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## Sophia College (Autonomous)

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### Life Science

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**FYBSc - Semester I**

**COURSE CODE: SBSLSC101**

**PAPER -I CELL AND MICROBIAL BIOLOGY**

#### **Course Objectives**

**CO1:** Introduce students to basics of microscopy, types of microscopes to visualize microbial cells, microorganisms.

**CO2:** Make the students learn about diverse microbes, microbial diversity, the cell wall structure and its propagation

**CO3:** Introduce students to parameters of microbial growth and conditions for their control.

#### **Course Outcomes**

Student will be able to

**LO1:** differentiate between different microscopic methods to observe samples

**LO2:** classify microbes on their appearance

**LO3:** understand the importance of the components for the growth of bacteria in culture media and also about mechanisms that inhibit their growth.

**COURSE CODE: SBSLSC102**

**PAPER -II BIOMOLECULES AND SEPARATION TECHNIQUES**

#### **Course objectives**

**CO 1:** To introduce the students with biological molecules of living cells.

**CO 2:** To familiarize students with process of DNA synthesis.

**CO 3:** To introduce students with extraction, separation and analytical techniques.

#### **Course outcomes**

Students will be able to

**LO 1:** identify the biomolecules involved in living cells.

**LO 2:** understand DNA synthesis process.

**LO 3:** analyze the techniques involved in extraction and separation techniques.



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## Sophia College (Autonomous)

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### SEMESTER II

**COURSE CODE: SBSLSC201**

**PAPER –I EUKARYOTIC CELL BIOLOGY**

#### Course Objectives

**CO1:** Make the students learn the structure and function of components of eukaryotic cell like nucleus, plasma membrane, chloroplast and mitochondria.

**CO2:** Make the students learn about protein formation and trafficking through the endomembrane organelles.

**CO3:** Make the students understand processes and mechanism of cell division.

#### Course Outcomes

Students will be able to

**LO1:** differentiate between Euchromatin and Heterochromatin, active and passive transport across the membrane in animals and plants.

**LO2:** differentiate between different cell-cell junctions and extracellular matrix which contribute stability and elasticity to the cell.

**LO3:** gain an insight into the different cell organelles and diseases associated due to their malfunctions.

**COURSE CODE: SBSLSC202**

**PAPER –II CLASSICAL GENETICS, ECOLOGY AND EVOLUTION**

#### Course Objectives

**CO 1:** To make the students understand the history and basics of modern genetics.

**CO 2:** To familiarize the students about the influence of the environment on survival of organism.

**CO 3:** To introduce students with theories on the origin of life and evolution.

#### Course Outcomes:

Students will be able to

**LO 1:** achieve an understanding of classical genetics.

**LO 2:** identify genetic disorders.

**LO 3:** understand the process of evolution.



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## Sophia College (Autonomous)

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**SYBSc Life Science**

**SEMESTER III**

**COURSE CODE: SBSLSC301**

**PAPER -I: COMPARATIVE PHYSIOLOGY- I**

**Course Objective:**

**CO 1:** Outline physiology and homeostatic maintenance.

**CO 2:** Compare and contrast the control and coordination in plants and animals.

**CO 3:** Gain knowledge about sex determination and sexual differentiation

**Course Outcome:**

Students will be able to

**LO 1:** compare and contrast diverse mechanisms and this provides a cohesive understanding of physiology.

**LO 2:** interpret the nervous system in diverse genera.

**LO 3:** identify the process of sexual maturation and gamete development across the plant and animal kingdom.

**COURSE CODE: SBSLSC302**

**PAPER -II: LIFE PROCESSES AT THE TISSUE, ORGAN AND ORGANISM LEVELS: A BIOCHEMICAL APPROACH- I**

**Course Objective:**

**CO 1:** Familiarize students with the basic biochemical process in the cells and tissues and their regulation.

**CO2:** Acquaint the students to the lipid and protein catabolism by demonstrating its significance in terms of real life examples.

**CO3:** Introduce students to different techniques used to extract and purify enzymes and the parameters to study enzyme kinetics and further how enzyme activity is regulated.

