JAI HIND COLLEGE

Basantsing Institute of Science & J. T. Lalvani College of Commerce.

And Sheila Gopal Raheja College of Management

Affiliated to University of Mumbai

Autonomous

Bachelor of Science (B.Sc in Life Sciences)

Semester I

Course Code: SLSC101	Course Title: Life Sciences at the molecular and cellular levels

Learning Objectives:

1. To train students with fundamental chemical processes and interactions that prevail in living systems

2. To Familiarize the students with biological molecules that are crucial for the maintenance of structure/function in an organism

3. To impart knowledge on tools that may be used in the study of biomolecules and cells.

Learning Outcomes:

1. Use fundamental chemical processes and interactions that prevail in living systems

2. Implement knowledge on biological molecules that are crucial for the maintenance of structure/function in an organism

3. Use tools that may be used in the study of biomolecules and cells.

Semester I

Course Code: SLSC102	Course Title: Introduction to plant and animal life processes

Learning Objectives:

1. To make them aware about types of nutrition in plants and animals; nutritional adaptations; anatomy and physiology of digestion; evolutionary adaptations

2. To train them with knowledge on functions of organ systems and cellular functions (Life processes including transport and circulation in plants and animals; support and locomotion, respiration and gaseous exchange, excretion and osmoregulation)

3. To make them aware about physiology from the cellular and molecular level to the organ system and organismic level of organization.

Learning outcomes:

1. Explain types of nutrition in plants and animals; nutritional adaptations; anatomy and physiology of digestion; evolutionary adaptations

2. Explain functions of organ systems and cellular functions (Life processes including transport and circulation in plants and animals; support and locomotion, respiration and gaseous exchange, excretion and osmoregulation)

3. Integrate physiology from the cellular and molecular level to the organ system and organismic level of organization.

Semester I

Course Code: SLSC1PR	**Course Title: Semester - I Practicals**

Learning Objectives:

1. To make them aware about introduction to Laboratory discipline:

2. To train them with knowledge of GLP (Good Laboratory practices)

3. To sensitize them with Lab safety (instruments and chemicals)

Learning Outcomes:

1. Monitor and use the knowledge of introduction to Laboratory discipline:
2. Use knowledge of GLP (Good Laboratory practices)
3. Apply knowledge on Lab safety (instruments and chemicals)

Semester II

Course Code: SLSC201	Course Title: **Life Sciences at the molecular and cellular levels**

Learning Objectives:

1. To Make them aware about Differences between prokaryotes and eukaryotes.
2. To familiarize them with the structures and basic components of eukaryotic cells, with respect to membranes and organelles.
3. To train them about the function and the composition of the plasma membrane.

Learning Outcomes:

1. Differentiate between prokaryotes and eukaryotes.
2. Use knowledge on understanding of the structures and basic components of eukaryotic cells, with respect to membranes and organelles.
3. Describe the function and the composition of the plasma membrane.

Semester II

Course Code: SLSC202	Course Title: **Elementary genetics, ecology and behavior**

Learning Objectives:

1. To inculcate knowledge on Gene concept, Mendelian inheritance along with problem solving –mono and dihybrid crosses, Sex-linked inheritance, pedigree analyses

2. To train them about Non-Mendelian inheritance, intra-allelic and inter-allelic gene interactions

3. To help them to understand about Types of mutations and human congenital disorders

Learning Outcomes:

1. Use knowledge on Gene concept, Mendelian inheritance along with problem solving –mono and dihyrbrid crosses, Sex-linked inheritance, pedigree analyses

2. Evaluate Non-Mendelian inheritance, intra-allelic and inter-allelic gene interactions

3. Differentiate Types of mutations and human congenital disorders

Semester II

Course Code: SLSC2PR	Course Title: Practical

Course Objectives :

1. To impart knowledge on Movements in plants and animals

2. To familiarize with the concept of Cytoplasmic streaming in *Vallisnaria / Hydrilla*

3. TO train them about Culturing and observation of *Paramoecium* from Hay infusion and Histochemical localization

Course Outcome:

1. Solve problems on Movements in plants and animals

2. implement concept of Cytoplasmic streaming in *Vallisnaria / Hydrilla*

3. Culture and observe *Paramoecium* from Hay infusion and Histochemical localization.

Semester III

Course Code: SLSC301	Course Title: Comparative Physiology

Learning Objectives:

1. To Make them aware about homeostatic mechanisms that are essential for survival.
2. To Make them understand about Cell signaling, how cells communicate with each other.
3. To Sensitize Neuroendocrinology, glands and hormones involved.

Learning Outcome:

1, Implement Cell signaling pathways and communication between cells.

2. define the concepts of Neuroendocrinology, glands, and hormones involved.

