



# DEPARTMENT OF BIORESOURCES

SCHOOL OF BIOLOGICAL SCIENCES

UNIVERSITY OF KASHMIR, SRINAGAR

NAAC Accredited "A<sup>+</sup>"

Coordinator/Head

No. F(Innovative courses)Biores/KU/24

Dated:-10-07-2024

## To whom it may concern

This is to certify that Dr. Manzoor Ahmad Mir (Senior Assistant Professor) Department of Bioresources has prescribed the following Innovative syllabus Courses at PG level, which can bring the innovation are attached:

S. No.	Course Title	Semester
1.	Industrial Entomology	IV
2.	Hormones and Human health	IV
3.	Bio-industries	IV
4.	Microbial Technology	IV
5.	Animal resources	I
6.	Animal cell and tissue technology	IV
7.	Infectious diseases and human health	II
8.	Infectious diseases and livestock health	III

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Coordinator/Head

Department of Bioresources

**SEMESTER I**

**BR18103CR: Animal Resources**

**Unit: I**

**Insect resources:** Importance and scope of insect based industries; Silkworm breeds, synthesis of silk and cocooning, harvesting and grainage; Apiculture products and apitherapy (honey, beeswax, bee pollen, propolis, royal jelly, bee venom); Lac products, properties and their uses (lac dye, lac wax, shellac, bleached shellac, dewaxed bleached shellac, aleuritic acid); Edible insect industry.

**Unit: II**

**Aquaculture:** Fish monoculture, polyculture and composite culture; Pearl and shellfish farming; Integration of aquaculture with agriculture and animal husbandry; Natural and artificial breeding in fish; Genetic approach to fisheries; Fish as a food commodity; Fish by-products; Processing and preservation of fish and its products.

**Unit: III**

**Livestock domestication:** History of domestication; Important breeds of livestock (cow, sheep, goat, buffalo) and poultry with special reference to economic characters; Important methods of selection and systems of breeding in farm animals and poultry birds; Genetic and phenotypic consequences and applications of inbreeding and outbreeding; Genetic basis of heterosis and its use.

**Unit: IV**

**Animal products and processing:** Principles and practices for production of high quality milk; Pasteurization and sterilization; Utilization of various animal and poultry by-products: blood, fat, hides, bones, wool, hair, and feather; Use of biotechnological tools in improving animal productivity; Scope of meat, fish and poultry processing industry in India.

*S. J. ...*

*Z/Ch*

**Coordinator**  
**Department of ... resource**  
**University of Kashmir, Srinagar**

**SEMESTER I****BR18104CR: Lab Course I****(Based on BR18101CR, BR18102CR, BR18103CR)****Practical Work Based on BR18101CR**

- Collection, description and herbarium preparation of various types of leaves, inflorescences and fruits.
- Types of quadrats and their utility.
- Determination of minimum size and number of quadrats for phytosociological studies.
- Computation of frequency, density, abundance and cover of constituent species of different communities.
- Field demonstration of Global Positioning System (GPS) and its utility in biodiversity studies.
- Role of Herbarium and its significance in biodiversity studies.
- Field study of various threatened endemic plants of Kashmir Himalaya.
- To prepare an inventory of economically important woody plants in KUBG.

**Practical Work Based on BR18102CR**

- Study the diagnostic features of some economically important angiosperm families (Asteraceae, Apiaceae, Brassicaceae, Fabaceae, Caryophyllaceae, Rosaceae, Lamiaceae and Poaceae).
- Study various types of plant fibres.
- Study the presence and structure of starch granules and oil bodies in various food crops.
- Study some commonly used spices and condiments.
- Pseudocereal- Buckwheat: Morphological features and seed structure; Test for presence of starch and proteins.
- Study the diagnostic features and medicinal importance of native medicinal plants of Kashmir Himalaya.

**Practical Work Based on BR18103CR**

- Study of modifications in legs of honey bees.

*S. Nigam*

*J. Ch.*  
 Coordinator  
 Department of Bioresource  
 University of Kashmir Srinagar

**SEMESTER I**

**BR18106DCE: Basic and Applied Immunology**

**Unit: I**

**Immune System and its organs:** Introduction to immune system, Immune system as defense, Timeline of immunology related developments, Overview of Infections and Diseases, Detailed overview of Immune organs, Composition of Blood and types of immune cells, Structure & function of Immune cells. Hypersensitivity and complement system.

