POST GRADUATE AND RESEARCH DEPARTMENT OF ZOOLOGY

B.Sc. ZOOLOGY
SYLLABUS

Choice Based Credit System

(For those who join in June 2015 and after)
ABOUT THE COLLEGE

Vivekananda College was started by Founder-President Swami Chidbhanandaji Maharaj of Sri Ramakrishna Tapovanam, Tirupparaimur, Trichy in 1971 on the banks of the river Vaigai which is blissfully free from the noise and hurry, the crowds and distraction of the city.

Vivekananda College is a residential college functioning under Gurukula pattern. It is Man-making education that is imparted in this institution, Culture, character and curriculum are the three facets of ideal education that make man a better man. This is possible only when the teacher and taught live together, The Gurukula system of training is therefore a humble and systematic attempt in reviving the age old GURUGRIHAVASA for wholesome education, Attention to physical culture, devotion to duty, obedience to teachers, hospitality to guests, zest for life, love for the nation, and above all, humility and faith in the presence of God etc. are the values sought to be inculcated. All steps are taken to ensure the required atmosphere for the ideal life training.

Vivekananda College, Tiruvedakam West, Madurai District-625 234 is an aided college established in 1971 and offers UG and PG courses. This College is affiliated to the Madurai Kamaraj University, Madurai. The College was reaccredited with ‘A’ grade (CGPA 3.59 out of 4.00) by NAAC in September 2015. The college was awarded College with Potential for Excellence by UGC in 2016.

VISION AND MISSION

Our Vision: To raise an army of neo-graduates steeped in the hoary culture of the motherland and dedicated to serving her as potential leaders in the manifold spheres of national effort.

Our Mission: A harmonious enrichment of physical, emotional and intellectual facets of a student’s personality to bring out his inherent PERFECTION.

OBJECTIVES OF THE INSTITUTION

1. To inculcate spiritual, ethical, moral and social values in all disciplines of study.
2. Simultaneous education of the Hand, Heart and Head. Only a sound body can hold a sound mind.
3. Provide opportunities for all round development of the students and excellence in higher education, research and extension in different disciplines.
4. Disseminate the findings of research to the community to facilitate its development.
5. To provide society citizens of sterling character.
6. To cater to the needs of the educationally backward people – the most backward, scheduled caste and tribe.
GURUKULA ADMINISTRATIVE SET UP

Secretary                  Swami Niyamananda Maharaj
Principal                  Dr. B. Ramamoorthy
Vice-Principal & NAAC Coordinator  Dr. S. Raja
Dean & Controller of Examinations  Dr. E. Jayakumar
IQAC Coordinator           Dr. S. Raja
IGNOU Coordinator          Sri. V. Parthasarathy
ICT Coordinator            Dr. N. Nagendran
Grievence Cell Coordinator  Dr. T. Kaliappan
Sessional Examination

I Eligibility for Admission

Admission to B.Sc. – Zoology Programme is open to candidates with +2 pass with Maths, Physics, Chemistry, Biology, Botany and Zoology as major subjects.

For B.Sc. - Zoology course offered in the college, a pass in the Higher Secondary Examination conducted by the Government of Tamil Nadu or an examination accepted as equivalent there to by the Syndicate of the MKU, subject to such conditions as may be prescribed therefore.

II Duration

The course is for a period of three years. Each academic year shall comprise of two semesters viz. Odd and Even semesters. Odd semesters shall be from June to November and Even Semesters shall be from December to April. There shall be not less than 90 working days which shall comprise 450 teaching clock hours for each semester (Exclusive of the days for the conduct of university end-semester examinations) for each semester.

III CBCS System

All Programmes offered in the college are run on Choice Based Credit System (CBCS). It is an instructional package developed to suit the needs of students to keep pace with developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education.

IV Semesters:

An academic year is divided into two semesters. In each semester, courses are offered in 15 teaching weeks. Each week has 30 working hours spread over 6 days a week.

V Credits:

The term 'Credit' refers to the weightage given to a course, usually in relation to the instructional hours assigned to it. The total minimum credits, required for completing the B.Sc., Programme is 140. The details of credits for individual components and individual courses are given in the above table.
VI Course:
Each Course is to be designed variously under lectures / laboratory / seminar / practical training / assignments to meet effective teaching and learning needs.

VII Examinations:
i). There shall be examinations at the end of each semester, for odd semesters in the month of October / November; for even semesters in April / May. A candidate who does not pass the examination in any course(s) shall be permitted to appear in such failed course(s) in the subsequent examinations to be held in October / November or April / May.

ii). A candidate should get registered for the first semester examination. If registration is not possible owing to shortage of attendance beyond condonation limit / regulations prescribed or belated joining or on medical grounds, the candidates are permitted to move to the next semester. Such candidates shall re-do the missed semester after the completion of the programme.

VIII Condonation
Students must have 75% of attendance in each paper for appearing the examination. Students who have 65% to 74% of attendance shall apply for condonation in the prescribed form with the prescribed fee. Students who have 50% to 64% of attendance shall apply for condonation in prescribed form with the prescribed fee along with the Medical Certificate. Students who have below 50% of attendance are not eligible to appear for the examination. They shall compensate the shortage after the completion of the programme.

IX Question Paper Pattern
Time: 3 Hours
Maximum Marks: 75

SECTION-A (10 X 1 =10 Marks)
Answer All Questions
(1-5) Multiple Choice
(6-10) Short Answer Questions
Two questions from each unit

SECTION-B (5 X 7 = 35 Marks)
Answer All Questions
(11-15) Questions shall be in the format of either (a) or (b)
One question from each unit

SECTION-C (3 X 10 = 30 Marks)
Answer any THREE Questions
(16-20) One question from each unit.

X Evaluation:
Performances of the students are evaluated objectively. Evaluation is done both internally and externally. They will be assessed continuously through Internal Assessment System and finally through summative (end) semester examination. To assess internally, there will be three examinations conducted centrally with duration of two hours for each paper. In addition to continuous evaluation, the summative semester examination, which will be a written examination of three hours duration, would also
form an integral component of the evaluation. The ratio of marks to be allotted to continuous internal assessment and to end semester examination is 25: 75.

The pattern of internal valuation shall be:
- Test: 20 Marks (the average of best two tests out of three tests)
- Assignment: 5 marks
- Total: 25 marks.

In respect of practical papers, the ratio of marks to be allotted to internal assessment and to summative (end) semester examination is 40: 60. The internal marks will be calculated on the basis of marks secured at the model examination and marks awarded for the preparation of practical note book. The external marks will be calculated on the basis of the marks awarded by the internal examiner and the external examiner at the summative semester examination.

**XI Passing Minimum:**
There is no passing minimum for Internal Assessment. The passing minimum for external Examinations shall be 27 out of 75 marks and passing minimum for a paper is 40%.

**XII Classification of Students:**
Candidates who have secured not less than 40% of marks in each paper shall be declared to have passed in that paper. Candidates who obtain 40% and above but below 50% shall be declared to have passed in Third Class. Candidates who obtain 50% and above but below 60% of the aggregate marks in Part-III shall be declared to have passed in Second Class and those who obtain 60% of marks and above shall be placed in the First Class. Candidates who obtain 75% and above shall be declared to have passed in Distinction provided he has not re-appeared for any paper during the course of the study.

**XIII Failed Candidates:**
A candidate who has arrears in any paper in a semester examination will be permitted to proceed to the next semester classes. A candidate who has arrears may appear again in these failed papers at the November/April examinations. The internal assessment marks already obtained by him shall be carried over for the subsequent appearance also.

**XIV Improvement of Internal Marks:**
The student desirous of improving the internal assessment marks may request the Head of the Department. After obtaining permission from the Staff Council Meeting by the Head, the student may write improvement examinations in consultation with the course teacher. The marks obtained (when it is more than the previous marks) will be submitted to the Controller of Examinations for further adoption.

**XV Study Tour**
Students are expected to participate in the field visit and the study tours organized by the department. Though study tour/field trip carries no credit, it is compulsory for the students to attend whereby the students can get an opportunity to gain practical knowledge. As such, observational visit to selected social welfare organizations, industries, trade centres, exhibitions, places of historical importance and the like will be considered as extra-curricular activities.

**XVI Extra Credits:**
Extra 2 credits will be awarded to the final year Zoology Major Students for mini project on Voluntary basis at the VI Semester

**Post Graduate and Research Department of Zoology**

The Department of Zoology, Institutional Member of International Society for Zoological Sciences (ISZS), Beijing, China since 2009 was started on 21st June 1971 to teach biology for pre-university students. **B.Sc. Zoology Degree course** was started during the academic year 1973 – 74 and **M.Sc. Zoology Post-graduate course** in the year 1987 – 1988 and **M.Phil. Course** in 2007 – 2008. In the year 2009 the Madurai Kamaraj University recognized the Department as Research Center in Zoology for pursuing PhD. B.Sc. Zoology and M.Sc. Zoology are renamed and the syllabus is modified in tune with the syllabus proposed by the Tamil Nadu State Higher Education during the year 2008-2009. The change in name was approved by the committee formed by Madurai Kamaraj University. Now the Department has collaborations and academic interactions with industries, national and international universities/institutes. The Department had the unique distinction of having eminent teachers ever since its inception. Prof. A. Mani, Dr. R. Sugumaran, Prof K. Chandran and Prof. S. Srinivasan have served as the Heads of the Department from 1974-2012. In tune with the legacy, at present the Department has an exceptional feature of having well experienced teachers with high teaching potential. Now there are nine faculty members headed by Dr.P.Rajendran, among whom five have obtained their doctoral titles and others are pursuing their research work for their doctoral degree.

**Vision**
- Unravel hidden research potentials & Entrepreneurial avenues in Zoology
- Bring a behavioral change in subject knowledge, scientific aptitude and instrumental skills to attract students with best caliber
- Raise students to international standards

**Mission**
- Strategic plans for translating goals and objectives by curriculum design, good teaching methods and evaluation
- Academic and research collaborations
- Bio track-A forum to update knowledge
- Hands on training at Bio industries

**Objectives**
- Motivate scientific aptitude and skill development to pursue higher studies with excellence in research
- Bio-based industrial hands on training to develop entrepreneurial skills for self-employment
- Dissemination of research findings and cater the needs of the society

**Department Highlights**
- Academic and research collaborations with **International Universities**
- HOD of Zoology **Dr.P.Rajendran** - Joint Secretary of **International Shalihotra Committe** affiliated and recognized by International Bourgelat Committee, **France-2014**
Department accreditation - VetAgro Sup Campus Vétérinaire, 1, avenue Bourgelat, 69280 Marcy l’Étoile, France for the World Veterinary Year Celebrations 2011

Corporate member - International Society of Zoological Sciences (ISZS), China-2009

Research project with Ryukyus University, Okinawa, Japan - 2006-07

The Department of Biotechnology, New Delhi and Tamil Nadu State Council for Science and Technology have recognized the department to conduct Research Projects

The Indian Academy of Sciences, Bangalore, Indian National Science Academy, New Delhi and the National Academy of Sciences, Allahabad, had conducted Lecture- workshop for Academicians, Students and Research Scholars.-2008

UGC sponsored Refresher course on Rural Biotechnology besides organizing many Symposia/ Workshop at the regional level every year.