**Course Outcome:**

Students will be able to

**LO1:** understand the basic biochemical process.

**LO2:** relate the process involving their food metabolism and respiration.

**LO3:** inculcate the knowledge of lipid and protein metabolism and relate the knowledge to host metabolic processes.



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## Sophia College (Autonomous)

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**COURSE CODE:** SBSLSC303

**PAPER -III:** POPULATION APPROACH: POPULATION AND COMMUNITIES AS REGULATORY UNIT-I

### Course Objective:

**CO 1:** Familiarize students with the basic bioinformatics tools, database and application

**CO2:** Acquaint the students to statistics and data analysis.

**CO3:** Make the student understand the evolutionary concepts and population studies

### Course Outcome:

Students will be able to

**LO 1:** analyze data in terms of statistical significance.

**LO 2:** comprehend the process of evolution.

**LO3:** develop proficiency in using bioinformatics tools and apply the knowledge in designing a short term project.

## SEMESTER IV

**COURSE CODE:** SBSLSC401

**PAPER -I:** Comparative physiology- II

### Course Objectives

**CO1:** Interpret the Integration and coordination in the living system.

**CO2:** Gain knowledge of endocrine glands and hormones.

**CO3:** Identify the mechanisms of homeostasis during infections.

### Course Outcomes

Students will be able to

**LO 1:** Develop an understanding of homeostatic mechanisms and cellular communications.

**LO 2:** Delineate the conditions due to derailing of homeostasis as happening in case of stress.

**LO 3:** Inculcate an understanding of defense mechanisms in case of infections plants and animals.



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## Sophia College (Autonomous)

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**COURSE CODE: SBSLSC402**

**PAPER -II: LIFE PROCESSES AT THE TISSUE, ORGAN AND ORGANISM LEVELS: A BIOCHEMICAL APPROACH- II**

### Course Objectives:

**CO 1:** Familiarize students with the basic biochemical process in the cells and tissues and their regulation.

**CO2:** Understand the molecular process involved in gene expression

**CO3:** Introduced to anabolism of biomolecules like carbohydrate, lipids and amino acids, further they will get deeper understanding photorespiration and C3 and C4 cycles in photosynthesis

### Course Outcomes:

Students will be able to

**LO 1:** understand the basic biochemical process.

**LO 2:** relate the process involving their food metabolism and respiration.

**LO 3:** understand the process involving gene expression.

**COURSE CODE: SBSLSC403**

**PAPER III POPULATION APPROACH: POPULATION AND COMMUNITIES AS REGULATORY UNIT-II**

### Course Objectives

**CO1:** Make students understand the significance of origin of species, and human evolution.

**CO2:** Familiarize with the biostatistic tests relevant to biological data collection.

**CO3:** Introduce the student to medically significant viral infectious diseases.

**CO4:** provide a first-hand knowledge of the advanced in silico tools.

### Course Outcomes

Students will be able to

**LO1:** develop an understanding of how life originated and subsequently evolution patterns in human as well as the society.

**LO2:** perform and determine that provided biological data set and statistically significant or insignificant. Additionally, the students will be able to apply their knowledge in the short term projects.

**LO3:** understand the disease mechanisms of different infectious diseases.

**LO4:** utilize the theory and practical knowledge of in silico tool and apply the database in validating their project data set or other given data set.



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## Sophia College (Autonomous)

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TYBSc Life Science

SEMESTER V

COURSE CODE: SBSLSC501

PAPER I GENETICS AND IMMUNOLOGY I

### Course Objectives

**CO1:** Make the students understand the history of genetic organization of genomes subsequently gene expression and regulation.

**CO2:** Make the students able to study the mechanism of genetic inheritance and variation.

**CO3:** Make the students gain the knowledge about the immune system and its involvement in generating immune response.

**CO4:** Make the students learn the significance of antigen antibody interaction and its downstream effects on effector mechanisms.