**Unit: II**

**Natural and acquired Immune Response:** Immunity and types of Immunity, Natural Immunity (Physiological, anatomical and cellular barriers to infections), Cells and factors of natural immunity, Mechanism of Innate immunity, Acquired Immunity as second line of defense, Characteristics of Acquired immunity, Phagocytosis, opsonization and PAMPS, PRRs and TLRs

**Unit: III**

**Antigen, antibody and cytokines:** Definition and characteristics of an antigen molecule, Types of an antigens (Super antigens, TD and TI antigens), Immunogens, Haptens, Allergens, Tollerogens, allo-antigens, Tumor antigens, auto antigens, Antibody structure (regions, domains and various chains), Isoforms of antibodies, Types of Antibodies (Structure, presence and functions), Digestion of antibodies and antibody fragments, Mechanism of Inflammation, introduction to Cytokines and Interferon's.

**Unit: IV**

**Serological techniques:** Theory and principles of routine clinical immunology procedures; Serology, Materials and methods necessary for basic serology tests (Collection, preparation and preservation of specimen), Complement inactivation, Serial dilution, determinations of end point and titer. HCG and pregnancy, Pregnancy test, Factors affecting pregnancy tests; Disease characteristics, clinical manifestation and laboratory diagnosis of AIDS.

*S. Chandra*

*J/h*  
**Coordinator**  
Department of **Resource**  
University of **South** **Delhi**

**SEMESTER II**

**BR18202CR: Animal Resource Regeneration**

**Unit: I**

**Principles of animal development:** Basic concepts of development— potency, commitment, specification and its types, induction, competence, determination and differentiation; Morphogenetic gradients; Cell fate and cell lineages; Genomic equivalence and the cytoplasmic determinants; Genomic Imprinting; Mutants and transgenics in analysis of development.

**Unit: II**

**Early embryonic development:** Gametogenesis (Production of male and female gametes) Spermatogenesis and Oogenesis; Types of eggs, Fertilization and Zygote formation, Mechanism of cleavage; Blastula formation; Gastrulation and formation of germ layers. Fat maps of germinal layers.

**Unit: III**

**Morphogenesis and organogenesis:** Axis and pattern formation in *Drosophila* and amphibia; Organogenesis—vulva formation in *Caenorhabditis elegans*, eye lens induction, limb development and regeneration in vertebrates; Environmental regulation of normal development.

**Unit: III**

**Hormones in Embryonic Development:** Reproduction and hormonal functions of the male and female: physiologic anatomy of the male and female sexual organs. Testosterone and other male sex hormones, abnormalities of the male sexual function (Prostrate, hypogonadism), Pineal gland. Ovarian cycle and functions of the ovarian hormones. Abnormalities of secretion by ovaries. Hormonal factors in pregnancy.

*S. Chakrabarti*  
*J. Ch.*  
Coordinator  
Department of Animal Resource  
University of Calicut, Kerala

**DISCIPLINE CENTRIC ELECTIVE COURSES**

**SEMESTER II**

**BR18205DCE: Inheritance Biology**

**Unit: I**

**Laws of inheritance:** Dominance, segregation and independent assortment; Types of dominance; Lethal alleles; Multiple alleles; Test of allelism; Gene interaction— complementation, epistasis and pleiotropy.

**Extra chromosomal inheritance:** Inheritance of mitochondrial and chloroplast genes; Maternal inheritance.

**Unit: II**

**Linkage and Recombination:** Linkage, linkage maps, 3 point test cross; Homologous and non homologous recombination; Gene mapping in prokaryotes through transduction and conjugation; Sex-linked inheritance— sex limited and sex influenced traits; Mechanism of sex determination.

**Quantitative inheritance:** Genes and environment— heritability, penetrance and expressivity.

**Unit: III**


**Mutations:** Spontaneous and induced mutations, molecular mechanism of mutations (chemical mutagens and physical mutagens); Suppressor, missense, nonsense and silent mutations.