3. Explain the Nervous System, Propagation of Nerve impulses and synapses.

Semester III

Course Code: SLSC302	Course Title: **Life processes at the tissue, organ and organism levels: A Biochemical Approach**

Learning Objective:

1. To familiarize with concept of Role of enzymes as biocatalysts, with introductory knowledge on enzyme kinetics.
2. To help them for clarifying basic cellular energy metabolism utilizing glucose and fatty acids
3. To make them aware about elementary amino acid metabolism viz. transamination, deamination & urea cycle

Learning Outcome:

1. Describe the role of enzymes as biocatalysts, with introductory knowledge on enzyme kinetics.

2. Define basic cellular energy metabolism utilizing glucose and fatty acids, elementary amino acid metabolism viz. transamination, deamination & urea cycle

3. Explain role of oxidative phosphorylation and photophosphorylation systems in cellular ATP synthesis.

Semester III

Course Code: SLSC303	Course Title: **Population approach: population and communities as regulatory unit**

Learning Objectives:

This course is aimed at achieving the following objectives:

1. To make them aware about the basics of evolution by studying different theories.
2. To make them Understand concepts of specific terms related to evolution: mutation, migration, genetic drift, non-random mating, and natural selection.
3. To help students to understand different types of evolution and the concept of how certain diseases spread.

Learning Outcome:

1. Enlist and describe the evidence for evolution and the mechanisms by which evolution occurs.
2. Provide detailed explanations of the processes of evolution by mutation, migration, genetic drift, non-random mating, and natural selection.
3. Identify major evolutionary transitions over time, and explain the tools and evidence that support current hypotheses of the history of life.

Semester III

Course Code: SLSC3PR	Course Title: Semester - III Practicals

Learning Objectives:

1. Train them to demonstration of reproductive system and location of endocrine glands in Make them Albino Mouse Male and Female.

2. To Make them aware about Microtome and preparation of Endocrine gland slides from above dissected specimen or any suitable plant specimen

3. To familiarize with Histological features of Endocrine glands.

Learning Outcomes:

1. Demonstrate of reproductive system and location of endocrine glands in make them Albino Mouse Male and Female

2. Use Microtome and prepare Endocrine gland slides from above dissected specimen or any suitable plant specimen

3. Perform experiment on Histological features of Endocrine glands.

Semester IV

Course Code: SLSC401	Course Title: Comparative Physiology

Learning Objectives:

1. To make them Understand Thermal physiology in plants and animals by studying the various strategies.

2. To make them aware of the Host-Parasite Relationship in plants and animals.

3. To familiarize with concepts of pathogenesis, prophylactic measures, diagnosis and treatments of diseases often seen in our surroundings.

Learning Outcomes:

1. Describe Thermal physiology and homeostasis during Stress

2. Perform the reproductive mechanisms in plants/animals and Host-Parasite Relationship

3. Explain the aetiology, pathogenesis, clinical manifestations, diagnosis, therapy, prophylaxis, epidemiology and treatments of a few infectious diseases.

Semester IV

Course Code: SLSC402	

	Course Title: Life processes at the tissue, organ and organism levels of Biochemical Approach

Learning Objectives:

1. Make them aware about the process of Gene Expression (Transcription and Translation)
2. Make them Understand about factors that could affect gene expression.
3. Train them about different process and the importance of error-free DNA Replication

Learning Outcomes:

1. Perceive all levels of the process of Gene Expression (Transcription and Translation)
2. Summarize the process and the importance of error-free DNA Replication
3. Recognize the process and importance of amino acid and fatty acid synthesis.

Semester IV

Course Code: SLSC403	**Course Title: Population approach: population and communities as regulatory unit**

Learning Objectives:

1. To familiarize with the concept of altruism and kin selection and their types.
2. To Train them with proper understanding of Primate Evolution and these characteristics have evolved and adapted in humans too.
3. To train them to Carry out hypothesis testing using the optimal statistical tools, while minimizing errors.

Learning Outcomes:

1. Describe various aspects of Evolution and Society.
2. Explain adaptation, providing examples from several different fields of biology
3. Differentiate between the parametric and non-parametric tests

Semester IV

Course Code: SLSC4PR	Course Title: Semester - IV Practicals

Learning Objectives:

1. To train them with techniques of Extraction and detection of Plant alkaloids, saponines, tannins and volatile oil from suitable plant sources.
2. To make them understand about Alkaloid separation by TLC
3. To make them aware about effect of temperature and caffeine on heart beat of Daphnia

Learning Outcomes:

1. Use techniques of Extraction and detection of Plant alkaloids, saponines, tannins and volatile oil from suitable plant sources.
2. Solve problems about Alkaloid separation by TLC
3. Practice effect of temperature and caffeine on heart beat of Daphnia

Semester V

Course Code: SLSC501	Course Title: Genetics and Immunology – I

Learning Objectives:

