Holy Cross College (Autonomous), Nagercoil

Nationally Re-Accredited with A^+ (CGPA 3.35) by NAAC (IV Cycle)

Kanyakumari District, Tamilnadu, India.

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli

Department of Zoology

POs,PSOs & COs

June to November

2021- 2022

DEPARTMENT OF ZOOLOGY

Vision

Empower the students with Academic skills, Research aptitude and Social commitment through holistic education.

Mission

1. Foster knowledge and skills through innovative teaching and instill moral and ethical values.
2. Render opportunities for critical thinking, communication and collaboration.
3. Create research ambience to promote innovations and contemporary skills relevant to local and global needs.
4. Inspire to explore the natural resources and connect with nature.
5. Promote passion to serve the local community by creating empowered women of Commitment and social consciousness through outreach and exposure programmes.
6. Facilitate life-long learning, participatory leadership and commitment to society.

Programme Educational Objectives (PEOs)

PEO - 1	The graduates will apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.
PEO - 2	The graduates will pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.
PEO - 3	The graduates will inculcate practical knowledge for developing professional empowerment and entrepreneurship and societal services.

Programme Outcomes (**POs**)

PO	Upon completion of B.Sc. Degree Programme, the graduates will be able to:
PO - 1	utilize scientific knowledge to pursue higher studies in the relevant field.
PO - 2	create innovative ideas to enhance entrepreneurial skills for economic independence.
PO - 3	face challenging competitive examinations that offer rewarding careers.
PO - 4	reflect upon green initiatives and take responsible steps to build a sustainable environment.
PO - 5	handle ethical issues with social responsibility.
PO - 6	communicate effectively and collaborate successfully with peers to become competent professionals.

Programme Specific Outcomes (PSOs)

PSO	Upon completion, B.Sc. Zoology graduates will be able to:	PO addressed
PSO - 1	gain knowledge on animal diversity and basic concepts of Taxonomy, Cell biology, Genetics, Physiology, Immunology, Microbiology, Biotechnology, Ecology, Evolution, Embryology and Applied Zoology.	PO - 1, 3
PSO - 2	perform experiments as per laboratory standards in the areas of Taxonomy, Physiology, Cell Biology, Genetics, Applied Zoology, Ecology and Toxicology, Biochemistry, Biophysics, Biostatistics, Biotechnology, Immunology, Microbiology and Evolution.	PO - 2, 3
PSO - 3	apply the biological method by formulating a hypothesis, gathering relevant data and analyzing the data to address the problem effectively.	PO - 4, 5
PSO - 4	plan their career goals and pursue higher studies in different Zoological disciplines and develop entrepreneurship skills by applying the knowledge gained from courses like Aquaculture, Sericulture, Apiculture, Poultry, Vermitechnology and Clinical Laboratory Technology.	PO - 2, 6

B.Sc. ZOOLOGY
ODD SEMESTER

Semester I **Major Core I**

Name of the course : Invertebrate Zoology

Course Code: ZC2011

No. of Hours/ Week	No. of Credits	Total Hours	Marks
4	4	60	100

Objectives

1. To know the difference between protozoa and metazoa, and to study the structure, functional organization, adaptations of invertebrates.
2. To develop the skill of identification of invertebrates and to promote employability in museum, consultancy firms and educational institutions.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	identify the fundamental principles of systematics and classify according to their characters.	PSO - 1	R
CO - 2	compare functional organization and their relationship with the environment.	PSO - 2	U
CO - 3	apply and communicate the information about Invertebrates for life - long learning.	PSO - 4	Ap
CO - 4	analyse the ecological and economic importance of invertebrates.	PSO - 3	An
CO - 5	evaluate animal diversity and initiate their career opportunities.	PSO - 2	E
CO - 6	observe, draw and synthesize information about invertebrates in laboratory and field conditions to enhance research.	PSO - 4	C

Semester I NMEC I

Name of the course : Public Health and Hygiene

Course Code: ZNM201

No. of Hours/ Week	No. of Credits	Total Hours	Marks
2	2	30	100

Objectives

1. To understand the various aspects of health and hygiene and to practice a healthy life.
2. To develop skill for personal care and maternal health for the betterment of society.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	describe personal health with respect to skin, hair, eye, ear and teeth.	PSO - 1	R
CO - 2	explain the concepts of health and nutrition in relation to physical, mental, social and spiritual fitness.	PSO - 1	U
CO - 3	analyse BMI and personal hygiene.	PSO - 3	An
CO - 4	evaluate food quality, housing standards and good sanitation.	PSO - 2	E
CO - 5	apply the knowledge of maternity, child health and Swachh Bharat Mission.	PSO - 4	Ap