**Structural and numerical alterations of chromosomes:** Deletion, duplication, inversion, translocation; Auto- and allo-polyploidy and their genetic implications.

**Unit: IV**

**Human genetics:** Pedigree— gathering family history, construction of pedigree; Pedigrees of sex-linked, autosomal and mitochondrial traits; Genetic disorders (Klinefelter -, Turner-, Patau-, Down- & Edward's syndrome).

**Population genetics:** Gene pool; Hardy-Weinberg principle, factors affecting Hardy-Weinberg equilibrium (natural selection, migration and genetic drift); Molecular divergence and molecular clocks.

  
Coordinator  
Department of Microbiology  
University of Kashmir, Srinagar

**SEMESTER III**

**BR18303CR: Biostatistics and Biotechniques**

**Unit: I**

**Data types and collection:** Data on ratio, interval, ordinal and nominal scales; Continuous and discrete data; Methods of primary and secondary data collection and their limitations.

**Processing and analysis of data:** Measures of Central Tendency— arithmetic mean, mode, median; Measures of dispersion— mean deviation, variance, standard deviation, coefficient of variation.

**Unit: II**

**Testing of hypothesis:** Basic concept, procedure for hypothesis testing, test of difference between means— independent and paired samples, test of proportions and test of goodness of fit.

**Sampling techniques:** Principles and steps in sample survey; Procedures and practices involved in simple random sampling, systematic, stratified and cluster sampling.

**Unit: III**

**Design and analysis of experiments:** Principles of experimentation; Experimental designs— layout, analysis of variance and comparison of treatments in completely randomised design, randomised complete block design and factorial experimental designs.

**Correlation and regression:** Basic idea of correlation; Simple correlation— calculation of correlation coefficient; Simple linear regression— calculation of regression coefficients.

**Unit: IV**

**Microscopy & spectroscopy:** Principle, working & application of fluorescence, phase contrast, scanning electron and transmission electron microscopy; Principle and working of a spectrophotometer; Application of spectroscopic techniques (UV-visible, IR, NMR).

**Chromatography:** Paper, thin layer, Gas-liquid chromatography; Ion exchange, adsorption and molecular exclusion chromatography; High performance liquid chromatography (HPLC); Radioisotopes— applications in biology.

*S. S. J. J.*

*J. J. J.*  
Coordinator  
Department of Hi resource  
University of Kashmir Srinagar

**DISCIPLINE CENTRIC ELECTIVE COURSES  
SEMESTER III**

**BR18305DCE: Biological Interactions**

**Unit: I**

**Plant interactions:** Biotic community— structure and dynamics; Factors contributing to community stability (successional model and climax pattern model); Keystone species; Symbioses, mycorrhizal association; Plant defence and chemical warfare— plant-insect, plant-vertebrate and plant-plant interactions (brief concept); Parasitic and insectivorous plants; Pollination and seed dispersal by animals.

**Unit: II**

**Social and community interactions of animals:** Heritable basis of behaviour; Learned behaviour; Communication signals; Courtship, mating, parenting and individual reproductive success; Benefits and costs of living in a social group; Altruism; Migration and navigation; Factors affecting community structure— mutualism, commensalism, competitive interaction, predation, parasitic interactions; Co-evolution; Man animal conflict.

**Unit: III**

**Biosignaling:** General features of signal transduction pathways; Diversity of basic signaling cascades (brief idea) with emphasis on Protein kinases, Phosphoinositides, G-protein complex and Calcium mediated signaling; Two component sensor-regulator system in bacteria, plants and animals (one example each). Bacterial chemotaxis and quorum sensing.

**Unit: IV**

**Applied Immunology:** Immune system; antigens and antibodies; Types of immunoglobulins (overview); structure of antibody, Immune response system, antibody mediated responses; Allergic disorders (introduction, diagnosis and clinical manifestations); Aeroallergens (identification, isolation and impact on human health); Role of immunotherapy in allergic disorders.