The Madurai Kamaraj, Karpagam, Bharathiar, Mother Theresa and the Manonmaniam Sundaranar Universities have recognized the department to conduct Research programmes under the guidance of the faculties.

The principal areas of research- Sericulture, Vermiculture, Microbial bioremediation, Biodiversity, Toxicology and Bio-control of Insect pests.

More than 50 Research Papers in reputed National and International journals. Written books in Microbiology, Microbial bioremediation, Biophysics, Biochemistry and Research Methodology in leading National publishing companies.

International Science organization Science Advisory Board, Wilson Boulevard, Suite 250. Arlington, VA 22201 and National organization, ENVIS, Madras University has recognized our faculties as their members.

Our faculties are recognized as International and National resource persons in their respective fields.

The Tamil Nadu State Government has recognized the faculties of the Department by conferring State Government Award.

Under Graduate and Post Graduate students of the Department have received Best Paper Presentation Award for Scientific Paper presentations in National Seminars.

Faculties have received several awards from recognized scientific bodies and organizations.
## SCHEME OF EXAMINATION
(For those who join in June 2015 and After)

### FIRST SEMESTER

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Total Number of Hours : 180  
Total Number of Credits : 140
FACULTY MEMBERS

Dr. P. RAJENDRAN, M.Sc., M.Phil., Ph.D.,
Head, Associate Professor of Zoology

Dr. M. SHUNMUGAVELU, M.Sc., M.Phil., Ph.D., FAZ., FZSI., FRES(London)
Associate Professor of Zoology

Dr. E. JAYAKUMAR, M.Sc., Ph.D.,
Associate Professor of Zoology

Sri V. PARTHASARATHY, M.Sc., M.Phil., M.A., B.L.,
Associate Professor of Zoology

Dr. G. PONRAJ, M.Sc., M.Phil., Ph.D.,
Associate Professor of Zoology

Sri R. MUTHUPPANDI, M.Sc., M.Phil., (Ph.D. Under FDP)
Assistant Professor of Zoology

Dr. K. RAMESH KUMAR, M.Sc., M.Phil., B.Ed., Ph.D.,
Assistant professor of Zoology

Dr. M. PAVUNRAJ, M.Sc., M.Sc., (Med.Sociol), Ph.D.,
Assistant professor of Zoology

Dr. T. RAMESH, M.Sc., M.Phil., B.Ed., Ph.D.,
Assistant professor of Zoology

Sri K. KAMATCHI, M.Sc., M.Phil.,
Assistant professor of Zoology
SEMESTER – I
(For those who Join in June 2015 and after)

<table>
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Objectives

To enable the students

- Acquire knowledge on general characteristics and classification of Invertebrates
- Study organization of various organs and organ systems

UNIT I: Phylum Protozoa
General characters of the phylum and classification up to class level
Type study : Paramecium
General topics : a) Locomotion in protozoa b) Nutrition in protozoa
c) Etiology and life cycle of protozoan parasites of man (Entamoeba, Plasmodium and Trypanosoma)

UNIT II: Phylum Porifera
General characters of the phylum and classification up to class level
Type study : Ascon sponge
General topics : a) Canal system in sponges b) Spicules of sponges.
c) Reproduction in sponges

UNIT III: Phylum-Coelenterata
General characters of the phylum and classification up to class level
Type study : Obelia
General topics : a) Polymorphism in hydrozoa b) Coral reefs
c) Ctenophora structure and affinities

UNIT IV: Phylum Platyhelminthes
General characters of the phylum and classification up to class level.
Type study : Fasciola hepatica
General topics : a) Origin of metazoa b) Origin of bilateria

UNIT V: Phylum Aschelminthes
General characters of the phylum and classification up to class level
Type study : Ascaris
General Topics : a) Helminthes parasites - Enterobius and
Wucheraria - Disease and control
b) Parasites adaptations in Helminthes.
Text Book

References:
SEMESTER – I
(For those who Join in June 2015 and After)

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Objectives
To enable the students

- Understand basic aspects of invertebrate biology with their salient features
- Study of animal organization, comparative anatomy and functional morphology

UNIT I: Phylum Annelida
General characters and classification up to class level with examples.
Type study : *Nereis*
General topics : a) Origin of coelom and metamerism
                b) Adaptive radiation in polychaetes

UNIT II: Phylum Arthropoda
General characters and classification up to class level with examples.
Type study : Prawn
General topics : a) Peripatus - structure and affinities
                b) Larval forms of crustacea.

UNIT III
External characters of Scorpion, Centipedes and Millipedes
General topics : a) Social Life of Insects
                b) Economic Importance of Insects

UNIT IV: Phylum Mollusca
General characters and classification upto class level with examples
Type study : *Pila*
General topics : a) Torsion in gastropods
                b) Cephalopods as advanced Molluscs

UNIT V Phylum Echinodermata
General characters and classification up to class level with examples.
Type of study : Star fish

Text Book
Reference

SEMESTER – I  
(For those who join in June 2015 and after)

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Objectives:  
To enable the students
- To become familiar in to the basic Principles Of Titrimetry
- To gain basic knowledge about Organic basic principles
- To have gain the basic concept of intermediates
- To be familiar with catalysis

UNIT I: GENERAL PRINCIPLES OF TITRIMETRY  
12 Hrs


UNIT II: ORGANIC BASIC PRINCIPLES I  
12 Hrs


UNIT III: ORGANIC BASIC PRINCIPLES II  
12 Hrs


UNIT IV: ORGANIC INTERMEDIATES  
12 Hrs


UNIT V: CATALYSIS AND PHOTOCHEMISTRY  
12 Hrs


TEXT BOOK

- Ancillary chemistry Dr. K.Ratinamuthu (Study material will be provided) Semester – I & II.

REFERENCE

SEMESTER – I
(For those who Join in June 2015 and After)

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2hrs/week-30 hrs

Objectives

To enable the students
- Study of various human tissues and skeletal systems
- Understand structure and functions of selected organs and organ systems

Unit –I

Types of Tissues, Exoskeleton – Skin and hair
Endoskeleton- Skull, fore limb and hind limb

Unit –II

Structure of Tooth and alimentary canal
Structure of Kidney and Nephron

Unit-III

Structure of lungs
Structure of heart, blood and blood groups

Unit-IV

Structure of brain
Structure of eye and ear

Unit-V

Endocrine glands and their secretions
Male and female reproductive system

Text book

Reference Book:
Objectives:

To enable the students

- Acquire knowledge on general features, classification and evolution of chordates.
- Study of organs and organ systems to understand their functional aspects

Unit I: Protochordata

General characters and classification with examples – Amphioxus - Detailed study, General characters of Balanoglossus and Ascidian. Affinities of Balanoglossus, Retrogressive Metamorphosis in Ascidian

Unit II: Vertebrata

General characters and classification upto classes with examples Agnatha – salient features of Petromyzon. External characters of Scoliodon, Frog, Calotes, Pigeon and Rabbit

Unit III:

Comparative anatomy in Vertebrates - Integumentary system, Digestive system and Respiratory system

UNIT IV

Comparative anatomy in Vertebrates - Circulatory system, Nervous system and Receptor organs

Unit V

Endoskeleton (Frog only) and Endocrine glands
Comparative anatomy of Urinogenital system

Text Book


References

- Harvey Pough F., Heifer, J.B. and McFarland, W.N. 1985 Vertebrate life,
Objectives

To enable the students

- Basic understanding and the study of salient features
- Origin, organization, comparative anatomy and trace the evolution

UNIT I

Origin and Phylogeny of Vertebrates, Amphibia, Reptilia and Birds

UNIT II

Parental care in fishes, Migration in fishes and Accessory respiratory organs in fishes

UNIT III

Parental care in Amphibia, Neoteny in Amphibia and Poisonous and non-poisonous snakes of South India

UNIT-IV

Flight adaptation and mechanism of flight in birds, Migration in birds and Flightless birds

UNIT V

Prototherians, Metatherians and Eutherians, Dentition in mammals, Aquatic mammals and Origin of mammals.

Text Book


Reference books

- Kotpal, R.L. 2011, Vertebrates, Rastogi Publications
SEMESTER – II
(For those who join in June 2015 and After)

Part – III : Core Subject Practical -I

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**SEMESTER– I - INVERTEBRATES**

**Objectives**

To enable the students

- Visualize and assimilate morphological and anatomical features by
  dissection demonstration, preserved specimens, charts and models
- Observe animals at their habitat & understand their biodiversity

**A. Demonstration**

Cockroach- Dissection - Digestive system, Nervous systems & Reproductive system
  - Mounting - Mouth parts and Salivary glands

Earthworm-Dissection - Digestive and Nervous systems
  - Mounting - Body setae and Penial setae

House fly- Mounting - Mouthparts

**B. Chart/Models**

- Pila - Digestive system and Nervous system
- Freshwater mussel - Digestive system

**C. Spotters**

- Protozoa: *Amoeba, Plasmodium, Paramecium* – Entire and conjugation.
- Porifera: Gemmules and Spicules.
- Nematoda: *Ascaris* – Male and Female.
- Annelida: *Nereis*, Leech.
- Arthropoda: *Zoan, Nauplius*, Millipede and Centipede
- Echinodermata: Starfish, Sea urchin, Sea cucumber.

**D. Field Visit:** Observation and identification of insect pests of agricultural crops.
  Visit to Vermifarm and observación of Earthworm species Visit to Apiary
SEMESTER
R – II - CHORDATES

Objectives

To enable the students

➢ Visualize and assimilate morphological and anatomical features by
dissection demonstration, preserved specimens, charts and models
➢ Field trip to observe animals at their habitat & understand their
biodiversity

A. Dissection and mounting

Fish – Dissection and observation of visceral organs
Shark- Mounting of Placoid scales

B. Chart/Models

Frog - Arterial system and Venous system, brain and spinal nerves

C. Spotters

Amphioxus, Balanoglossus, Ascidian, Petromyzon
Narcine, Anabas, Echines, Hippocampus, Eel
Rhacophorus and Alytes
Krait, Cobra, Viper, Typhlops, Enhydrina, Draco and Chaemeleon
Beaks and feet in birds, Ant eater and Bat
Osteology of Rabbit – Skull, Typical Vertebra, Pectoral and pelvic girdle – Fore
limb and Hind limb

D. Field visit: Rameshwaram, Kurusadai Island & Mandapam - Biodiversity study
of marine animals.

I YEAR UG SUMMATIVE PRACTICAL EXAMINATION
QUESTION PAPER PATTERN
Practical – 1 Invertebrates & Chordates (09CP23)

Time: 4 hrs Maximum Marks: 60

1. Major Practical – 1 15
2. Minor Practical – 2 (10 x 2) 20
3. Spotters (5 x 3) 15
4. Record 10
Total                      60

SEMESTER – II
(For those who join in June 2015 and after)

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Objectives:
To enable the students
  ❖ To learn the basic Principles Of Titrimetry
  ❖ To gain basic knowledge about pesticides
  ❖ To have gain the basic concept of amino acids
  ❖ To be basic concept of chemical bonding
  ❖ To know about the pollution and the effect.

