. PCR: basic principle, types and applications.
- 5.2 Blotting techniques: Northern blot, Southern blot and Western blot. Flow cytometry, X-ray diffraction by crystals.
- 5.3 Test of Hypothesis and two types of error's. Tests of means and proportions-students t test, Chi square test and their applications.
- 5.4 Analysis of Variance (one way and two way). Correlation, simple partial and multiple correlations. Simple and multiple regressions and their use in biology.

**BABA GHULAM SHAH BADSHAH UNIVERSITY**

**School of Biosciences and Biotechnology**

**Syllabus for Pre-Ph.D Examination-2017**

**Paper II-Biotechnology**

**Title: Fundamentals of Medical Genetics**

**Credits: 04**

**Name of Candidate: Yaser Rafiq Mir**

**Maximum Marks: 100**

**Unit I: Introduction to Genetics**

- 1.1. Basic mechanisms of inheritance: Mendel's laws of inheritance, extensions to Mendelism- dominance, co-dominance and incomplete dominance
- 1.2. Alleles & gene interactions: Multiple alleles, pleiotropic effects, partial penetrance & variable expressivity
- 1.3. Linkage and recombination: Recombination as the basis of gene mapping, linkage mapping, tetrad analysis, genetic fine structure mapping
- 1.4. Extra-nuclear Inheritance: cytoplasmic inheritance and maternal effects

**Unit II: Molecular Genetics**

- 2.1 DNA organisation in eukaryotic chromosomes; DNA markers: RFLPs, VNTRs, CNVs, SNPs
- 2.2 DNA genotyping and sequencing, concept of linkage disequilibrium (LD), haplotypes and tag SNPs
- 2.3 Molecular basis of mutations: Gene mutations, sources of mutations, types of mutations and effects of mutations
- 2.4 Genomics: Human genome project; Next generation DNA sequencing; Genome wide association studies; Beyond Genomics: Epigenetics.

**Unit III: Genetic Disorders-I**

- 3.1 History of human genetics
- 3.2 Pedigrees: gathering family history, pedigree symbols, construction of pedigrees, presentation of molecular genetic data in pedigrees
- 3.3 Autosomal inheritance: dominant, recessive, consanguinity and its effects
- 3.4 Sex-linked inheritance, sex-limited and sex-influenced traits, genomic imprinting



# Syllabus for Pre-Ph.D (Biotechnology) Examination-2017

Credits: 04  
Maximum Marks: 100  
Duration: 3 hrs

## Paper II: Cell Biology and Molecular Parasitology

### Unit 1: Introduction to Cell

- 1.1: Evolution of the cell. From molecules to first cell. From Prokaryotes to eukaryotes. From single cells to multicellular organisms.
- 1.2: Membrane structure: structure and function of a lipid bilayer; Membrane transport of small and large molecules; exocytosis and endocytosis.
- 1.3: Cell Organelles: Structure and function of the Nucleus, Golgi apparatus, Mitochondria, Endoplasmic reticulum, Lysosomes, Peroxisomes.
- 1.4: Cytoskeleton: Organization of the cytoskeleton, Structure and function of Microtubules, Intermediate filaments, Cilia and centrioles.

### Unit 2: Introduction to Cell Signalling

- 2.1: Basic concepts in cell signalling: studying cell surface receptors. Methods to study signal transduction. Identification of unknown interacting partners.
- 2.2: GPCR Signalling: Structure and properties of G-proteins, Signalling via adenylyl cyclase and phospholipase C, RTK signalling GPCR
- 2.3: mTOR and nutrient signalling
- 2.4: Second messenger signalling:  $Ca^{2+}$  signalling transduction pathway; cGMP signalling.

### Unit 3: Cellular and Molecular Parasitology-I

- 3.1: Parasite Biology, an overview; evolution of parasites
- 3.2: Life cycle of *Entamoeba histolytica*, *Giardia* and *Plasmodium falciparum*
- 3.3: Mechanism of invasion process in *E. histolytica*.
- 3.4: Calcium signalling in protozoan parasites

### Unit 4: Cellular and Molecular Parasitology-II

- 4.1: Organelles of Protozoa: cytoskeleton, mitotic spindle, hydrogenosomes, glycosomes
- 4.2: Drug Resistance and mechanism in protozoan parasites

4.3: Virulence factor in protozoan parasites