*S. J. Jafar*  
*J. B. H.*  
Coordinator  
Department of Bioresource  
University of Kashmir Srinagar



**SEMESTER IV**

**BR18402CR: Animal Cell and Tissue Technology**

**Unit: I**

**Animal cell and tissue culture:** History, scope and applications; Culture media, culture procedures and techniques; Transfection, targeted transfection, transient and stable transfections; Large scale culture of cell lines for production of biomolecules (viral vaccines, interferons, recombinant proteins and hybrid antibodies).

**Unit: II**

**Culture products:** Somatic cell fusion, hybridoma technology and production of monoclonal antibodies.

**Stem cells:** Stem cell lines— origin and types, stem cell therapy and its applications.

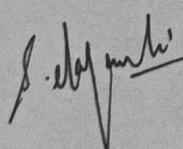
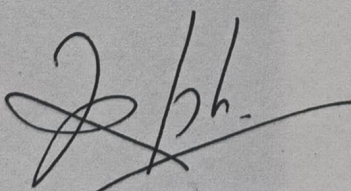
**Immunodiagnosics:** Blood grouping; Rh typing; Immuno electrophoresis; Enzyme linked Immuno Sorbent Assay (ELISA); Radio Immuno Assay (RIA).

**Unit: III**

**Tissue engineering:** Concept, approaches, prospects and limitations; Biomaterials for tissue engineering; Tissue engineering of skin and haemoglobin-based blood substitutes; Artificial womb technology.

**Unit: IV**

**Animal cloning:** *In vitro* fertilization and embryo transfer; Cloning livestock by nuclear transplantation; Production of transgenic animals with special reference to transgenic mice, cow and sheep; Identification and transfer of genes influencing milk quality and disease resistance.


  
 Coordinator  
 Department of Biotechnology  
 University of Kashmir Srinagar

**SEMESTER IV****BR18403CR: Microbial Technology****Unit: I**

**Microbial genome:** Bacterial genome structure, replication (DNA and plasmid); Genetic exchange (transformation, transduction and conjugation); Recombination (hosts, vectors and mechanism); Replication of Bacteriophages: Viral multiplication (lytic and lysogenic).

**Unit: II**

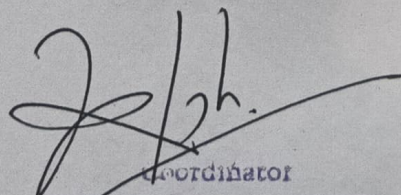
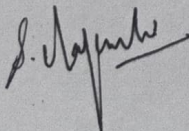
**Culturing of microbes:** Isolation and screening of microorganisms; Cultivation of microbes- nutritional requirements and factors affecting microbial growth (pH, temperature, water, oxygen, CO<sub>2</sub>); Culture types— static cultures, suspension cultures; synchronous cultures, growth curve, generation time, growth kinetics; Storage and transportation of microbes.

**Unit: III**

**Fermentation technology:** Introduction; Types of fermentation (aerobic, anaerobic), fermentors and their types, substrates for fermentation; Role of enzymes in various fermentation processes; Microbial chemostat cultures; Scale-up of cultivation of microorganisms; Microbes in beverages and food production (wine, beer, bread, cheese); Advantages of fermented foods.

**Unit: IV**

**Economic importance of microbes:** Major commercial microbial products (amino acids, enzymes, steroids, therapeutic agents and biopolymers); Single Cell Proteins; Role of microbes in bioremediation; Microbes as bioindicators; Biodefence and bioterrorism; Role of microbes in waste water treatment.



Coordinator  
Department of Resource  
University of Kashmir Srinagar

**BR18001GE: Industrial Entomology****Unit: I**

**Apiculture:** Importance and scope; Bee species (biology, morphology, behaviour, and habitat); Bee keeping equipment, hives, bee pasturage and seasonal management; Honey extraction; Factors affecting honey yield; Properties and uses of honey; Granulation, fermentation and storage of honey; Uses of other bee products; Bee enemies including diseases and their control.

**Unit: II**

**Sericulture:** Silkworm species, systematic position and salient features; Rearing techniques of mulberry, muga, eri and tassar silkworms; Nutritional requirements of silkworms; Sericulture rearing house and appliances; Grainage technology and cocoon marketing; Enemies and diseases of silkworms and their management; By-products of sericulture.