UNIT I: ACIDS AND BASES 12 Hrs

UNITII: PESTICIDES, AND FUNGICIDES 12 Hrs

UNITIII: AMINOACIDS, PROTEINS AND VITAMINS 12 Hrs
2. Vitamins Classification and biological functions of vitamins A, B6, B12, C, D, E and K(Structural elucidation not required).

UNIT IV: CHEMICAL BONDING 12 Hrs

UNIT V: POLLUTIONS 12 Hrs
Air pollution: Definition – Composition of air – Chemical reactions occurring in air due to sunlight– Sources of air pollution – Classification and effects of air pollutants – Effects of CFC – Ozone layer- Green house effect.

**TEXT BOOK:**

- Ancillary chemistry K.Ratinamuthu (Study material will be provided)

**REFERENCE**

SEMESTER – II
(For those who join in June 2015 and after)

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2hrs/week- 30 hrs

Objectives

To enable the students
- Reveal the types, source and importance of nutrients
- Expose disorders of malnutrition and food born diseases

Unit-I Food as a source of nutrients
Definition- functions of food- recommended daily allowances for nutrients-nutritive value of foods- Balanced diet.

Unit-II Nutrients
Carbohydrates, Proteins Fats, Minerals and Vitamins.

Unit-III Disorders of Malnutrition

Unit-IV Food sanitation and Hygiene
Water- Food- food spoilage- Preservation- Control of Insects and Rodents

Unit-V Food Borne Diseases
Food poisoning-Poisoning organisms – Bacteria, Mold and Yeast.

Text book
Part – III : Core Subject  Theory

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Objectives

To enable the students

- Basic idea about animal cell, composition, organelles and their functions
- Introduction of microscopy and cytological methods

Unit – I


Unit- II


Unit- III


Unit- IV


Unit- V

Nucleic Acids: Molecular Structure of DNA & RNA – Types of RNA & DNA replication, Role of RNA and ribosome in protein synthesis, Regulation of protein synthesis (Lac Operon).

Text book


Reference Books

Objectives

To enable the students

- Mendelian concepts, application and modes of inheritance
- Interaction of genes and molecular events for chromosomal mapping

UNIT-I

a) Historical ideas- Mendel’s work- Mendel’s laws of inheritance- Mendelian ratio- Test cross- Back cross- Pleiotropism- Penetrance and expressivity.
b) Non-allelic interactions- Complementary genes and Epistasis
c) Supplementary genes, Duplicate genes, Collaborator genes and Lethal genes.

UNIT-II

a) Definition- Mode of inheritance of Kernel colour in Wheat and Skin colour in Man- Difference between Polygenic and Mendelian inheritance; Multiple allele
b) Definition- Mode of inheritance of Coat colour in Rabbit and ABO-blood groups in Man- Problems relating to inheritance of ABO-blood groups - Genetics of M-N blood group and Problems.
c) Genetic basis of Rh- Blood groups and their significance

UNIT-III

a) Definition- Linkage- Linkage groups- Kinds of Linkage- Detection of linkage- Significance.
b) Crossing-over- Significance and evidences of Crossing-over.
c) Chromosomal Mapping.

UNIT-IV

a) Mechanism of Sex determination- various theories- Role of hormone and environment in sex determination.
b) Sex linked inheritance in Man- Colour blindness, Haemophilia and Eye colour in Drosophila
c) Inheritance of sex limited, sex influenced genes and holandric genes.

UNIT-V

a) Extra chromosomal inheritance-Inheritance of Shell coiling in Snail, Kappa particles in Paramecium and Sigma particles in Drosophila.
b) Inborn errors of Metabolism.
c) Human Genetics- Role of Pedigree analysis, Twin study, Syndromes, Genetic counselling, Eugenics, eugenics and euphenics

TEXT BOOK


REFERENCE BOOKS

PART – III : Allied Subject Theory

Subject Title: Plant Diversity

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Objectives

- To understand the life history of cryptogams
- To understand the evolution of plants
- To learn to identify the different groups studied

UNIT I: ALGAE

General characters – Structure and reproduction of the following.

a) Cyanophyceae - *Nostoc*

b) Chlorophyceae – *Oedogonium*

c) Phaeophyceae – *Sargassum*

UNIT II: FUNGI

General characters – Structure and reproduction of the following.

a) Ascomycetes – *Penicillium*

b) Basidiomycetes – *Puccinia*

c) Lichens – Nature of association – habit and habitat - classification and morphology of lichen thallus. (Reproduction need not be discussed)

UNIT III: BRYOPHYTES

General characters – structure and life cycle of *Funaria*.

UNIT IV: PTERIODOPHYTES

General characters – structure and life cycle of *Lycopodium*.

UNIT V: GYMNOSPERMS

General characters – structure and life cycle of *Cycas*.

Text Books:

- An introduction to Embryophyta –Pteridophytes - N.S. Parihar, Surjeet Publications, Delhi, 2012 Ed.
- Botany for Degree Students Gymnosperms - P.C. Vashishta, S.Chand & Company Ltd, Delhi, 2014 Ed.

Reference Books:

Objectives:
To enable the students
- Inculcate the importance of public health and hygiene
- Consciousness on importance, source and quality of water

UNIT I:
Scope of Public Health and Hygiene – Concepts of Health and Disease –. Nutrition and Health: Classification of foods – Nutritional deficiencies – Vitamin deficiencies – Balanced diet – Nutritional requirements of special groups.

UNIT II:

UNIT III:
Communicable diseases: Respiratory infections- Measles, Mumps and Diptheria, Intestinal infections- Poliomyelitis, Typhoid and Amoebiasis, Arthropod infections- Filariasis and Dengue , Zoonosis- Rabies and Japanese encephalitis, Surface infections: Tetanus and AIDS.

UNIT IV:

UNIT V:

Text books:

Reference Book:
• Gopalan, C. 1985, Nutritive values of Indian foods, ICMR, New Delhi
• Rajvir Bhawar, 2008. Text Book of Public Health and Community Medicines, Published by Armed Forces Medical College, Pune.

SEMESTER – IV
(For those who join in June 2015 and after)

<table>
<thead>
<tr>
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<td>Sessional Marks: <strong>25</strong></td>
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</table>

Objectives:
To enable the students
- *Introduce basic aspects of animal and human development*
- *Understand certain important process involved in embryonic development*

Unit-I
a) Historical reviews-Theory of preformation, Theory of Epigenesis, Baer’s law and Biogenetic law
b) Gametogenesis- spermatogenesis, Oogenesis
c) Types of eggs -structure of spermatozoa and ovum in mammals.

Unit-II
a) Fertilization: Acrosomal reaction, cortical reaction, Physiological and biochemical changes, significance-parthenogenesis.
b) Planes and types of cleavage patterns.
c) Fate maps in Amphioxus, Frog and Chick.

Unit-III
a. Blastulation and Gastrulation in Amphioxus, Frog and Chick.
c. Foetal membranes in Chick

Unit-IV
a) Human reproduction; Menstrual cycle-Menopause, pregnancy-Parturition-lactation-hormonal control -Types and Functions of Placenta.
b) Amphibian metamorphosis: Anatomical and Biochemical changes, role of hormones in metamorphosis, Insect metamorphosis.
c) Regeneration: Definition –mechanism and types- factors controlling regeneration

Unit-V
a. Gradient theory- Organizer- concept, Spemann’s experiment,
b) Mechanism of Induction- Nuclear transplantation experiments.
c) Differentiation- Types, processes, competence- Nucleo cytoplasmic interaction
d) Human welfare and Embryology- Birth control, Infertility, Test tube Baby and Teratogenesis.

TEXTBOOK
- Veer Bala Rastogi 2016, Chordate Embryology, Kedan Nath Ram Nath, Delhi.

REFERENCE BOOKS
Objectives

To enable the students

- Organization of various organ system and their functioning mechanisms
- Study of animal behaviour and introduction of Biological clocks

UNIT- I

a) Definition and brief history of Physiology - the fields and branches of physiology

b) Nutrition and types-Food- composition, classification - the physiological role of major nutrient and minerals; Vitamins- chemical nature of vitamins, classification and their role in animal life.

c) Digestion and absorption of carbohydrate, protein and lipids in man.

UNIT- II

a) Circulation- types of circulatory system, types of heart, Composition of blood, general functions of blood

b) Origin and conduction of heart beat, blood clotting mechanisms,

c) Respiration — Respiratory pigments, transport of respiratory gases-Oxygen dissociation curve, respiratory quotient.

UNIT- III

a) Excretion- major excretory substances- classification of animals based on excretory products, excretion and water conservation

b) Structure of human kidney, nephron and its ultra structure, mechanism of urine formation and excretion – hormonal control.

c) Osmoregulation—definition, Osmoregulators, osmoconformers, stenohaline and euryhaline organisms, Osmoregulation in fishes and crustaceans - Thermoregulation – Suspended animation–Hibernation, Aestivation, Diapause.
UNIT- IV
a) Nervous system- Ultra structure of a typical neuron, concept of synapse
b) Nerve impulse conduction- neuro muscular junction- reflex action- reflex arc.
c) Muscular system-ultrastructure of skeletal fibres-general properties of muscle fibre, muscle contraction.

UNIT- V
a) Receptors- different types of receptors- structure and functioning of phonoreceptor (Human ear) and photoreceptor (Human eye)
b) Endocrine system- structure, hormones and role of pituitary gland, thyroid gland, Para-thyroid gland, adrenal gland and Islets of Langerhans
c) Chronobiology- biological rhythms and biological clock.