### Course Outcomes:

Students will be able to

**L01:** summarize the discovery of the genetic material.

**L02:** comprehend the complexity of nucleic acid and organization of eukaryotic and prokaryotic genome.

**L03:** articulate gene regulation, genetic recombination and inheritance, and mutational variation in eukaryotes.

**L04:** gain an understanding regarding the immune cells, organs of the immune system and immune response.



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## Sophia College (Autonomous)

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COURSE CODE: SBSLSC502

### PAPER II- DEVELOPMENTAL BIOLOGY AND NEUROBIOLOGY I

#### Course Objectives Developmental Biology I

**CO1:** Introduce the students to the concepts in development with basic understanding of the processes involved

**CO2:** Aid the students to further understand the concepts like body plan, potency, regulatory development, spemann's organizer in development using model organism

**CO3:** Familiarize the students with detailed development in plants especially in the model plant Arabidopsis, further introduction to double fertilization and seed formation.

#### Neurobiology I

**CO 4** Make the students gain an understanding of general organization of the nervous system.

**CO 5** Make the students understand the cellular organization of the nervous system.

#### Course Outcomes

##### Developmental Biology -I

Student will be able to

**LO1:** differentiate concepts like morphogen gradient, growth, morphogenesis and pattern formation.

**LO2:** familiarize oneself with experimental approaches like fate mapping, large scale mutagenesis screens and use of transgenetics to study development of model organisms.

**LO3:** gain knowledge about plant development.

##### Neurobiology I

Student will be able to

**LO 4:** describe the anatomical organization, functioning of the nervous system and its early development.

**LO 5:** analyze the cellular basis of nerve conduction within a neuron and transmission across synapses.



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## **Sophia College (Autonomous)**

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**COURSE CODE: SBSLSC503**

### **PAPER III- BIOTECHNOLOGY AND GENETIC ENGINEERING I**

#### **Course Objectives**

- CO1:** To introduce students with different aspects of fermentation technology.
- CO2:** To familiarize students with industrial production of food and beverage.
- CO3:** Understanding principle behind the working of instruments in Biotechnology.
- CO4:** To Familiarize students with Intellectual property rights.
- CO5:** Acquaint the students with the components of genetic engineering and biotechnology.
- CO6:** Introduce the students to different types of tools and techniques used in recombinant DNA technology.

#### **Course Outcome:**

Students will be able

- LO1:** to understand the process behind biotechnological products from biotechnological industries.
- LO2:** to analyze, interpret the data coming from instruments used in Biotechnology.
- LO3:** to apprehend the concepts of genetic engineering that includes details about the vector, restriction enzymes, DNA recombination and cloning.
- LO4:** to compare and contrast the principle and procedure of tools and techniques used in recombinant DNA.

**COURSE CODE: SBSLSC504**

### **PAPER IV-ENVIRONMENTAL BIOLOGY-I**

#### **Course Objectives**

- CO1:** To appraise the environment around us.
- CO2:** To introduce the fundamental concepts of environment and the biodiversity around us.
- CO3:** To introduce the India and Multilateral Environmental agreements.
- CO4:** Comprehend the significance of pests, pesticides, toxicology management.
- CO5:** To inculcate the knowledge of Community and Environment Conservation.

#### **Course Outcome:**

Student will be able to

- LO 1:** identify issues and problems regarding the natural resources.
- LO 2:** infer community and environment conservation.
- LO3:** understand the importance of toxicology management and the subsequent importance of Community and Environment Conservation.





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## **Sophia College (Autonomous)**

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**SEMESTER VI**

**COURSE CODE: SBSLSC601**

**PAPER I- GENETICS AND IMMUNOLOGY II**

### **Course Objectives**

**C01:** Understanding the concept of gene mapping.

**C02:** Studying the various tools and techniques involved in human genetics and recombination.

**C03:** Learning about immune mediated hypersensitivity, infectious, vaccines and importance immunodeficiency diseases.

**C04:** Introducing the concepts of transplantation, tumor immunology, tolerance and autoimmunity.

### **Course Outcomes**

The student will be able

**L01:** perform gene mapping using numerical problems.

**L02:** interpret the knowledge of gene recombination and mapping in detection of polymorphism and personalized medicine.

**L03:** compare and contrast between different tools and techniques in molecular genetics.

**L04:** make use of the knowledge to understand the mechanistic insight involved in hypersensitivity, immunodeficiency diseases and vaccine development.