1. Make them understand the concepts of linkage, recombination and gene mapping in phage and bacteria.
2. Familiarize with an Understanding organization of genomes
3. To train them to Differentiate between innate and adaptive immunity, illustrate the cell types

Learning Outcomes:

1. Use the concepts of linkage, recombination and gene mapping in phage and bacteria.
2. Solve problems in Understanding organization of genomes
3. Differentiate between innate and adaptive immunity, illustrate the cell types and

Semester V

Course Code: SLSC502	Course Title: **Developmental Biology and Neurobiology – I**

Learning Objectives:

1. To familiarize with concepts of model organisms and landmark discoveries in research related to developmental biology.
2. To impart knowledge on developmental biology with Arabidopsis as the model System.
3. To train tehm about development from a single cell to a multicellular organism in chick and human.

Learning Outcomes:

1. Use concepts of model organisms and landmark discoveries in research related to developmental biology.

2. Use knowledge on developmental biology with Arabidopsis as the model System.

3. Analyze developmental stage from a single cell to a multicellular organism in chick and human.

Semester V

Course Code: SLSC503	**Course Title: Fermentation technology & Genetic engineering: A Biotechnological approach I**

Learning Objectives:

1. Make them Understand the various concepts of fermentation (aerobic, anaerobic, batch vs continuous);
2. TO train them to Design a simple containment system (Bioreactor / fermentor).
3. To train them too Isolate and screen microorganism with potential to produce particular metabolite.
4. Enhance the efficiency of microorganisms to produce particular metabolite and produce the same at large scale.
5. Produce beer, wine, vinegar, cheese, yoghurt etc resulting from alcoholic and acidic fermentation.
6. Understand the Principles of instrumentation.
7. Describe the use of restriction endonucleases in gene cloning.
8. Describe the different vectors (prokaryotic) that can be used in gene cloning experiments.
9. Describe the essential steps involved in gene cloning with relevant examples.
10. Describe the various strategies of cloning, screening and selection methods.

No Outcomes:

1. Enhance the efficiency of microorganisms to produce particular metabolite and produce the same at large scale.

2. Produce beer, wine, vinegar, cheese, yoghurt etc resulting from alcoholic and acidic fermentation

3. Describe the use of restriction endonucleases in gene cloning.

Semester V

Course Code: SLSC5PR1	**Course Title: Life Sciences Paper 1 & 2 Practical**

Learning Objectives:

1. To train them with Extraction of chromosomal DNA from chicken liver

2. To make them aware about Streak plate isolation of saliva on two different media

3. To impart hands on knowledge Viable count for enumeration of bacteria by – Bulk seed method

Learning Outcomes:

1. Perform Extraction of chromosomal DNA from chicken liver

2. Perform and analyze Streak plate isolation of saliva on two different media

3. Calculate Viable count for enumeration of bacteria by – Bulk seed method

Semester V

Course Code: SLSC5PR2	Course Title: **Life Sciences Paper 3 & 4 Practical**

Learning Objectives:

1. To make them trained on Extraction of enzyme: (Amylase from sweet-potato / salivary amylase / egg white lysozyme or any other convenient enzyme)

2. To train them with Purification of enzyme: Above enzyme extract used for purifying by salting-out method

3. To impart knowledge on Determination of - i) enzyme activity ii) specific activity.

Learning Outcomes:

1. Solve problems on Extraction of enzyme: (Amylase from sweet-potato / salivary amylase / egg white lysozyme or any other convenient enzyme)

2. To Purify enzyme: Above enzyme extract used for purifying by salting-out method

3. Determine - i) enzyme activity ii) specific activity.

Semester V

Course Code: SLSC5AC	Course Title: Horticulture and Gardening - I

Learning Objectives:

1. To make them aware about various branches of horticulture as well as regional centers and research institutes promoting horticulture.
2. To train them with basic gardening skills and operations including propagation of plants by artificial and natural methods
3. To make them Learn use of various gardening implements

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Learning Outcomes:

1. Perform experiment on branches of horticulture as well as regional centers and research institutes promoting horticulture.
2. Practice basic gardening skills and operations including propagation of plants by artificial and natural methods
3. Use knowledge for various gardening implements

Semester V

Course Code: SLSC5ACPR	**Course Title: Horticulture and Gardening - I Practical**

Learning Objectives:

1. To make them understand about basic gardening operations including propagation of plants by artificial and natural methods
2. To Train them to use of various gardening implements
3. To make them understand common pests as well as samples of diseased specimens of plants and they will learn to prepare eco-friendly insecticides.

Learning Outcomes:

1. Perform test to identify different types of chemical fertilizers and also observe different types of bio-fertilizers and green manure plants.
2. Use methods for testing soil samples for its pH, organic content, etc.
3. Project work on selecting horticulture related topic in depth.