TEXT BOOKS

REFERENCE BOOKS
- C.L Prosser and F.A.Brown 1965. Comparative Animal physiology, W.B.Saunder’s Co
SEMESTER – IV
(For those who join in June 2015 and after)

Part III : Core Subject Practical II

<table>
<thead>
<tr>
<th>Subject Title :</th>
<th>Cell Biology, Genetics, Developmental biology &amp; Physiology</th>
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SEMESTER –III – CELL BIOLOGY & GENETICS

Cell biology

Objectives

To enable the students

- Observation of different cell types and cell division
- Histological techniques for the preparation of permanent slides

1. Study of Cell types – Observation of prepared slides
2. Study of oral epithelium in human and Onion peeling
3. Mitosis – Study of stages in Onion root tip meristem
4. Meiosis – Study of stages of spermatogenesis in grass hopper testis – squash
5. Micro technique- Preparation of permanent slides (Demonstration only).
6. Identification of the genetic material(chromosome) by simple staining – Giant chromosome in Chironomous larva
7. Spotters- Watson and Crick model of DNA, DNA Replication, Lac Operon, Clover leaf model of RNA and Coding dictionary

Genetics

Objectives

To enable the students

- Understand the Mendelian principles using colour beads
- Understand Human genetics and Drosophila culture

1. A survey of simple Mendelian traits in man (Class population)
2. Use of beads and models to illustrate Monohybrid, Dihybrid and Test cross
3. Distribution of tasters and non tasters in the class population (PTC tasting)
4. Polygenic inheritance of quantitative traits – observations and graphical representations may be made using height and weight of the students.
5. ABO Blood grouping
7. Fraternal, Identical and Siamese twins

**SEMESTER –IV**  
**DEVELOPMENTAL BIOLOGY & PHYSIOLOGY**

**Developmental Biology**

**Objectives**

**To enable the students**

- Observation of embryonic and developmental stages of animals
- Train the students to mount embryonic stages
1. Study of structure of egg of an insect, frog and Chick.
2. Temporary mounting of Chick blastoderm.
3. Effect of Thyroxin in tadpoles of Frog (Group study)
4. *Spotters* a) Observation of Cleavage, Blastula and Gastrula of Frog (Slides), Whole mount of 24 hours and 48 hours chick embryo (Slides)
5. Placental types – Observation

**Physiology**

**Objectives**

**To enable the students**

- Observe the physiological activities of animals
- Test the products of physiological activities of animals
1. Effect of temperature on the opercular movement of fish.
2. Study of oxygen consumption by a fish
3. Test for the detection of excretory products (Ammonia, Urea and Uric acid).
4. Study of blood corpuscles- Preparation of blood smear and counting of blood corpuscles using haemocytometer.
5. A study on ECG strip and report
6. Effect of activities on blood pressure in Man.

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**II YEAR UG SUMMATIVE PRACTICAL EXAMINATION**

**QUESTION PAPER PATTERN**

Practical – II Cell Biology, Genetics, Developmental biology & Physiology  
(09CP43)

Time: 5 hrs                                      Maximum Marks: 60

1. Major Practical – 2                          (14 x 2) 28
2. Minor Practical – 1 10
3. Spotters (4 x 3) 12
4. Record 10

Total 60

**SEMESTER – IV**
*(For those who join in June 2015 and after)*

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<tr>
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<td><strong>Subject Code:</strong> 08AT02</td>
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**Objectives**
- To understand the life history of angiosperms
- To understand the mechanism of water movement in plants
- To know the various kinds of hormones involved in plants growth

**UNIT I:**
Natural classification – Bentham and Hooker’s classification.

**UNIT II:** Studying the following families:
- Annonaceae, Caesalpiniaceae, Asclepiadaceae, Lamiaceae, Euphurbiaceae, Poaceae.

**UNIT III:** Plants and water relations

**UNIT IV:** Photosynthesis
- Structure of chloroplast – Light reaction – Dark reaction – C₃ and C₄ cycles only.

**UNIT V:** Growth and development
- b. Physiology of flowering – Photoperiodism and Vernalization.

**Text Books:**
- Taxonomy of Angiosperms- B.P. Pandey, S.Chand & Company Ltd, Delhi, 2014 Ed.

**Reference Books:**
- Plant Physiology – Suraj Mandal, Campus Books, New Delhi, 2014 Ed.
1. Make suitable micropreparations of types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperm.
2. Identifying, observing and sketching the floral parts of the plants belonging to the families prescribed in the syllabus.
3. Demonstrating the following physiology experiments

   I. Four leaf experiment
   II. Foliar Transpiration
   III. Ganong’s Light screen
   IV. Ganong’s Potometer
   V. Mohl’s half leaf experiment
   VI. Evolution of O₂ during photosynthesis
   VII. Arc Auxanometer
   VIII. Clinostat
   IX. Phototropism
   X. Kuhne’s fermentation vessel
SEMMESTER – IV  
(For those who join in June 2015 and after)

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Objectives

To enable the students

- *Principles, applications and working mechanisms of biomedical instruments*
- *Haematological techniques*

UNIT I  BIOMEDICAL DIAGNOSTIC LABORATORY-1:

Laboratory bio safety – general plan and organization – biomedical waste management, Applications of autoclave, centrifuge, microscope.

UNIT II BIOMEDICAL DIAGNOSTIC LABORATORY -2

Chromatography, Colorimetry and X-ray

UNIT III BIOMEDICAL DIAGNOSTIC LABORATORY -3

Ultra Sound scan, Doppler scan, CT scan and MRI

UNIT IV HEMATOLOGICAL TECHNIQUES

Haemoglobinometer, Haemocytometer, ECG and ESR

UNIT V BIOMEDICAL STANDARDS AND DISORDERS:

Lipid profile, urine profile, semen analysis, stool examination; anaemia, diabetes, jaundice, bleeding disorders, CHD and Arthritis.

Text Book

SEVENESTER – V
(For those who join in June 2015 and after)

<table>
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<th>Part – III Core Subject</th>
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<td>75</td>
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Objectives

- To enable the students in
  - Understanding the structure and functions of the biomolecules.
  - To study effect of physical principles on the living system

UNIT-I

- a. Acids, Bases, Dissociation constant, indicators, pH, Buffers, Electrolytes, isotopes, isomerism.
- b. Biologically important chemical bonds and their importance.
- c. Classification, structure and properties of Carbohydrates, Lipids, Protein and Amino acids.

UNIT-II

- b. Enzymes and Co enzymes: Classification and properties of enzymes-factors affecting enzyme action
- c. Theories of enzyme action-Mechanism of enzyme action- Role of Coenzymes and isoenzymes.

UNIT-III

- a. Metabolism of carbohydrates (Glycolysis, Glycogenesis, Glyconeogenesis and Glycogenolysis)
- b. Metabolism of Protein (deamination, transamination, transdeamination and urea synthesis)
- c. Metabolism of Lipid (β-oxidation, biosynthesis of glycerol)

UNIT-IV

- a. Biological oxidation: Definition- The respiratory chain-Oxidative phosphorylation
- b. Production of ATP and energy budget in the metabolism of major nutrients.
c. High energy compounds-definition-biologically important high energy compounds.

UNIT-V

a. Colloids — introduction. Types of colloidal solution-general properties of colloidal solution, Brownian movement, Osmotic pressure, dialysis, Donnan membrane equilibrium. Surface tension
b. Adsorption, hydrotroph, diffusion (passive and active), transport across the cell membrane- pinocytosis, transport of ions.
c. Thermodynamics Laws—definitions of different terms, Free energy, heat energy, enthalpy, entropy, exothermic and endothermic reactions. Bioelectricity - definition and measurement-action potential-membrane potential, Redox potential.

TEXT BOOKS


REFERENCE BOOKS

- Ambika Shanmugam 2003. Fundamentals of Biochemistry, Madras Medical College, Chennai
Modules: Core Subject Theory

**Subject Title:** Bio technology

**Subject Code:** 09CT52

**Hours per week:** 6  **Credit:** 5

**Sessional Marks:** 25  **Summative Marks:** 75  **Total Marks:** 100

**Objectives**

To enable the students to

- Know the concept of Biotechnology, tools and techniques.
- Understand the scope and application aspects of Biotechnology

**Unit: I  Introduction and Molecular Tools**

a. **Definition** – Scope and importance- Biotechnology as an interdisciplinary pursuit - Intellectual Property Rights (IPR) and Ethics in biotechnology
b. **Enzymes** – Restriction endonucleases (Type I, II & III ), DNA-ligase, Reverse transcriptase, DNA polymerase, Terminal transferase - Linkers and Adaptors
c. **Vectors** – pBR322, Ti plasmid, SV40 - Basic ideas about Phagemid, Cosmid, Bacterial Artificial Chromosome (BAC), Yeast Artificial Chromosome (YAC), Transposons as vectors, Shuttle and Expression vectors.

**Unit-II  Recombinant DNA Technology**

a. Gene cloning in Prokaryotes - DNA-gene library, genomic library - cDNA library
b. Integration of DNA fragments into vector - Transfer of rDNA into bacterial cell
c. Screening of recombinants - Selection of recombinants - DNA-sequencing

**Unit: III  Techniques**

a. **Molecular techniques**- Agarose Gel Electrophoresis – RFLP, RAPD, Polymerase Chain Reaction (PCR) – Blotting Techniques- Molecular probes and Hybridization- DNA finger Printing- Microarray
b. **Animal Cell culture techniques**: Basic aspects of Animal cell, tissue and organ culture - Immobilized cell culture - Insect cell culture-Whole embryo culture

c. **Plant cell culture techniques**: *In vitro* culture technique – Introduction for plant cell, tissue and organ culture

**Unit-IV**  
**Applied Biotechnology**

a. **Animal**-Transgenic animals- Sheep & Fish- Animal bioreactor and molecular farming - Products from animal cell culture - Tissue plasminogen activator (tPA), blood factor VIII, Erythropoietin (EPO)

b. **Plant**-Disease resistant plant production-Production of stress resistant plants – Insect resistant transgenic plants

c. **Microbes**-Biofertilizers, Biopesticides, Primary and secondary metabolites- Ethanol production- Single cell protein (SCP) - Biogas production- Biohydrogen- Mushroom culture

**Unit - V**  
**Biotechnology in Medicine and Environment**

a. **Medicine**: Recombinant vaccines - Improved contraceptives & Vaccines to control fertility- Antibiotic production- Penicillin., Monoclonal antibody production and its applications

b. DNA probes in diagnosis of diseases- Production of Human peptide hormones and insulin- Gene therapy

c. **Environment**: Genetically Modified Organisms (GMOs) for the management of environmental wastes - Bioremediation – *in situ* and *ex situ* process- Microbial degradation of Xenobiotics – Biomining and Ore leaching.

**Text Book**

**Reference Books**
SEMESTER – V
(For those who join in June 2015 and after)

<table>
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<td>Sessional Marks: 25</td>
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Objectives

To enable the students to

- Acquire knowledge on statistical applications in the study of biology,
  Applications of computers in biology & Bioinformatics tools
- Understand the application of statistical tools and problems solving

UNIT- I

a. Scope of Biostatistics- Types of Data- Importance of data collection
b. Classification, tabulation and frequency distribution.
c. Representation of data- Diagrammatic and graphical methods – Bar (Simple, Composite and Percentage) Pie, Histogram and Frequency curve.

UNIT – II

b. Measures of Dispersion – Calculation of range, Quartile deviation, mean deviation, standard deviation
c. Variance and co-efficient of variation

UNIT-III

a. Chi- square analysis- Calculation of gene frequency in a Mendelian population
b. Probability- Theorem and calculation
c. Students t-test and its significance

UNIT IV

a. History, Classifications of computer-main frame, mini, micro and super computer
b. Number systems -Decimal to binary. Popular software packages- MS word, power point, MS Excel

c. Web and multimedia-Web browsers, E-mail-creating ID, management of mail.

UNIT V

a. History and concepts of Bioinformatics, Biological databases; Types of databases.
b. Basic and functional genomics - gene alignment, BLAST, Tools in BLAST. Multiple sequence alignment, CLUSTAL W
c. Phylogenetic analysis, SwissProt- Expasy- Proteomic tools.