Semester I Add on Course

Name of the course : Professional English for Life Sciences

Course Code: ALS201

No. of Hours/ Week	No. of Credits	Total Hours	Marks
2	2	30	100

Objectives

1. To enhance the lexical, grammatical and socio-linguistic and communicative competence in an increasingly complex, interdependent world.
2. To develop intellectual flexibility, creativity and critical thinking skills of students by offering adequate practice in professional contexts.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	recognise the words used in life science and improve their competence in using the language.	1	R
CO - 2	Comprehend unfamiliar texts and describe biological processes.	2	U
CO - 3	apply language for speaking and writing with confidence in an intelligible and acceptable manner.	3	Ap
CO - 4	apply critical and theoretical approaches to the reading and analysis of various texts in life sciences.	3	Ap
CO - 4	analyze critically, negotiate and present without committing	4	An

	errors and develop entrepreneurship skills.		

Semester II **Major Practical I**

Name of the course : Invertebrate Zoology & Chordate Zoology

Course Code: ZC20P1 (Conducted during Semester I & II)

No. of Hours/ Week	No. of Credits	Total Hours	Marks
2 + 2	2	60	100

Objectives

1. To impart practical knowledge on morphology and anatomy of invertebrates and chordates.
2. To reinforce the basic laboratory skills including microscopy, dissection and observation of animal diversity.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	identify the systematic position of selected invertebrates and chordates through observation of live and preserved specimens.	PSO - 1	R
CO - 2	describe the external morphology and biological significance of invertebrates and chordates.	PSO - 4	U
CO - 3	apply technical and creative skills through teamwork.	PSO - 3	Ap
CO - 4	analyse the different taxonomic groups based on anatomy and structural arrangements.	PSO - 2	An

Semester III **Major core III**

Name of the course : Cell Biology

Course Code: ZC2031

No. of Hours/ Week	No. of Credits	Total Hours	Marks
4	4	60	100

Objectives

1. To give a perception on the general structure and functions of cellular organelles.
2. To develop skills on microscopy and cytological techniques.

Course outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	identify the types of microscope, cell, cell organelles and cell division.	PSO - 1	R
CO - 2	outline the role of cell organelles, nucleic acid and their interactions.	PSO - 4	U
CO - 3	apply knowledge in cellular research using cytological and modern techniques.	PSO - 3	Ap
CO - 4	differentiate cell types, chromosomes, cell stages, normal and abnormal cells.	PSO - 2	An

Semester III Major Elective I (a)

Name of the course : Biochemistry, Biophysics and Biostatistics

Course Code: ZC2032

No. of Hours/ Week	No. of Credits	Total Hours	Marks
4	3	60	100

Objectives

1. To enrich the knowledge of students on the structure, classification andmetabolism of biomolecules and to learn the principle and functions of specified bio-instruments.
2. To enlighten students on the nature of life and basic methods in statistics to be used in future biological research.

Course outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	recall the structure of atoms, biomolecules, bioinstruments, and biological data.	PSO - 1	R
CO - 2	describe the interactions of biomolecules; importance of buffer systems, enzymes, light, bioinstrumentation and collection of biological data.	PSO - 2	U
CO - 3	apply basic scientific methods and analysis in the fields of biochemistry, biophysics and biostatistics.	PSO - 3	Ap
CO - 4	classify biological macromolecules, the techniques used in biological study, and analyse biological data using appropriate statistical methods.	PSO - 3	An
CO - 5	evaluate the significance of biomolecules, principle of bioinstruments, statistical concepts.	PSO - 4	E

Semester III **Allied Zoology**

Name of the course : General Zoology

Course Code: ZA2031

No. of Hours/ Week	No. of Credits	Total Hours	Marks
4	3	60	100

Objectives

1. To impart knowledge on Animal diversity, Cell Biology, Genetics, Developmental Biology, Evolution and Physiology.
2. To instill interdisciplinary skills for availing employment opportunities.