**L05:** summarize the concepts of transplantation, tumor immunology, tolerance and autoimmunity.



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## Sophia College (Autonomous)

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COURSE CODE: SBSLSC602

### PAPER II- DEVELOPMENTAL BIOLOGY AND NEUROBIOLOGY II

#### Course Objectives

##### Developmental Biology II

**CO1:** Explains the molecular and cellular aspects of the important genes involved in early development in plants and animals.

**CO2:** Introduction to regeneration, advances in stem cell and regenerative medicine, apoptosis and types of cancer and the treatment strategies.

##### Neurobiology II

**CO 1:** Describes the structural and functional features of the various sensory and motor systems.

**CO 2:** Elaborates on some behavioral aspects such as sleep and memory.

#### Course Outcomes

Students will be able to

##### Developmental Biology II

**L01:** differentiate between determination and transdetermination.

**L02:** have knowledge of the molecules deposited by the mother and the role of Maternal genes and zygotic genes.

**L03:** familiarize oneself with the plant genome project.

##### Neurobiology II

**L01:** describe the sensory and motor systems.

**L02:** deduce the neurobiological basis of behavior and diseases that arise due to malfunction of the nervous system.



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## **Sophia College (Autonomous)**

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**COURSE CODE: SBSLSC603**

**PAPER III- BIOTECHNOLOGY AND GENETIC ENGINEERING II**

### **Course Objectives**

**CO 1:** Familiarizing students with the process of production of enzyme and pharmaceutical products.

**CO 2:** Introducing students to tissue culture techniques.

**CO3:** Inculcate the knowledge of transgenic animals and its applications.

**CO4:** Introduce the students to in silico and in vitro tools used in genetic engineering.

### **Course Outcomes**

Students will be able to

**LO1:** relate the application of fermentation technology in the production of various pharmaceutically important compounds.

**LO2:** comprehend the knowledge in understanding the application of genetic engineering tools in the field of medical/pharmaceutical and agricultural biotechnology.

**LO3:** understand the ethical, legal, and social Implications of recombinant DNA technology.

**LO4:** compare and contrast between different tools used in silico and in vitro tools used in genetic engineering.

**COURSE CODE: SBSLSC604**

**PAPER IV - ENVIRONMENTAL BIOLOGY II**

### **Course Objectives**

**CO 1:** Deals with the human dimension of development and its effect on the environment.

**CO 2:** Aims to provide adequate insight on management of natural resources.

**CO 3:** It introduces critical issues in environmental studies, both in an Indian and global perspective.

### **Course Outcomes**

Student will be able to

**LO 1:** interpret the process of urbanization with respect to consumption of resources.

**LO 2:** analyze the environmental consequences of urban transformation, waste disposal and pollution.

**LO 3:** interpret sustainability in relation to safety, health and environment.



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## **Sophia College (Autonomous)**

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**TYBSc AC Life Science**

**Semester V**

**Applied Environmental Sciences**

**Course code SBSAPC502**

**Objectives:**

- To revise the important concepts of environment and its impact on the interrelationship between various components of the environment.
- To recognize and realize or raise awareness of the harmful effects of overexploitation of components in the environment resulting in balance shifts in ecosystems.
- Analytic methods used for testing harmful chemicals/pollutants released in the environment.
- To learn remediation techniques to mitigate the effects of anthropogenic activities on the environment.

**Environmental Management**

**Course code: SBSAPC602**

**Objectives:**

- To introduce the various concepts of costing, book keeping and final accounts.
- To make students aware of entrepreneurship and motivate them to identify opportunities.
- To explore possibilities within learners to be nature enthusiasts, passionate naturalists, adventurers and eco-friendly tourists.
- To tap the ecotourism avenues within and outside the country.
- To expose and augment the avenues of employability and entrepreneurship in the arena of industrial consultancy.
- Learner will develop an acumen to tap the potential for entrepreneurship with respect to environment related products and indoor plants.