TEXT BOOKS

- Ignacimuthu, 2006, Basic Bioinformatics, Narosa Publishers, New Delhi

REFERENCE BOOKS

- B.N.Misra and Misra.,1983, Introductory Practical Biostatistics, Naya Prakash, Kolkatta
- Lohar,P.S 2009, Bioinformatics, MJP Publishers, Chennai
SEMESTER – V
(For those who join in June 2015 and after)

<table>
<thead>
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**Objectives**

**To enable the students to**
- *Understand sericulture as a cottage industry and exposure to silkworm rearing*
- *Mulberry cultivation and pathology*

**UNIT I**

History of Sericulture – Sericulture as cottage industry - Types of Silk worms – Mulberry and Non-mulberry– Economic importance of silk and its by products

**UNIT II**

Mulberry cultivation – Methods of propagation – Irrigation – Manuring - Diseases and Pests of Mulberry – Control measures.

**UNIT III:**


**UNIT IV:**

Characteristics of Cocoons – Stiffling – Process of Silk reeling

**UNIT V:**

Identification of silk worm larvae, pupa and Imago, Morphology of silk gland, DFL, Rearing appliances and Chandrika

**Text Books**

Reference books

SEMESTER – V
(For those who join in June 2015 and after)

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Objectives
To enable students to
- Disseminate information of Environment of national and international issues
- Environmental consciousness creation among the students

Unit-I
Introduction – Nature, scope and importance of Environmental studies – Natural Resources and conservation – forest, water and energy.

Unit-II
Ecosystem – concept – structure and function, energy flow, food chain, food web and ecological pyramids

Unit-III
Biodiversity – definition, types – values – India, a mega diversity zone – Hotspots – Endangered and endemic species – threat to biodiversity and conservation

Unit-IV

Unit-V

Text books
SEMESTER – VI
(For those who join in June 2015 and after)

<table>
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<td>Subject Title: Evolution</td>
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- Subject Code: **09CT61**  
- Hours per week: **4**  
- Credit: **4**

**Sessional Marks:** **25**  
**Summative Marks:** **75**  
**Total Marks:** **100**

**Objectives**

**To enable students to**

- Understand the basic concepts of origin of life, Principles of evolution and evolutionary theories with evidences
- Focus on elemental forces of evolution

**Unit – I**

- a) Origin of Life: Oparin-Haldane Theory,
- b) Evidences for Evolution from Morphology and comparative anatomy, Embryology, Physiology and Biochemistry.
- c) Lamarckism and Neo-Lamarckism

**Unit – II**

- b) Modern synthetic theory- Hardy-Weinberg’s Law – Behaviour of genes in natural population
- c) Genetic Drift – Evolutionary Significance.

**Unit - III**

- a) Species Concept – Sub Species and Sibling Species, Allopatric and Sympatric Speciation, Isolating Mechanism – Types and Examples
- b) Distribution of Animals – Barriers – Continental Drift Hypothesis Extinction – Types and causes
- c) Mimicry and colouration.

**Unit – IV**

- b) Fossils: methods of fossilisation –types

c) Methods of detection - Lead and Carbon Method.

Unit –V
a) Adaptive Radiation in Mammals.
b) Evolution of Man- Biological and cultural.
c) Evolution of horse- Orthogenesis.

Text Book


Reference Books

SEMESTER – VI
(For those who join in June 2015 and after)

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**Objective**

**To enable the students to**

- Understand the basic principles of microbiology and immunology
- Applications of microbiology and immunology

**Unit I**

a. History and scope of Microbiology: Classification of microorganisms-
Structural features of Bacteria, Virus, *Actinomycetes* and Fungi:
Reproduction of Viruses (T4 Phage and HIV)

b. Bacterial growth and nutritional requirements: Culture of Microorganisms –
Types of culture media, Cultural characteristics of bacteria

c. Isolation and enumeration, methods and maintenance of culture;
preservation of microbes. Reproduction in Bacteria – Conjugation,
Transformation and Transduction

**Unit II**

a. Food Microbiology: Fermented food, food spoilage, food poisoning,
physical and chemical methods in food preservation.

b. Soil Microbiology: Common soil microbes; symbiotic and asymbiotic
organisms; physiology of nitrogen fixation.

c. Water Microbiology: Coliform bacteria and MPN, Estimation of Total Plate
Count, Index, Faecal *Streptococci*.

**Unit III**

a. Study of common bacterial and viral diseases of man – Causative organisms,
mode of transmission, pathogenicity, symptoms and their preventive measures


Unit IV

a. Immune system – Types of Immunity – Innate and acquired immunity: Passive and active

b. Lymphoid organs – Primary and secondary organs, GALT & BALT. Lymphocytes – Sub-Population of T&B Cells

c. Immunoglobulin – Types, structure and functions-Antigen-Antibody reactions – Vaccination principles – Vaccines – Preparations and immunization

Unit V


c. Hypersensitivity, transplantation – grafting – immune deficiency-Types and diseases.

Text Books

Reference Books
- Gangal S. and Sontakke, S. 2013 Text Book of Basic and Clinical Immunology, University Press (India) Pvt. Ltd, Hyderabad
SEMESTER – VI
(For those who join in June 2015 and after)

Part – III : Core Subject Practical III

<table>
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<tr>
<th>Subject Title: Bio-Series, Environmental Biology, Evolution, Dairy Farming, Microbiology &amp; Immunology</th>
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SEMESTER – V

Biochemistry & Biophysics, Biotechnology, Environmental Biology, Biostatistics, Computer Applications and Bioinformatics

Biochemistry & Biophysics

Objectives

To enable the students to

- Experiments to observe certain physiological aspects
- Analysis of blood and water samples

1. Study of salivary amylase enzyme activity. Effect of temperature and pH
2. Tests for albumen, Sugar and Urea in Urine.
3. Qualitative tests for carbohydrate, protein and lipid.
4. Study of pH meter and measurement of pH of various water samples.
5. Estimation of Ascorbic acid (Vitamin-C)

Biotechnology

Objectives

To enable the students to

- Screen industrially important microbes
- Isolation of genomic and plasmid DNA
  1. Primary screening of industrially important microbes
  2. Isolation of Genomic DNA
  3. Isolation of Plasmid DNA
  4. Demonstration of Agarose gel Electrophoresis
  5. Immobilization of yeast cells
6. PCR demonstration
7. Spotters - Typical gene cloning experiment, Electrophoretic apparatus, Southern blotting, Northern blotting and DNA sequencing

Environmental biology

Objectives

To enable the students to

- Observation of eco system
- Estimation of ecological parameters
  1. Morphometric study of fresh water pond
  2. Food web and Food chain
  3. Identification of fresh water and marine plankton
  4. Animal association
  5. Estimation of dissolved oxygen in water samples
  6. Measurement of soil temperature, pH and moisture

Biostatistics, Computer Applications and Bioinformatics

Objectives

To enable the students to

- Apply statistical Programmes in biological Studies
- Handle the various basic tools of bioinformatics

Biostatistics

1. Collection of Data
2. Frequency Distribution (with number of Seed Pods)
3. Calculation of Mean, Median, Mode and Standard Deviation
4. Chi-Square analysis for Mendelian Cross (Monohybrid & Dihybrid)
5. Probability with tossing of coins.

Computer Applications

1. MS Word and its applications
2. Excel – Bar diagram, Pie diagram and Histogram
3. Powerpoint
4. Data base retrieval from internet
5. E.Mail creation and sending documents

Bioinformatics
1. Browsing the internet using websites
2. Browsing the internet using search Engines
3. Searching the data bases
   a. in NCBI
   b. in PDB
   c. in Swiss – Prot
4. Getting gene sequences from data bank
   a. Nucleotide sequences
   b. Protein sequences
5. Analysing Protein sequences using ROSMOL and JMOL
   a. Structure
   b. Bond length between molecules
   c. Bond angle between molecules

SEMESTER – VI
Evolution, Dairy Farming, Microbiology & Immunology

Evolution

Objectives
To enable the students to
- Finger print study and experiments with beads to understand evolutionary concepts
- Principles of natural selection and genetic drift in large and small population

1. Variation in finger prints in Man.
2. Experiment with beads to illustrate gene pool concept & production of genotypes
3. Experiment to study natural selection in large population
4. Experiment to study principles of genetic drift in small population.
5. Spotters- Homologous and Analogous organs, Evolutionary importance of *Peripatus, Limulus* and *Nautilus*, Study of vestigial organs, Petrified fossils (Stone fossil)

Dairy Farming

Objectives

To enable the students to
- Observation of Dairy Process, testing and identification of breeds
- Detect the quality of milk
1. Identification of breeds of Coe, and exotic cows
2. Computation of Ration for calf and pregnant cow
3. Experiment to identify the specific gravity of milk using Lactmeter
4. Detection of adulteration using MBR test, alcohol test and \( \text{H}_2\text{SO}_4 \) tests
5. Visit to Dairy Processing Centre and Veterinary hospital

**Microbiology and Immunology**

**Objectives**

To enable the students to

- Introduction of basic techniques in microbiology
- Principles and uses of microbiological instruments
- Dissection & observation of lymphoid organs
- Introduction of basic techniques in Immunology

1. Cleaning of glass wares – Sterilising media and equipments
2. Preparation of media for Microbes.
3. Distribution of microbes in Nature- Soil, Water and in Air.
4. Cultural characterisation of Bacteria
5. Simple staining of bacteria
7. Microscopic examination of live bacterial population. Hanging drop technique
9. Dissection to show lymphoid organs in Chick.
10. Observation of spleen cells-Slide.
11. Bleeding and serum separation.
12. Demonstration of agglutination by blood group antigen.
14. Spotters : Various Lymphoid organs in chick and human

******************************************************************************

**III YEAR UG SUMMATIVE PRACTICAL EXAMINATION**

**QUESTION PAPER PATTERN**

Practical – III Bio-Series, Environmental Biology, Evolution, Dairy Farming,
Microbiology & Immunology (09CP63)

Time: 5 hrs  Maximum Marks: 60
1. Major Practical – 3  
   (10 x 3) 30
2. Minor Practical – 2  
   (5 x 2) 10
3. Spotters  
   (4 x 2.5) 10
4. Record  
   10

Total 60

SEMESTER – VI  
(For those who join in June 2015 and after)

<table>
<thead>
<tr>
<th>Part – III : Elective Subject</th>
<th>Theory</th>
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<tbody>
<tr>
<td>Subject Title: Dairy Farming</td>
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<tr>
<td>Subject Code: 09EP61</td>
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<tr>
<td>Hours per week: 4</td>
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<td>Credit: 2</td>
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<td>Sessional Marks: 25</td>
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<td>Summative Marks: 75</td>
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<tr>
<td>Total Marks: 100</td>
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</table>

Objectives

To enable students to

- Knowledge on various dairy breeds of indigenous and exotic breeds.
- Skill development in milk processing and associated activities.

UNIT I:

a. Scope of Dairy farming, Dairy breeds of India- Cow and Buffalow
b. Exotic breeds-Cow  
c. Systems of breeding – Hybrid vigour – grading up. Merits and demerits of inbreeding and outbreeding.