Course outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	recall the classification of animals, cells, genetic disorders in man, development of frog, structure and function of vital organs.	PSO - 1	R
CO - 2	outline the diversity of animal forms and their cellular organization, genetic makeup, evolution and physiology.	PSO - 1	U
CO - 3	correlate the physiological processes of animals and relationship of organs system, inheritance of characters.	PSO - 3	Ap
CO - 4	recognize the major functions of organ systems in the human body and the role played by animals and evolution of animal life.	PSO - 2	An
CO - 5	evaluate the characters, functions and genetics of diverse animals.	PSO - 4	E

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Semester III **Add on Course**

Name of the course : Professional English for Life Sciences

Course Code: ALS203

No. of Hours/ Week	No. of Credits	Total Hours	Marks
2	2	30	100

Objectives

1. To enhance the creative and academic writing skills and workplace communication.

2. To develop competence and competitiveness and thereby improve the employability skills and life-long learning.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	define concepts related to communicative and digital competence.	1	R
CO - 2	illustrate academic writing and creativity in digital media.	2	U
CO - 3	apply communicative skills with digital competence in the workplace.	3	Ap
CO - 4	analyse a variety of formats, including essays, research papers, reflective writing, and critical reviews of life sciences.	4	An
CO - 5	analyze lectures, scripts, blogs, e-content and short films related to biology.	4	An

Semester III & IV Major Practical II

Name of the course : Cell Biology, Biochemistry, Biophysics and Biostatistics

Course Code: ZC20P2 (Conducted during III & IV Semester)

No. of Hours/ Week	No. of Credits	Total Hours	Marks
2 + 2	2	60	100

Objectives

1. To impart practical skills in selected fields of biology.
2. To develop skills to apply the principles of biological techniques.

Course outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	Identify biomolecules, cells, chromosomes, genetic disorders and animals.	PSO - 1	**R**
CO - 2	illustrate cells and its structure, biomolecules and theprinciples of biotechniques.	PSO - 2	U
CO - 3	handle analytical instruments and biological samples.	PSO - 3	Ap
CO - 4	analyse biochemical constituents, biological sequences and disorders.	PSO - 4	An

Semester III &IV **Allied Zoology Practical**

Name of the course : General Zoology & Applied Zoology

Course code: ZA20P1 (Conducted during Semester III & IV)

No. of Hours/ Week	No. of Credits	Total Hours	Marks
2 + 2	2	60	100

Objectives

1. To develop practical skills in basic concepts of biology.
2. To enhance practical skills on agro-based animal farms.

Course outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	recognize museum specimens, stages of cleavage, vital organs, genetic diseases of human and culturable organisms.	PSO - 1	R
CO - 2	explain the economic importance of animals, clinical procedures, dominant and recessive characters of humans.	PSO - 2	U
CO - 3	use the skills relevant to general and applied Zoology.	PSO - 3	Ap
CO - 4	analyse the clinical samples, nutritive value farms products and water quality parameters.	PSO - 4	An

B.Sc. Zoology (V Semester)

For those who join in the programme from the academic year 2017-2018 onwards

Semester V **Major Core V**

Name of the course : Physiology

Course Code: ZC1751

No. of hours/week	No. of credits	Total number of hours	Marks
6	5	90	100

Learning Objectives

1. To make students understand the functional significance of the different organs and organ systems of animals.
2. To provide job opportunities in academic institutions, National Health Service Centers.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	understand the basic anatomy of digestive, respiratory, excretory, homeostatic, neuromuscular, endocrine and reproductive system.	PSO - 1	U
CO - 2	describe the functional mechanism of internal regulation by different organ systems.	PSO - 1	U; R
CO - 3	compare various organ systems and discuss the adaptations exhibited by animals.	PSO - 1	U; E
CO - 4	analyze the reason for diseases in man and other organisms.	PSO - 8	U; An
CO - 5	use anatomical knowledge to predict physiological consequences.	PSO - 8	Ap; C; An