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## Sophia College (Autonomous)

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### Life Science

### MSc Part - I

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#### SEMESTER I

**COURSE CODE:** SMSLSC101

**PAPER -I** MACROMOLECULES

#### Course objective

**CO1:** To learn fundamentals of thermodynamics.

**CO2:** To have an understanding of behaviour of molecules in context to thermodynamics.

**CO3:** To acquire a clear understanding of processes involving Nucleic acid biochemistry.

**CO4:** To understand details of protein structure and folding, and its relation to protein function.

**CO5:** To introduce the students to different techniques in macromolecular biology.

#### Learning Outcome:

The students will be able to

**L01:** Relate the fundamentals of thermodynamics and molecular biology behaviour in the biochemical reaction.

**L02:** Have a clear understanding of the important molecular biology process of Gene transcription and regulation.

**L03:** Have a clear understanding of protein biochemistry at molecular level.

**L04:** Understand the principle behind techniques involved in Macromolecular biology.



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## Sophia College (Autonomous)

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**COURSE CODE: SMSLSC102**

**PAPER -II CELL BIOLOGY I**

### **Course Objectives:**

- CO1:** To enable understanding of microbial diversity and structure of prokaryotic cell.
- CO2:** To understand microbial growth and its control.
- CO3:** To introduce students to Organelles of eukaryotic cells – structure and function.
- CO4:** To understand concept of intercellular communication and various methods used to study cellular processes.

### **Learning Outcome**

The Students will be able to

- LO1:** Distinguish between different forms of bacteria and archaea.
- LO2:** Have thorough knowledge of characteristics of antibiotic drugs and the mode of action.
- LO3:** Have understanding of Eukaryotic cell, the membrane, the organelles and the benefits of compartmentalization.
- LO4:** Further understand the function of cytoskeleton and the importance of cell junctions.

**COURSE CODE: SMSLSC103**

**PAPER -III SYSTEMS BIOLOGY I**

### **Course Objectives**

- CO1:** Familiarize the students to Physiological systems.
- CO2:** Introduce the students to the basics of Immunology.
- CO3:** Describe the significance of Host Parasite interactions and diseases.
- CO4:** Illustrate and demonstrate the techniques used in physiology and immunology.

### **Learning Outcomes**

The students will be able to

- LO1:** Comprehend the mechanism of Physiological systems that maintain homeostasis-Digestive, Circulatory, Excretory.
- LO2:** gain an understanding regarding the immune cells, organs of the immune system and immune response.
- LO3:** understand the details about host parasite interactions and apply the knowledge while performing experiments.
- LO4:** compare, contrast and also apply the techniques used in physiology and immunology during their project work.



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## Sophia College (Autonomous)

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**COURSE CODE: SMSLSC104**

**PAPER -IV BIOINFORMATICS, TOXICOLOGY, BIostatISTICS I AND RESEARCH METHODOLOGY**

### Course Objectives

**CO1:** Apprehend the major classes of toxicology, different toxins, and route of exposure, risk assessment, prediction and management.

**CO2:** Demonstration and understanding of the central concepts of modern statistical theory and their probabilistic foundation.

### Learning outcomes

The Students will be able to

**LO1:** Design, execute and statistically analyse experiments using the principles of scientific research methodology.

**LO2:** Interpret results by using descriptive statistical methods effectively.

## SEMESTER II

**COURSE CODE: SMSLSC201**

**PAPER -I PRINCIPLES OF GENETICS**

### Course Objectives

**CO1:** To understand the theory of classical genetics

**CO2:** To understand the DNA repair mechanism

**CO3:** To acquire detailed understanding of Regulation of gene expression.

**CO4:** Introduce techniques in genetics

### Course Outcome:

Students will be able to

**LO1:** Explain the concept of Classical genetics.

**LO2:** Understand the processes involved in regulation of genes.

**LO3:** Understand different tools in genetics and to apply these techniques for genetic manipulation.



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## Sophia College (Autonomous)

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**COURSE CODE: SMSLSC202**

**PAPER -II CELL BIOLOGY II**

**Course Objectives:**

**CO1:** To enable understanding of the basics of cell division and cell cycle and molecules in cell cycle regulation.

**CO2:** To understand cell signaling with examples and cell death processes and pathways involved.

**CO3:** Introduction to autophagy, its machinery and examples.

**CO4:** Introduction to techniques in cell cycle analysis, apoptosis, autophagy and cell signaling.

**Learning Outcome:**

Students will be able to

**LO1:** Differentiate between different cell cycle stages and gain knowledge about cyclins and cyclin dependent kinases.