UNIT II:

a. Digestive system of Cow and glands related to digestion  
c. Feeding and management of pregnant cow and calf

UNIT III:

a. Viral diseases – rinderpest, Foot and mouth disease  
b. Bacteiral diseases – Mastitis, Anthrax, Haemorrhagic – septicaemia  
c. Metabolic diseases – Milk fever and bloat.

UNIT IV:

a. Anatomy of udder and physiology of milk production  
b. Milk – composition, Pasteurization and Nutritive value, Colostrum and their importance, Techniques to produce quality milk-Techniques to detect milk adultration, Spoilage of milk  
c. Preparation of Dahi, Butter,Ghee, Gova, Flavored milk, butter milk, ice cream.

UNIT V:

a. Housing and equipments for dairy cows- Records to be maintained in a Dairy
b. Artificial insemination – Semen collection and storage - Techniques
c. Role of co-operative societies in milk production and marketing.

Text Books

Reference Book
- Sukumar De, 2008. Outline of Dairy technology, Oxford University Press

SEMESTER – VI
(For those who join in June 2015 and after)

<table>
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<tr>
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<tr>
<td>Subject Code: 09EP62</td>
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<td>Sessional Marks: 25</td>
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</table>

Objectives
To enable the students to
- Study of reciprocal relationships between organisms and their environment
- Significance of environmental degradation, biodiversity conservation, environmental legislation and education

UNIT-I
b. Light- light in relation to aquatic habitat, effect on organisms
c. Temperature-range, thermal stratification, tolerance, homeothermic, Poikilothermic animals, adaptations to extremes of temperature and effects on organisms.

UNIT-II
b. Ecosystem- Definition, components, Pond and forest as an ecosystem-trophic levels, Food chain and Food web- Ecological pyramids, energy flow and productivity

UNIT-III
a. Community- Definition, structure and characteristics- Ecotone, edge effect and ecological niche
b. Community dynamics- ecological succession and climax community.
c. Population ecology- characteristics- Natality, Mortality, Dispersal, age pyramid, population estimation- Regulation and dynamics of population.

UNIT-IV
a. Characteristics, Zonation and fauna and adaptations of fresh water, marine and estuary habitats
b. Terrestrial habitats- forests, deserts, caves, fauna and their adaptations
c. Parasitic adaptations- Ecto and endo

UNIT-V
a. Environmental pollutants- Types- Air pollution- Sources, Effects and control measure
b. Water pollution- Sources, Effects and control measures- Radioactive and Noise pollution
c. Natural Resources-Wild life - Conservation and management.

TEXT BOOKS

REFERENCE BOOKS
SEMESTER – VI
(For those who join in June 2015 and after)

<table>
<thead>
<tr>
<th>Part – IV : Skill Based Subject</th>
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<td>Subject Title : Fish culture</td>
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<td>Subject Code: 09SB61</td>
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<td>Sessional Marks: 25</td>
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</tbody>
</table>

Objectives
To enable the students to

- *Impart the knowledge on common food fishes and enhancement of fish productivity*
- *Management and maintenance of fish pond and various types of fish culture*

UNIT I:
Scope and importance of aquaculture – Physical and Chemical characteristic features of water bodies – Types of culture systems (Traditional, intensive, semi-intensive and extensive)

UNIT II:
Selection of cultivable species – Site selection for fish farming – construction of fish ponds – Types of fish ponds – Maintenance and management of ponds. Fish Feeds

UNIT III:
Types of culture – Monoculture, Monosex-culture and Poly culture – Integrated fish farming (paddy cum fish culture – Induced breeding

UNIT IV:
Common fish diseases - Prevention and treatment

UNIT V:
Identification of common edible fishes
Live fish feeds
Ornamental fish culture
Text Books

- G. Santhanakumar 1993. Fish Culture, JJ publications

Reference books

- Khanna, S. 2011. An introduction to fishes, Silver line publications
- Pandey & Shukla, 2010. Fish & Fisheries, Rastogi Publications

**SEMESTER – VI**
*(For those who join in June 2015 and after)*

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<tr>
<td>Summative Marks: 75</td>
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<td>Total Marks: 100</td>
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</table>

Objectives

To enable students to

- Role of vermitechnology for sustainable agriculture and environmental management
- Salient features of exotic and indigenous earthworm species

Unit I

Features of exotic species and indigenous species for vermicomposting

Unit II

Rearing and culturing – Vermicompost Unit – vermibel preparation

Unit III

Vermicast – characteristics – qualitative analysis - Vermiwash – characteristics – vermiwash unit - preparation, collection and analysis

Unit IV

Application of vermicomposting in Agriculture and horticulture – Economics of vermiculture

Unit V

Earthworms in pollution control and waste land development. Earthworms as food and medicinal importance - Role of KVIC and NABARD

Text book:


Reference books
Gupta B.K. (2003). Vermicomposting for sustainable agriculture, Agrobios (India), Jodhpur

SEMESTER – VI
(For those who join in June 2015 and after)

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<td><strong>Summative Marks: 75</strong></td>
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<tr>
<td><strong>Total Marks: 100</strong></td>
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</tbody>
</table>

To enable students to
- Appear for competitive exams
- Have overall subject knowledge essential for employment

**UNIT I**


UNIT II

a) Cell and Molecular Biology: Cellular Organeles - Structure and function - Plasma membrane, mitochondria, golgi bodies, endoplasmic reticulum and ribosomes - Nucleolus and nucleus - Chloroplast - Cell division (Mitosis & meiosis) - Chromosomes - DNA structure and function, replication of DNA, Genetic code - RNA and protein synthesis. Gene expression - Recombinant DNA, Genetic cloning - Genetic engineering, its uses in agriculture, biology and medicine - Sex chromosomes and sex determination.


UNIT III


UNIT IV


UNIT V

b) Economic Zoology:- Parasitism and Commensalism - Protozoan Parasites and diseases, helminth parasites and diseases of man and domestic animals - Beneficial and destructive insects Insect pests on crops and stored products - Control methods. Sericulture, apiculture, poultry, pisciculture and induced breeding, Shell fisheries, Aquaculture practices in Tamil Nadu and their impact on the environment and on agriculture.

**Question paper pattern**

Multiple Choice Questions $\quad (75 \times 1) = 75$ marks

**SEMIESTER – VI**

(For those who join in June 2015 and after)

<table>
<thead>
<tr>
<th>PART – IV : Common Subject Theory</th>
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<td>Summative Marks: 75</td>
<td>Total Marks: 100</td>
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</table>

**UNIT I - The heart of Education:**


**UNIT II The Value of Body and Life Energy**

Introduction – what are the causes for paid, Disease and death? Three Basic needs for all living Beings – Personal Hygeine Five Factors of Balance in Life – The need and benefits of physical Exercise – The value and Base of Life energy – The value and Base of Bio-magnetism - You are your own best caretaker.

**The Marvelous nature of mind**


**UNIT III Analysis of Thought**


**Benefits of Blessings** - Effects of good vibrations – Make Blessing a Daily Habit

**UNIT IV: Moralisation of Derive**

Introduction – moralization of desire - Analyse your desires – Summary of practice.

**Neutralisation of Anger:**

Introduction – meaning – characteristics of Anger – Anger is a Destructive emotion – Anger spoils our relationship with others – Some common misconception about anger – will power and method success through awareness – method of neutralisation of anger.

**UNIT V: Eradication of Worries**

63
Worry is a mental disease – Nature’s Law of cause and effect – factors beyond our control – How to deal with problems – analyse your problem and eradicate worry

**Harmonious Relationships**


**Text Book: Value Education for Health, Happiness and Harmony**
(Based on the Philosophy and Teachings of Swami Vethanthiri Maharisi)

Published By: Brain Trust, Aiyar A Wing of World Community Service Centre

**SEMESTER – VI**
(For those who join in June 2015 and after)

<table>
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<tr>
<th>PART – V : Common Subject Theory</th>
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<tr>
<td>Subject Title : Extension Activities</td>
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**UNIT-I:** Community Development-I

Definition – structure and composition – community based issues – need for awareness – Developmental Programmes.

**UNIT – II: Community Development–II**


**UNIT – III: Volunteer Empowerment**


**UNIT – IV: Social Analysis:**


**UNIT – V: Introduction to NSS:**


(OR)

**NCC -** Origin – Organisation – Ministry of Defence – Armed forces – commands – Defence establishments in Tamil Nadu Civil Defence – Aid to civil authorities – Disaster management – Leadership – Man management – Adventure activities – Social service
Reference: National Service Scheme Manual (Revised), Ministry of Human Resources Development, Government of India.

B.Sc. Chemistry and B.Sc. Botany (Ancillary Zoology)
(For those who join in June 2015 and after)

<table>
<thead>
<tr>
<th>Part – III : Allied Subject Theory</th>
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<tr>
<td>Subject Title: Animal Organisation</td>
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<td>Total Marks: <strong>100</strong></td>
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Objectives
To enable the students to

- **Fundamental course that provides basic understanding of biology of invertebrate and chordate.**
- **Study of salient features of invertebrates and chordates**

Unit-I

b. Outline classification of Invertebrates and the salient features of the Phyla with examples
c. Outline classification of Chordates upto classes giving examples

Unit – II

a. Feeding and digestion in Amoeba, Hydra and Frog.
b. Respiration in Amoeba, Cockroach
c. Gills in Fish and Lungs in bird.

Unit – III

a. Circulatory system in *Paramecium*, Earthworm and *Calotes*.
b. Locomotion in Amoeba, *Paramecium* and Earthworm
c. Flight mechanism in Pigeon.

Unit – IV

a. Nervous system of Earthworm
b. Human brain and ear
c. Receptors – photoreceptors of Euglena, insects and man

Unit – V

a. Excretion in Amoeba and Earthworm
b. Excretion in Man-Structure of kidney and urine formation.
c. Reproductive system of Rabbit.

Text books

Reference Books

B.Sc. Chemistry and B.Sc. Botany (Ancillary Zoology)
(For those who join in June 2015 and after)

<table>
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<th>Part – III : Allied Subject Theory</th>
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<tr>
<td>Subject Title: <strong>Biology and Human welfare</strong></td>
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<tr>
<td>Subject Code: <strong>09AT02</strong></td>
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<td>Sessional Marks: <strong>25</strong></td>
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</tbody>
</table>

Objectives

To enable the students to

- Knowledge on viral, bacterial, fungal, protozoan and helminthes disease and their control.
- Entrepreneurial avenues in Sericulture, Fish culture, Vermiculture, Mushroom and Apiculture.

Unit I

a. Structure of a typical virus
b. Brief account on Viral diseases
c. Polio, Rabies and AIDS.

Unit-II

a. Structure of typical Bacteria
b. Brief account on Bacterial diseases
c. Cholera, Tuberculosis and Tetanus.