**Unit: III**

**Lac culture:** Lac insect, biology and habitat; Host trees— pruning, inoculation, lac cropping techniques and harvesting; Enemies of lac insect and their control; Processing techniques of lac (traditional and modern); Physical and chemical characteristics of lac.

**Unit: IV**

**Beneficial Insects:** Insects as pollinators and biocontrol agents; Insects as soil fertility improving agents and scavengers; Use of insects and insect products in medicine; Use of insects in scientific investigations; Use of insects as food source.

*S. D. Jambhale*

*J. K. B.*  
Coordinator  
Department of Applied Entomology  
University of Kashmir Srinagar



## **Department of Bioresources**

School of Biological Sciences

University of Kashmir, Srinagar-190006

NAAC Accredited Grade A<sup>+</sup> University

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### Syllabus

**BR18003OE: Infectious Diseases and Livestock Health**

**Semester – III (02 Credit Course)**

#### **Unit: I**

**Introduction to Infectious Diseases and their immune response:**

**Common diseases of live stock diseases:** Anthrax Aetiology, Pathogenesis, Diagnosis and Control; Salmonellosis (Gastroenteritis) Pathogenesis, Diagnosis and Control.

Foot & Mouth Disease -Distribution, Pathogenesis and Control.

Aspergillosis, Aetiology, Epidemiology, Pathogenesis, Diagnosis and Control.

#### **Unit: II**

**Nature and Consequences of Parasitism:** Parasitology, types of parasites, life cycle of different parasites, Host Parasitic associations; Parasitic adaptations; Host parasite interaction, Zoonosis- Classification. Morphology life cycle, Pathogenicity, prophylaxis and control of *Fasciola hepatica*.

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Syllabus

**BR18002OE: Infectious Diseases and Human Health**  
**Semester-II (02 Credit Course)**

**Unit: I**

**Introduction to Infectious Diseases:** Basic concepts in pathophysiology of infectious diseases, Infectious disease transmission, Infection and immunity, Inflammation, Acute and chronic Infections, Major infectious diseases of humans. **Bacterial Infections:** Pathogenesis, mechanisms of pathogenesis; transmission, epidemiology, diagnosis, prophylaxis and treatment of Tuberculosis.

**Unit: II**

**Viral, Fungal and Protozoan Diseases:** Pathogenesis, transmission, life cycle, epidemiology, diagnosis, prophylaxis and anti-retroviral therapy of HIV/AIDS (Viral infection) Candidiasis (fungal infection); Plasmodium falciparum causative agent of Malaria (Protozoan infection). Sexually transmitted diseases.

  
Coordinator  
Department of Bioresources  
University of Kashmir, Srinagar

**DEPARTMENT OF BIORESOURCES**  
**HORMONES IN HUMAN HEALTH (BR19007GE)**

**SEMESTER –IV**

Subject Code: BR19007GE

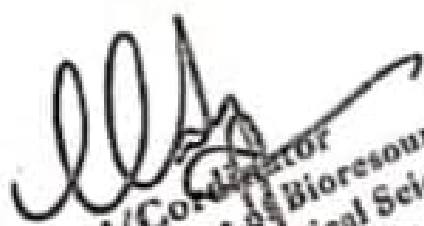
Credits: Two (02)

Unit: I

**Hormones:** Introduction, Classification, and Characteristics of Hormones, Functions of hormones from Pituitary Gland, Pineal gland, Thyroid Gland, Parathyroid Gland, Adrenal Gland, Pancreas. Physiologic Effects of Ovarian Hormones, Menstrual cycle and its regulation. Physiologic Effects of Androgens at Target Organs.

Unit: II:

**Hormonal Disorders:** Feedback mechanism of hormonal regulation, Endocrine Disorders and their causes, symptoms, diagnosis and treatment (Hyperthyroidism, Thyroiditis, Goiter, Obesity, Gigantism, Diabetes, PCOS, Hypoglycemia, Addison's Disease, Cushing Disease). Hormones as therapeutic agents, Role of hormones in postmenopausal disorders (ovarian cancer, breast cancer) Hormone replacement therapy.

  
Head/Coordinator  
Department of Bioresources  
School of Biological Sciences  
University of Kashmir