**LO2:** Differentiate between morphological and cellular changes due to necrosis and apoptosis.

**LO3:** Differentiate between different kinds of cell signaling with the receptors and signal transduction.

**LO4:** Students will gain knowledge about techniques used in cell biology like TUNEL assay, Comet assay, autophagy marker assay, MTT cell proliferation assay and cell signaling kinase assay.

**COURSE CODE: SMSLSC203**

**PAPER -III SYSTEMS BIOLOGY- II**

**Course Objectives**

**CO1** Understand in detail about the Endocrine, Reproductive and Nervous systems.

**CO2** Study the concepts of development biology.

**CO3** Introduces the details about different types of model systems used in developmental biology.

**CO4** Outline the fundamentals of different tools used in systems biology.

**Learning Outcomes:**

The students will be able to

**LO1:** Understand the function and organization of Endocrine, Reproductive and Nervous systems.

**LO2:** Comprehend the different stages of development.

**LO3:** Inculcate and apply the knowledge of the model system while proposing objectives for their project work.

**LO4:** Compare, contrast and apply the knowledge of different tools for their project work.





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## **Sophia College (Autonomous)**

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**COURSE CODE: SMSLSC204**

**PAPER -IV EVOLUTION, POPULATION BIOLOGY, BIOSTATISTICS- II AND BIOINFORMATICS**

### **Course objective**

**C01:** To infer evolutionary concepts and population studies.

**C02:** To outline fundamentals of biostatistics and bioinformatics.

**C03:** To introduce students into the world of 'omics' with a bioinformatics perspective.

### **Learning outcomes.**

The Students will be able to

**L01:** To familiarize themselves with various biological databases/tools and their applications.

**L02:** To understand and analyze sequences and construct phylogenetic trees.



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## **Sophia College (Autonomous)**

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### **Life Science**

### **MSc Part - II**

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#### **SEMESTER III**

**COURSE CODE:** SMSLSC301

**PAPER -I** CELLULAR ORGANIZATION OF THE NERVOUS SYSTEM

#### **Course Objectives:**

**CO1:** To introduce students to neuroscience by giving them a historical perspective and dawn of neuroscience.

**CO2:** Introduction to primitive nervous system and basic plan of vertebrate nervous system.

**CO3:** Introduction to the structural and functional features of Neuron and Glia.

**CO4:** Introduction to types of synapses, neurotransmitters and their functional localization and introduction to different electrophysiological techniques and computational neuroscience.

#### **Learning outcomes:**

The student will be able to

**LO1:** differentiate between Mind and brain, between the primitive nervous system and Cephalization in Molluscs.

**LO2:** catagorize between types of neurons, types of glia and their function in addition they will also learn about electrical properties of the neuron.

**LO3:** compare between the different types of synapse and neurotransmitters.

**LO4:** differentiate between electrophysiological techniques like Patch clamp and Voltage clamp.



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## Sophia College (Autonomous)

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**COURSE CODE: SMSLSC302**

### **PAPER –II ORGANISATION AND FUNCTIONAL MODIFICATION OF THE NERVOUS SYSTEM**

**Course Objectives:**

- CO1:** To introduce the basics of nerve and muscle physiology.
- CO2:** To introduce the basics of Neural – Immune interactions and Clinical implications of neural – immune signaling.
- CO3:** To introduce the basics of gut microbiome and nervous system.
- CO4:** To introduce the fundamentals of the tools related advanced neurogenetics and imaging techniques

**Learning outcomes:**

The students will be able to

- LO1:** interpret the mechanism of signal transmission at the neuromuscular junction and muscle contraction.
- LO2:** understand the correlation between nervous and immune system, its effect on behavior & clinical implication.
- LO3:** comprehend the effect of the gut microbiome on the nervous system and neurodegenerative diseases.
- LO4:** learn the fundamentals of advanced techniques in Neurogenetics and Imaging.

**COURSE CODE: SMSLSC303**

### **PAPER –III SYSTEMS APPROACH TO NEUROSCIENCES I**

**Course Objectives:**

- CO 1** To enable the understanding of anatomical and functional organization of the nervous system.
- CO 2** To demonstrate the comprehensive information about the structure, organizations and functional connectivity of the CNS and PNS.