Semester VI

Course Code: SLSC601	**Course Title: Genetics and Immunology – II**

Learning Objectives:

1. To make them Understand the concept of recombination and gene mapping in Eukaryotes

2. To make them aware about various types of mutations and mutagenesis methods

3. To help them to Understand various tools used in molecular genetics

No Outcomes

1. Use knowledge about the concept of recombination and gene mapping in Eukaryotes

2. Summarize various types of mutations and mutagenesis methods

3. Implement various tools used in molecular genetics

Semester VI

Course Code: SLSC602	**Course Title: Developmental Biology and Neurobiology – II**

Learning Objectives:

1. To make them understand the cellular and molecular basis of development and genes involved during the early development.
2. To make them aware about applications of developmental biology in different fields related to treating various conditions and diseases.
3. To train them to Explain the basics of stem cell research.

No Outcomes:

1. Describe the cellular and molecular basis of development and genes involved during the early development.

2. Summarize applications of developmental biology in different fields related to treating various conditions and diseases.

3. Explain the basics of stem cell research.

Semester VI

Course Code: SLSC603	**Course Title: Fermentation technology & Genetic engineering: A Biotechnological approach II**

Learning Objectives:

1. To make them Understand the enzyme technology, the various methods of immobilization of enzymes.

2. To make them aware about how the fermentation technology can be applied in medicine.

3. To Impart Knowledge of plant and animal tissue culture and production of secondary metabolites

No Outcomes

1. Discuss Understand the enzyme technology, the various methods of immobilization of enzymes.

2. Explain how the fermentation technology can be applied in medicine.

3. Use Knowledge of plant and animal tissue culture and production of secondary metabolites

Semester VI

Course Code: SLSC604	**Course Title: Environmental Biotechnology II**

Learning objective:

1. To make them understand the basic sustainability concepts of Population changes, carrying- capacity and various factors for the same.

2. To train them articulate the interdisciplinary context of environmental issues.

3. To Prepare for career success in natural resources and its conservation, public health, environmental monitoring, industrial environmental management.

Learning Outcomes:

1. Define the basic sustainability concepts of Population changes, carrying- capacity and various factors for the same.

2. Explain the interdisciplinary context of environmental issues.

3. Prepare for career success in natural resources and its conservation, public health, environmental monitoring, industrial environmental management.

Semester VI

Course Code: SLSC6PR1	**Course Title: Life Sciences Paper 1 & 2 Practical's**

Learning Objectives:

1. To train them about Giant Chromosome preparation (*Drosophila* /*Chironomuslarvae*)

2. To make them aware about Estimation of bacteriophage titre by plaqueassay

3. To impart knowledge on Effect of UV radiation on microorganisms (Light repair and Dark Repair)

Learning Outcomes:

1. Explain about Giant Chromosome preparation (*Drosophila* /*Chironomuslarvae*)

2. Summarize about Estimation of bacteriophage titre by plaque assay

3. Use knowledge on Effect of UV radiation on microorganisms (Light repair and Dark Repair)

Semester VI

Course Code: SLSC6PR2	Course Title: Life Sciences Paper 3 & 4 Practical's

Learning Objective:

1. To impart knowledge about thin layer chromatography of lipids/plant alkaloids/any other suitable extract.

2. To make them aware about Bioassay of antibiotic for anti-bacterial activity.

3. To train them about Assay of fermentation product:
    a. Alcohol
    b. Sugar

Learning outcome :

1. Use knowledge about Thin layer chromatography of lipids/plant alkaloids/any other suitable extract

2. Implement knowledge about Bioassay of antibiotic for anti-bacterial activity

3. Perform Assay of fermentation product:
    (a) Alcohol
    (b) Sugar

Semester VI

Course Code: SLSC6AC	Course Title: Horticulture and Gardening - II

Learning Objectives:

1. To train them to learn the basic principles of landscape gardening, different types of gardens and important garden features.
2. To make them aware about the commercial production and harvesting of flowers, fruits and vegetables. They will also learn various techniques of preservation of fruits and vegetables.
3. To impart knowledge about principles of landscape gardening is added to understand the basic concepts involved in construction of various types of garden.

Learning Outcomes:

1. Acquire entrepreneurial skills.
2. Use knowledge about crop cultivation & food preservation technology.
3. Summarize the need of space gardening and basic techniques involved in construction of different types of gardens.

Semester VI

Course Code: SLSC6ACPR	**Course Title: Practical's in Horticulture and Gardening - II**

Learning Objectives :

1. To make them aware techniques of horticulture.
2. To train them about making terrarium.
3. To impart knowledge about instruments used in gardening.

Learning Outcome:

1. Use techniques of horticulture.
2. Implement knowledge about making terrarium.
3. Use knowledge and skills about instruments used in gardening.