Semester V — Major Core VI

Name of the course : Developmental Zoology

Course Code: ZC1752

No. of hours/week	No. of credits	Total number of hours	Marks
6	5	90	100

Learning Objectives

1. To understand the sequential changes from cellular grade of organization toorgan grade of organization in the development of multicellular organisms.
2. To pursue a wide range of career related to women's health and also in fields concerned with maternal and reproductive medicine.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	explain gametogenesis, fertilization and parthenogenesis.	PSO - 2	U
CO - 2	describe cleavage, morphogenetic movements and gastrulation.	PSO - 2	R
CO - 3	acquire knowledge on Organizer, gradient system foetal membranes and placentation in mammals	PSO - 6	U
CO - 4	demonstrate metamorphosis and regeneration	PSO - 2	R
CO - 5	discuss Nuclear cytoplasmic interaction, assisted reproductive technology and birth control measures.	PSO - 8	R

Semester V **Major Core VII**

Name of the course : Ecology and Toxicology

Course Code: ZC1753

No. of hours/ week	No. of credits	Total number of hours	Marks
5	4	75	100

Learning Objectives

1. To provide the opportunity for students to develop a deep understanding of various aspects of the environment and apply that knowledge to current environmental issues and for wise environmental management.
2. To seek employment in Food and Drug Administration agency and Environmental Protection Agency.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	discuss the abiotic and biotic factors of the natural ecosystem.	PSO - 1	U
CO - 2	identify the natural resources and its conservation.	PSO - 2	R
CO - 3	critically evaluate the environmental degradation and suggest measures for remediation.	PSO - 3	Ap; E
CO - 4	identify hazardous environmental factors and assess their effects.	PSO - 7	Ap; An
CO - 5	utilize scientific literature and database to effectively communicate aspects of toxicology.	PSO - 5	Ap

Semester V **Major Elective III – (b)**

Name of the course : Sericulture

Course Code: ZC1755

No. of hours/week	No. of credits	Total number of hours	Marks
5	5	75	100

Learning Objectives

1. To develop skills in sericulture in order to enable the students to adopt it as a vocation after their graduation as it is rural based and welfare-oriented agro based industry.
2. To develop entrepreneurial way of thinking that will allow them to identify and create business opportunities that may be commercialized successfully.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	explain the cultivation and maintenance of mulberry plantation.	PSO - 5	U
CO - 2	identify the diseases and pests of mulberry plant and silk worm.	PSO - 8	R
CO - 3	rear silkworms and gain knowledge on silk reeling.	PSO - 8	Ap
CO - 4	evaluate the quality of cocoon and marketing.	PSO - 9	An; E
CO - 5	acquire skills necessary for self-employment in sericulture.	PSO - 5	Ap; C

Semester V **Major Practical V**

Name of the course : Physiology and Developmental Zoology

Course Code: ZC17P5

No. of hours/week	No. of credits	Total number of hours	Marks
4	2	60	100

Learning Objectives

1. To understand the basic principles of physiology and report experimental data.
2. To identify the stages of embryonic development and the structures in the temporary and permanent preparations.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	explain the effect of abiotic factors on physiological process.	PSO - 3	Ap
CO - 2	describe the principles of analytical instruments and its uses in physiology.	PSO - 4	An; Ap

CO - 3	perform scientific mode of thinking; planning experiments, analyzing and evaluating data skills as scientific laboratory reports.	PSO - 6	Ap; An
CO - 4	develop methodological approach to embryonic development.	PSO - 7	An
CO - 5	identify instruments, tissues, embryonic structures in preparations, photographs and diagrams.	PSO - 8	R; An

Semester VI **Major Practical VI**

Name of the course : Ecology and Toxicology & Evolutionary Biology

Course Code: ZC17P6 (Conducted during Semester V & VI)

No. of hours/week	No. of credits	Total number of hours	Marks
4	2	60	100

Learning Objectives

1. To investigate the relationship between the organisms and their environment.
2. To know the phylogenetic relations of the animal phyla and their traits in understanding the evolutionary relationship.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	analyse the quality of water samples.	PSO - 3	Ap; An
CO - 2	examine and identify the zooplanktons.	PSO - 1	Ap
CO - 3	assess the evolutionary concepts through experiments.	PSO - 4	E
CO - 4	study the natural ecosystem and report.	PSO - 7	C; Ap

B.Sc. ZOOLOGY
EVEN SEMESTER

Semester : II **Major Core II**
Name of the Course : Chordate Zoology
Course code : ZC2021

No. of hours/week	No. of credits	Total number of hours	Marks
4	4	60	100

Learning Objectives

1. To impart knowledge on the systematic position, structure, functional organization, adaptation and the economic importance of chordates.
2. To develop real time skills on identification of major groups of chordates to gain employment in academic and research institutions.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	identify the systematic position and describe the biological significance of chordates.	PSO - 1	R
CO - 2	recognize different chordates based on their salient features.	PSO - 1	U
CO - 3	compare the morphology and anatomy of selected chordates.	PSO - 3	An

CO - 4	assess the structural, physiological, ecological and behavioural adaptations pertaining to their mode of life.	PSO - 2	E
CO - 5	design experiments to relate chordates with their environment.	PSO - 2	C
CO - 6	disseminate knowledge on chordates to excel in research and entrepreneurship initiatives.	PSO - 4	Ap

Semester : II **Major Practical II**
Name of the Course : Chordate Zoology
Course code : ZC20P2

No. of hours/week	No. of credits	Total number of hours	Marks
2	2	30	50

Learning Objectives

1. To recognize and describe the morphology and anatomy of the chordates.
2. To create interest in chordate biodiversity through animal album and bird Watcher's diary.

Course Outcome

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	identify the Systematic position of selected chordate specimens.	PSO - 2	R
CO - 2	describe the external morphology and biological significance of chordate specimens.	PSO - 1	U
CO - 3	acquire cognitive, technical and creative skills through team work.	PSO - 2	Ap
CO - 4	analyse the anatomy and structural arrangements in selected chordate animals.	PSO - 3	An

Semester : II **NMEC II**
Name of the Course: Common Ailments and Simple Remedies
Course Code : ZNM202

No. of Hours/Week	Credits	Total No. of Hours	Marks
4	2	60	100

Learning Objectives

1. To create awareness on the changing life style and its impact on human health.
2. To develop skills on disease management to form a healthy society.

Course Outcomes

COs	Upon completion of this course the students will be able to:	PSO Addressed	CL
CO - 1	enumerate the symptoms of common diseases.	**PSO - 1**	**R**
CO - 2	summarise common health problems like anaemia, heart diseases, diabetes, skin and dental problems and old age ailments.	**PSO - 1**	**U**
CO - 3	apply preventive strategies to develop healthy society.	**PSO - 3**	**Ap**
CO - 4	analyse the problems of changing life style and its impact on human health.	**PSO - 3**	**An**
CO - 5	evaluate the simple remedies for common ailments.	**PSO - 3**	**E**

Semester IV — Major Core IV

Name of the course : Genetics

Course Code: ZC2041

No. of Hours/ Week	No. of Credits	Total Hours	Marks
4	4	60	100

Objectives

1. To enable the students to understand the basic principles of inheritance and population genetics.
2. To enhance skills to interpret hereditary, mutation and syndromes and extend genetic counseling to society.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	recall the key concepts of heredity, population genetics, karyotyping and genetic counselling.	PSO - 1	R
CO - 2	describe Mendelian, polygenic and cytoplasmic inheritance, chromosome mapping, nondisjunction, gene frequency and eugenics.	PSO - 1	U
CO - 3	apply the principles of heredity to real life situations.	PSO - 2	Ap
CO - 4	execute and analyze the results of genetic experimentation in animal and plant models.	PSO - 3	An
CO - 5	evaluate the genetic data of a population.	PSO - 4	E

Semester : IV Major Practical III
Name of the course : Genetics, Biostatistics and Computer Applications
Sub. Code : ZC20P2

No. of hours/week	No. of credits	Total number of hours	Marks
2	2	30	100

Learning Objectives

1. To learn and practice the basic principles of inheritance in a firsthand manner.
2. To train the students learn and perform experiments, collect data, analyze the data, learn to interpret the data and draw conclusion from it.

Course Outcome

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Demonstrate Mendelian genetic principles in a controlled experimental set up.	PSO - 2	R
CO - 2	Identify the own Blood group.	PSO - 3	Ap
CO - 3	Perform experiments with the model organism, *Drosophila*.	PSO - 3	An
CO - 4	Design experiments, collect, analyze, interpret the data statistically and draw conclusion.	PSO - 3	Ap
CO - 5	Use computing skill for typing text.	PSO - 3; PSO - 5	Ap

Semester IV Major Elective II: (a)
Name of the course: Clinical Laboratory Technology

Course Code: ZC2042

No. of Hours/ Week	No. of Credits	Total Hours	Marks
4	3	60	100

Objectives

1. To impart knowledge on the laboratory techniques adopted in clinical laboratories.
2. To develop skills for gaining employability in hospitals and research laboratories.