Unit III

a. Fungal diseases – Ringworm and Black piedra
b. Protozoan diseases – Amoebic dysentery and Malaria
c. Helminth parasites – *Ancylostoma* and *Wucheraria*

Unit IV

b. Fish culture – Scope and Importance – Types of culture – Identification of common edible fishes - Induced breeding - common diseases and control – maintenance of fish pond.
c. Vermiculture – Features of exotic and indigenous species – rearing and culturing – Characteristics of Vermicast and Vermiwash – Economics of vermiculture

Unit V

a. Biogas production – characteristic features of biogas – production of biogas – uses
b. Mushroom culture – nutritive and medicinal value – Morphology of Indian oyster mushroom – cultivation of paddy straw mushroom - Advantages

Text Book:

Reference Books
- Gupta 2003. Vermicomposting for sustainable agriculture, Agrobios (India), Jodhpur
- Ganga & Sulochana shetty 1997. An Introduction to Sericulture, Oxford and IBH.
B.Sc. Chemistry and B.Sc. Botany (Ancillary Zoology)
(For those who join in June 2015 and after)

Part – III : Allied Subject Practical
Subject Title : PRACTICAL-I

<table>
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<th>Hours per week: 2</th>
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</table>

Objectives
To enable the students to

- Identification of all classes of invertebrates and vertebrates.
- Unrevealing anatomical features of invertebrate and chordate

1. Observation of the following -Spotters
   - Paramecium- conjugation
   - Obelia (entire)
   - Hydra (entire)
   - Taenia (entire)
   - Scolex of Taenia
   - Ascaris male and female
   - Nerites (entire)
   - Penaeus
   - Pila (entire) and shell of Fresh water mussel)
   - Starfish (entire)
   - Amphioxus, Balanoglossus, Scoliodon
   - Cobra, Viper, Pigeon
   - Skull of Pigeon dorsal and ventral view
   - Pectoral girdle of pigeon
   - Fore and hind limb of Frog
   - Synsacrum of bird

2. Simple staining of Bacteria from milk and sewage water.
3. Mounting of mouth parts of Mosquito, Housefly and Honey bee.
4. Identification of Ascaris (male & female) and Tapeworm.
5. Identification of egg, larva, pupa and adult of silk moth.
6. Dissection to show silk glands.
7. Common appliances used in silkworm rearing and apiculture.
8. Visit to Biogas production, Mushroom culture and Fish culture centres.

ANCILLARY SUMMATIVE PRACTICAL EXAMINATIONS
QUESTION PAPER PATTERN

Practical – I Animal Organisation, Biology and Human Welfare (09AP03)
Time: 3 hrs                                                                                  Maximum Marks: 60

1. Major Practical 20
2. Minor Practical 15
3. Spotters (5 x 4) 20
4. Record 5
Total                        60

DEPARTMENT OF ZOOLOGY
CERTIFICATE COURSE IN PHOTOGRAPHY

UNIT-I: HISTORY AND SCOPE OF PHOTOGRAPHY

a) History of Photography-Conventional and Digital
b) Scope of Photography
   Photography as an art - Scope in commercial field - Social functions -
   Industrial field - Scientific field-Political field

UNIT-II: PRINCIPLE OF PHOTOGRAPHY

a) Properties of light
   Dispersion – Reflection – Transmission – Absorption
b) Controlling of light
   Pin hole – Lenses
c) Image formation
   Direct image – Inverted image
d) Recording of an image.
e) Studio lights

UNIT-III: FOCUS ON CAMERA

a) Types of Camera
   Box type, TLR, SLR, Professional, Miniature, Subminiature,
   Underwater, Space, Cine, Video and Digital SLR.
b) Basic Components of a Camera:
   Lens, Shutter, diaphragm, viewfinder, film chamber etc.
c) Accessories of a Camera:
   Lenshood, Lens cap, Tripod stand, Cable release, Lux meter, Flash unit,
   Camera case and Tripod Panoramic views.
d) Working mechanism of TLR and SLR Cameras.

UNIT-IV: STUDY OF LENS FILMS AND FILTERS
a) Lens:
   Concept, focal length, Compound lens and Standard lens, Wide angle
   lens, Telephoto lens and Zoom lens and their application.

b) Films:
   Classification – Contrast, Resolving Power, Slow, Medium and Fast
   films.

c) Filters:
   Types and application.

UNIT-V: EXPOSURE TECHNIQUE

a) Composition

b) Exposure – Lighting Condition – aperture setting – Judging the distance
   – Shutter speed selection – Exposure on moving objects – Dept of field –
   use of flash – Silhouette.

UNIT-VI:

a) Digital Photography

b) Basic Principles & Parts of a Digital Camera

c) Operation of Digital Camera

d) Loading the pictures on to a computer-Memory Card and Reader.

e) Copying the pictures on a CD

f) Printing the pictures in different ways.

PRACTICALS:

1. Demonstration of various parts of a Camera.
2. Demonstration of various types of a Camera.
3. Demonstration of Inverted image formation.
4. Observation of various types of lenses.
5. Observation of accessories used for a camera.
6. Composing technique.
7. Demonstration of Photoshop an digital creative technique.
DEPARTMENT OF ZOOLOGY
CERTIFICATE COURSE IN VIDEOGRAPHY

UNIT-I:
History and Scope

UNIT-II:

UNIT-III:
Controls and functions in a video camera – M3000 play back – playback via T.V.Set.

UNIT-IV:
Preparations: Using the Battery pack – setting the clock – setting the view finder – Inductions in the view finder – warning and alarm indicators – inserting the video tape – Using the on-screen display – others.

UNIT-V:

UNIT-VI:
Dubbing and editing: Dubbing – Insert editing – Audio dubbing.

UNIT-VII:
Mixing:
b) Character generator and pattern maker. Features and use.
c) Chromo key functions.

UNIT-VIII:
Trouble shooting and service: symptoms – Cause – Action in power source, shooting and play back.

UNIT-IX:

UNIT-X:
Standard and optional – Accessories of a video camera.

UNIT-XI:

UNIT-XII:

UNIT-XIII:

PRACTICALS:
1. Study of controls and functions in video camera M 3000
2. Preparation for shooting
3. Shooting practice – Panning Tilting and Zooming
4. White Balance
5. Shooting with different functions – Mix/wipe effect, digital effect, superimposing and fade control.
6. Recording of Date and Time
7. Editing and Audio Dubbing
8. Trouble shooting and remedies
9. Character generation and pattern making (demonstration only)
10. Operation of mixing unit – demonstration only
11. Video coverage – Video making for an advertisement
12. Video coverage of a live programme – Each student is expected to produce a video coverage.
13. Script writing for a given subject.
DEPARTMENT OF ZOOLOGY
CERTIFICATE COURSE IN GANDHIAN THOUGHT
PART I - MAHATMA GANDHI’S LIFE

4. The Indian phase II: Growth of constructive work civil disobedience,salt satyagraha, Round table conferences, Constructive work further veoles – Individual satyagraha & Quit India movement – Quenching the communal Fire and shanti esna experiments – The supreme sacrifice and beyond.

PART II – MAHATMA GANDHI’S AGE

5. The British expansion in India and the early Indian Resistance – 1857 Revolt – Birth of Indian National Congress-Moderate(Gopalakrishna Gokale) Extrimists (Bank Gangadhar Tilak) and Violent fighters (Bhahavat singh,V,V,S,IYER)
7. Forerunners of ghandhi: Raja ram Mohan Roy, Dayanandha saraswadhi, Ramakrishna and Vivekananda, Ramalinga Vallalar, Raukin,Thoreau and Leo Tolstoy.

Books Recommended:
M.K.gandhi : An autobiographyor story to the story of my experiments with Truth. : Satyagraph in South Africa
B.R.Nanda : Mahatma Gandhi-A Biography
Louis Fisdrer: Life of Mahatma Gandhi.

DEPARTMENT OF ZOOLOGY
CERTIFICATE COURSE IN GANDHIAN THOUGHT
PAPER II – SARVODAYA AND NONVIOLENCE – 40942

PART I – SARVODAYA

5. Sarvodaya in Practice: Concept of Dhana (Vinoba Bhave), Jeevan Dhani and Total Revolution (Jeyaprakash Narayan), Sarvaodaya sangh and other Ghandhi Institution (K.Arunachalam and Ramachandran), ASEFA (S.Loganathan), Shanthi Sena Movement (m.Aram and N.Radhakrishnan), Gandhi Ashrams and Museums (G.Ramachandran, Soundaram, K.Muniyandi & S.Pandiyan), Environmental Movement (Sundarlal Babukuna and Metha Patkar), Struggle for Justice (S.Jaganathan & P.V.Rajagopal).

PART II – NONVIOLENCE

6. Meaning of nonviolence; Non Killing – Removing all forms of direct and indirect (Structural) violence, preventing accidents and calamities, disarmament and Nonkilling in the Non human context – Love enlightened
self interest, mercy, compassion, altruism, sacrifice, forgiving, sharing reverence for all life – Love of god: Bhakti Nonviolent Action: Nonviolent Life Style construction work to build up a Nonviolent order, peaceful resolution of conflicts Nonviolent Direct Action (sathyagraha) for peace and justice Nonviolent politics and economics, etc – Nonviolent ethics and values: truth: Quest for holistic Knowledge and awareness and implementing it.

7. Contributions to Nonviolence by Mahavira, Buddha, Upanishad and Gita, Socrates, Jesuschrist, Thiruvalluvar, Prophet Mohammad, Leo tolosty, Ramalinga Vallalar, Martin Luther King, Dalailama, Aung Sung Suki, Mairead Corregan, Desmand Tutu.

8. Peaceful resolution of Conflicts: Skills for Counselling, Negotiations, Meditation and arbitration reforming the Judicial System place of Therapies, Healing Techniques and Transformation Practices.


Book Recommended:
M.K.Gandhi : Sarvodaya (Edited by Bharata Kumarappapp)
Gobinath Dhavan : Political Philosophy of Mahatma Gandhi
Viswanath Prasad : Political Philosophy of Mahatma Gandhi
Varma : Gandhi & Sarvodaya
Jhon : Unto this Last
Richard B.Gregg : Power of Nonviolence
P.R.Diwakar : Sage and Satyagraha
M.K.Gandhi : Non-Violence in War Peace
Part –VI: Certificate course

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<thead>
<tr>
<th>Subject Title: APICULTURE</th>
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<tr>
<td>Subject Code:</td>
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<td>Hours per week: 2</td>
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<td>Total Marks: 100</td>
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Objectives:
- Salient features of the different species of honey bees
- Flora of Apiculture
- Products of Apiculture

Unit- I:
Introduction- Habit and Habitat- species of honey bees- *Apis dorsata, Apis indica, Apis florea, Apis mellifera, Dammer bee* (stingless bee).

Unit- II:
Social organization of honey bee- Queen- Worker- Drone- life history- hive of *Apis indica*.

Unit- III:

Unit- IV:
Appliances used in apiculture- typical moveable hive- Queen excluder- honey extractor uncapping knife- other equipments- bee vial, cloves, queen gate.

Unit- V:
Products of bee keeping- honey, bee wax, pollen, probolies, royal jelly, honey comb and its economic importance- bee venom- bee enemies- bee keeping industries- economics and marketing.