**Learning outcomes:**

The student will be able to

- LO 1** categorize the autonomic and enteric nervous system and also with the integration of autonomic and endocrine functions with behavior.
- LO 2** further the implications of pathogenic diseases along with the neuroimaging techniques.



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## Sophia College (Autonomous)

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**COURSE CODE: SMSLSC304**

**PAPER -IV SYSTEMS APPROACH TO NEUROSCIENCES II**

### **Course Objectives:**

**CO1:** To introduce the students to process behind Sensory detection and encoding of neural signaling.

**CO2:** To introduce the conscious perception and awareness with respect to neural signaling processing

**CO3:** Understand Ethical, legal, social impact of imaging techniques and use of cognitive enhancers.

### **Learning outcomes:**

The student will be able to

**LO1:** delineate the process and mode of transduction of sensory stimulus, their detection, and encoding of neural signaling pathway.

**LO2:** explain structural features of muscle, transmission of nerve signal leading to muscle contraction, displacement and movement.

**LO3:** inculcate the ethical, legal, social impact of imaging techniques and use of cognitive enhancers.

## **SEMESTER IV**

**COURSE CODE: SMSLSC401**

**PAPER -I DEVELOPMENT NEUROBIOLOGY**

### **Course Objectives:**

**CO1:** To enable understanding of the various processes involved in development of a functional nervous system.

**CO2:** Introduction to disorders and genetic diseases associated with the developing brain.

**CO3:** Understand Sexual Differentiation of the Nervous System.

**CO4:** Introduction to Aging of the brain and its associated diseases.

### **Learning objectives**

The student will be able to

**LO1:** gain insights into Axis formation and Neural Induction.

**LO2:** learn about Axon guidance and synapse formation.

**LO3:** know the details of the developmental disorders and genetic diseases associated to the brain.

**LO4:** gain knowledge about role of genes and hormones in determination of physical differences and generation of sexually dimorphic behavior.



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## Sophia College (Autonomous)

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**COURSE CODE: SMSLSC402**

**PAPER -II BEHAVIOURAL NEUROBIOLOGY**

**Course Objectives:**

**CO1:** Introduce to brain and behavior.

**CO2:** Familiarize the students with Cognitive development and associated Behavioral Disorders.

**CO3:** Familiarize the students with terms related to emotions, sleep and dreams, and Consciousness.

**Learning objectives**

The student will be able to

**LO1:** develop the knowledge about the Brain and behavior, connections established between the physiology and functions of the brain to the activities.

**LO2:** inculcate the insight about the cognitive and emotional aspects of the brain.

**LO3:** learn about the diseases associated with the behavioral disorders and neurological correlates of sleep.

**COURSE CODE: SMSLSC403**

**PAPER -III BEHAVIOURAL NEUROSCIENCES II**

**Course Objectives:**

**CO 1** To classify types of learning, the processes, including information encoding, storing, and retrieval.

**CO 2** To define learning and memory processes at cellular and molecular level.

**CO 3** To demonstrate the manner of complex language processing.

**Learning objectives**

The student will be able to

**LO 1** analyze the neural pathways leading to the ability of encoding ideas into signals.

**LO 2** enable the learner to understand the theory of human decision making as the course includes an interdisciplinary topic of economics, psychology and neuroscience.

**LO 3** able to apply neuroscience to marketing, use of imaging technology and to understand consumer behavior.



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## **Sophia College (Autonomous)**

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**COURSE CODE: SMSLSC404**

**PAPER -IV MOLECULAR NEUROBIOLOGY AND DISEASE PATHOLOGY**

### **Course Objectives:**

**C01:** To familiarize students with the aspects of neuro toxicology and neuro pharmacology.

**C02:** To understand the processes behind neurodegenerative diseases of nervous system.

**C03:** To Introduce students with recent techniques in experimental neuroscience.

**C04:** To make students aware of the neuroethics and IPR related with neuroscience.

### **Learning objectives**

The student will be able to

**L01:** understand details of neurotoxicology and neuropharmacology.

**L02:** interpret pathophysiology of degenerative disease of nervous system.

**L03:** able to understand the recent techniques in experimental neuroscience.

**L04:** aware conscious about neuroethics.

**L05:** guage the importance of IPR in context to neuroscience.