Course outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	describe the laboratory principles applied in diagnosis of disease.	PSO - 1	R
CO - 2	classify the clinical specimens and use appropriate laboratory protocol.	PSO - 2	U
CO - 3	prepare reagents, handle instruments, perform clinical analysis and validate the results.	PSO - 3	Ap
CO - 4	develop skills necessary for higher studies or placement in clinical laboratories.	PSO - 4	An

Semester IV Major Practical II

Name of the course : Major Core & Electives III & IV Semester

Course Code: ZC20P2 (Conducted during III & IV Semester)

No. of Hours/ Week	No. of Credits	Total Hours	Marks
2 + 2	2	60	100

Objectives

1. To impart practical skills in selected fields of biology.
2. To develop skills to apply the principles of biological techniques.

Course outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	Identify biomolecules, cells, chromosomes, genetic disorders and animals.	PSO - 1	**R**
CO - 2	illustrate cells and its structure, biomolecules and theprinciples of biotechniques.	PSO - 2	U
CO - 3	handle analytical instruments and biological samples.	PSO - 3	Ap

CO - 4	analyse biochemical constituents, biological sequences and disorders.	PSO - 4	An

Semester VIII **: VI** **Major Core**

Name of the Course **: Biotechnology**

Course code **: ZC1761**

No. of hours/ week	No. of credits	Total number of hours	Marks
6	5	90	100

Learning Objectives

1. To learn the basic concepts of biotechnology and understand the various techniques pertaining to biotechnology.
2. To get employability in biotech industries.

Course Outcome

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	acquire knowledge of basic concepts of biotechnology and central dogma.	PSO - 3	U
CO - 2	discuss the rDNA technology, DNA library, hybridoma technology, animal cell and tissue culture and gene therapy.	PSO - 4	U
CO - 3	decide and apply appropriate tools and techniques in biotechnological manipulation.	PSO - 6	Ap; An
CO - 4	explain the general principles of generating transgenic plants, animals and application of microbes pharmaceutical products.	PSO - 6	Ap
CO - 5	undertake any responsibility as an individual and as a team in a multidisciplinary environment for landing in a job.	PSO - 8	Ap

Semester IX **: VI** **Major Core**

Name of the Course : Immunology and Microbiology
Course code : ZC1762

No. of hours/week	No. of credits	Total number of hours	Marks
6	5	90	100

Learning Objective

1. To enable the students to become aware of the microbes around us and also to know about the processes involved in the elimination of invading microbes by the defense system of our body.
2. To provide proficiency in basic microbiological and immunological skills.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	identify the major components of the immune system at organ and cellular level.	PSO - 1	R
CO - 2	discuss the types of immune response and mechanisms to eliminate antigens.	PSO - 1	U
CO - 3	culture and identify the microorganisms based on morphological and staining techniques.	PSO - 3	Ap
CO - 4	apply knowledge of microorganisms on common pathological diseases.	PSO - 5	R; Ap
CO - 5	develop skills to monitor and maintain food safety.	PSO - 4	Ap
CO - 6	design analytical and experimental tasks involving microbiology and immunology.	PSO - 3	Ap; An

Semester : VI
Practicals
Name of the Course: Biotechnology, Immunology and Microbiology
Course code : ZC17P7

No. of hours/week	No. of credits	Total number of hours	Marks
4	4	60	100

Learning Objectives

1. To familiarize the students with various immunological and microbiological techniques.

2. To implement experimental protocols and adapt them to carry out using biotechnological techniques.

Course Outcome

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	Isolate genomic DNA	PSO - 3	Ap
CO - 2	Perform quanitative, immunological and microbiological analysis.	PSO - 6	Ap U
CO - 3	Differentiate Gram positive and negative bacteria.	PSO - 3	Ap; An
CO - 4	Identify lymphoid organs in vertebrate model.	PSO - 4	R
CO - 5	Develop skills needed for future research in immunology, microbiology and biotechnology.	PSO - 6	Ap