Field visit

Text book:

**Reference books:**

(For those who join in June 2016 and after)

<table>
<thead>
<tr>
<th>Part –VI: Certificate course</th>
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<tbody>
<tr>
<td>Subject Title : MUSHROOM CULTURE</td>
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<td>Subject Code:</td>
<td>Hours per week: 2</td>
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**Objectives:**
- *Characteristic features of the different mushroom varieties*
- *Spawn preparation*
- *Food values and economic importance of mushroom*

**Unit- I: Introduction**
History of Mushroom cultivation- Biodiversity of mushrooms- Habit and Habitat- morphology of mushroom- Identification edible and non edible mushrooms.

**Unit- II: Mushroom spawn preparation**
Laboratory requirements- mushroom culture- conservation of mushroom culture- mother spawn and planting spawn.

**Unit- III: Mushroom cultivation**

**Unit- IV: Nutritive value of mushroom**

**Unit- V: Preservation and economics of mushroom**
Short and long term preservation- NABARD- NEH- Economics and marketing of mushroom.
Text book:


Reference books:


(For those who join in June 2016 and after)

<table>
<thead>
<tr>
<th>Part –VI: Certificate course</th>
<th>Subject Title : AQUACULTURE</th>
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<tr>
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<td>Hours per week: 2</td>
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Objectives:

- *Impart the knowledge on common food fishes and aquatic organisms*
- *Management and maintenance of fish pond*
- *Common fish diseases, treatment and control measures*

Unit- I: Culture fisheries:

Fish farms –fish ponds- Types of fish culture- management- seed procurement- transport of seed and breeders- farm management- culture of fish feed organisms.

Unit- II: Freshwater culture

Major carps- common carp – Chinese carps - composite culture- paddy cum fish culture- induced breeding.

Unit- III: Prawn culture


Unit- IV: Fish parasites and diseases

Diseases- Viral- Fungal- Bacterial- Protozoans- Helminthes and Arthropods- Causative organisms, symptoms, control and treatment.

Unit- V: Fish preservation

Rigor mortis- spoilage- preservation method- chilling- freezing- Canning- drying- salting- smoking- economics and marketing.

Field visit
Text book:

Reference books:

(For those who join in June 2016 and after)

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<tr>
<th>Part –VI: Certificate course</th>
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<tr>
<td>Subject Title : VERMITECHNOLOGY</td>
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<td>Subject Code:</td>
<td>Hours per week:</td>
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Objectives:
- Role of vermitechnology for sustainable agriculture and environmental management
- Salient features of the exotic and indigenous earthworm species
- Product from vermitechnology

Unit I:
Salient features of the exotic and indigenous species for vermicomposting

Unit II:

Unit III:
Vermicast and vermiwash- its characteristics- vermiwash unit- preparation and collection.

Unit IV:
Application of vermicomposting in agriculture and horticulture- Applications of biofertilizers.

Unit V:
Earthworms in pollution control and waste land development- Role of KVIC and NABARD- economics and marketing.

Field visit
Text book:

Reference books:

(For those who join in June 2014 and after)

<table>
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<tr>
<th>Part – VI : Certificate course</th>
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<tr>
<td>Subject Title : SERICULTURE</td>
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Objectives:
- Understand sericulture as a cottage industry and exposure to silkworm rearing
- Mulberry cultivation and pathology
- Awareness creation to make them an entrepreneur

UNIT I:
History of Sericulture – Sericulture as cottage industry - Types of Silk worms – Mulberry and Non-mulberry– Economic importance of silk and its by products

UNIT II:
Mulberry cultivation – Methods of propagation – Irrigation – Manuring - Diseases and Pests of Mulberry – Control measures.

UNIT III:
Life cycle of *Bombyx mori* – Voltinism - Silk gland – Rearing House and appliances - Rearing methods- Pathology of silk worm and control.

UNIT IV:

UNIT V:
Identification of silk worm larvae, pupa and Imago, Morphology of silk gland, DFL, Rearing appliances and Chandrika.
Field visit.

**Text book:**

**Reference book:**

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(For those who join in June 2014 and after)

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<thead>
<tr>
<th>Part – VI : Certificate course</th>
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<tr>
<td>Subject Title : <strong>Dairy Farming</strong></td>
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<td>Hours per week: 2</td>
<td>Total Marks: 100</td>
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**Objectives**

To enable students to
- Knowledge on various dairy breeds of indigenous and exotic breeds.
- Skill development in milk processing and associated activities.

**UNIT I:**
- a) Scope of Dairy farming, Dairy breeds of India- Cow and Buffalow
- b) Exotic breeds-Cow
- c) Systems of breeding – Hybrid vigour – grading up. Merits and demerits of inbreeding and outbreeding.

**UNIT II:**
- a) Digestive system of Cow and glands related to digestion
- b) Common cattle feed – their nutritive value – minerals- Feed additives and silage preparation.
- c) Feeding and management of pregnant cow and calf

**UNIT III:**
- a) Viral diseases – rinderpest, Foot and mouth disease
- b) Bacterial diseases – Mastitis, Anthrax, Haemorrhagic – septicaemia
- c) Metabolic diseases – Milk fever and bloat.

**UNIT IV:**
- a) Anatomy of udder and physiology of milk production
- b) Milk – composition, Pasteurization and Nutritive value, Colostrum and their importance, Techniques to produce quality milk-Techniques to detect milk adulteration, Spoilage of milk
c) Preparation of Dahi, Butter, Ghee, Gova, Flavored milk, butter milk, ice cream.

UNIT V:
  a) Housing and equipments for dairy cows- Records to be maintained in a Dairy
  b) Artificial insemination – Semen collection and storage
  c) Role of co-operative societies in milk production and Marketing.

Text Books

Reference Book
- Sukumar De, 2008. Outline of Dairy technology, Oxford University Press

DIPLOMA COURSE IN SERICULTURE

Paper I: Mulberry Farming and Silkworm Rearing 100 Marks
Paper II: Breeding, Biotechnology, Grainage, Reeling, Marketing and Sericulture Extension. 100 Marks
Paper III: Practical I on paper I 50 Marks
Paper IV: Practical II on paper II 50 Marks
Paper V: Farm Management 50 Marks
Rearing and Production 50 Marks
Paper VI: Project 50 Marks
Field visit report 15 Marks
Case study report 15 Marks
Viva voce 20 Marks

Total = 500 Marks
(For those who join in June 2016 and after)

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**PAPER I: MULBERRY FARMING AND SILKWORM REARING TECHNOLOGY**

**UNIT-I: Mulberry Biology and Farming Practice**

**UNIT-II: Diseases and Pests of Mulberry**

**UNIT-III: Biology of Silkworm and Rearing Practice**

**UNIT-IV: Diseases and Pests of Silkworms**

UNIT-V: Non – Mulberry Silkworms

Eri, Tasar and Muga silkworms – Biology and rearing methods – food plants – Diseases and pests – control measures.

Text Books:

Reference Books:
2. FAO agricultural services bulletins, 1987, Manuals on Sericulture, Vo. 1 to 4, CSB, Bangalore.

(For those who join in June 2016 and after)

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PAPER II: BREEDING, BIOTECHNOLOGY, GRAINAGE, REELING, MARKETING AND SERICULTURE EXTENSION

UNIT-I: Genetics and breeding of silkworm and mulberry


UNIT-II: Biotechnology of Sericulture and Moriculture


UNIT-III: Grainage Technology

UNIT-IV: Silk Reeling Technology


UNIT-V: Marketing (egg, cocoon and silk) and extension.

Sericulture extension – organization at various levels – sericulture net work – marketing management ( cocoon and silk) Traditional and regulated markets – Role of Co-operative and credit agencies – subsidy and loan for sericulture farmers. Finance agencies in sericulture – NABARD, SIDBI, IDBI and banks – Assistance for sericulture IRDP, ITDP and special component schemes – Self employment potentials and employment generation in sericulture.

Text Books:

Reference Books:
- Biswas, S and Sengupta, K 1994, Genetic control of Disease Resistance in Mulberry, Sericologia, 34(1) 33-42
- FAO agricultural services bulletins, 1987, Manuals on Sericulture, Vo. 1 to 4, CSB, Bangalore.
- Nagaraju, J, 2000, Recent Advances in Molecular Genetics or Silkmother, Bombyx mori, Current Science 78(2):151-161
- Veeiah, T.M.2000, Strategy for silkworm seed Technology Research, Indian Silk (Millenium Special Issue)
PAPER III: Practical I on Paper I (10 hrs)
1. Soil testing for mulberry cultivation and land preparation.
2. Preparation for Row system planting, Irrigation and Mulching practices.
3. Morphology and sex separation of silkworm larva, Pupa and moth.
4. Study of cocoon.
5. Dissection of Silk glands.
6. Rearing house maintenance and its appliances
7. Mountages, Cocoon harvesting and maintenance of rearing records.
8. Collection, preservation and identification of pests of mulberry and silkworm.

PAPER IV: Practical II on Paper II (10 hrs)
1. Observation of mulberry races of breeding importance.
2. Observation of silkworm races of breeding importance
3. Vermicomposting with sericulture wastes
4. Grainage – Infrastructure (ground plan)
5. Grainage equipments
6. Preparation of disease free layings (demonstration)
7. Reeling equipments and demonstration of reeling.
8. Microscopic observation of pebrine spores by mothermoth examination.
9. Studies on cocoon characteristics.
10. Cocoon market – A case study.

PAPER V: Farm Management Rearing and Production

PAPER VI
a) Project
b) Field visit
   1. Visit to a model mulberry cultivation centre.
   2. Visit to a commercial grainage.
   3. Visit to a Seed Cocoon Market.
   4. Visit to a reeling centre.
   5. Visit to a sericulture institute.
c) Case Study Report
d) Viva-Voce
(For those who join in June 2016 and after)

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Objectives:

- Knowledge on various dairy breeds of indigenous and exotic breeds.
- Knowledge on various diseases of dairy animals.
- Prepare rural youth /self employment for accepting dairy farming as profit making.

UNIT I:
Scope of Dairy farming- Dairy breeds of India – both cows and buffaloes – Exotic cow breeds.
Systems of breeding – Hybrid vigour – grading up – Merits and demerits of inbreeding and out breeding.

UNIT II:
Common cattle feed – their nutritive value – minerals, feed additives and silage preparation.
Feeding and management of pregnant cow and calf.

UNIT III:
Viral diseases – Rinderpest, Foot and mouth disease - Bacterial diseases – Mastitis, Anthrax, Haemorrhagic – septicaemia.
Metabolic diseases – Milk fever and bloat.

UNIT IV:
Milk– composition and nutritive value, Colostrum and their importance- Pasteurization of milk.
Techniques to detect milk adulteration, spoilage of milk
Preparation of Dahi, Butter and Ghee. Role of co-operative societies in milk production and marketing.

UNIT V:
Housing and equipments for dairy cows. Records to be maintain in a farm.
Artificial insemination – Semen collection, storage and application.
Field visit.

Text book:

Reference book: