

**GOVERNMENT COLLEGE FOR
WOMEN
(AUTONOMOUS)
KUMBAKONAM**

DEPARTMENT OF ZOOLOGY

Programme: B.Sc., Zoology

Programme Code : USZO



UG SYLLABUS

2021– 2022 ONWARDS

Programme Outcomes for B.Sc., Zoology

PO1	Obtain functional knowledge of the fundamental theoretical concepts and experimental methods in Science
PO2	Develop skills critically to reflect upon the theory they learn.
PO3	Extend and understand the impact of science on society.
PO4	Inculcate ability to engage in life-long learning to improve professional competency.
PO5	Apply their professional ability for entrepreneurship and self employment.

Programme Specific Outcomes for B.Sc., Zoology

PSO1	Students gain knowledge and skill in the fundamentals of animal science, understand the complex interactions among various living organisms
PSO2	Analyze complex interactions among the various animals of different phyla, distribution and their relationship with the environment
PSO3	Understand and apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms, the complex evolutionary processes and behaviour of animals
PSO4	Can understand the functioning of Immune system and its interaction with pathogens, allergens and organ transplants.
PSO5	Correlates the physiological processes of animals and relationship of organ systems
PSO6	Understanding of environmental conservation processes and its importance, pollution control and biodiversity and protection of endangered species
PSO7	Perform laboratory experiments as per standard protocols in the areas of Biology
PSO8	Gain knowledge of Agro based Small Scale industries like sericulture, fish farming and vermicompost preparation.
PSO9	To impart skills and necessary training to initiate start-ups in the realm of life sciences.

**I – SEMESTER
INVERTEBRATA**

Theory Hours	: 6	Course Code: U21ZC101
Practical Hours	: --	Credits : 5
Exam Hours	: 3	Marks :25+75

Objectives: To make thorough understanding students on kingdom classification, general characters and special functions with special reference to various major and minor, phylum of invertebrata such as Protozoa, Porifera, Cnidaria, Annelida, Arthropoda, Mollusca and Echinodermata along with general topics.

UNIT – I

Animal Kingdom: Classification, taxonomy and nomenclature.

Phylum: Protozoa – General characters and classification up to class level with suitable examples.

Detailed Study: Paramecium.

General Topics: 1. Human Protozoan Diseases: Amebiasis, Leishmaniasis and Malaria
2. Locomotion in Protozoa.

UNIT – II

Phylum: Porifera and Cnidaria - General characters and classification up to class level with suitable examples.

Detailed Study: Sycon and Aurelia.

General Topics: 1. Canal system in Porifera.
2. Coral and coral reefs.

UNIT – III

Phylum: Platyhelminthes and Aschelminthes (Nematoda). General characters and classification up to class level with suitable examples.

Detailed Study: Liver fluke and Ascaris.

General Topics: 1. Parasitic adaptation in helminthes.
2. Human Nematode parasites – *Wuchereria bancrofti* and Enterobius.

UNIT – IV

Phylum: Annelida and Arthropoda. General characters and classification up to class level with suitable examples.

Detailed Study: Nereis and Prawn.

General Topics: 1. Larval forms in Crustacea.
2. Economic Importance of Honey Bee, Silk Worm, Mosquito and Housefly.

UNIT – V

Phylum: Mollusca and Echinodermata. General characters and classification up to class level with suitable examples.

Detailed Study: Pila and Starfish.

General Topics: 1. Torsion in Gastropoda.
2. Larval forms of echinoderms.

Reference books:

1. Ekambaranatha Iyer and T.N Anantha Krishnan (1992). A manual of Zoology Vol-I (Invertebrata) Part I and II Viswanathan and co.
2. Barrington E.J.W (1979). Invertebrates structure and function 2nd edn. ELBS and Nelson.
3. Jordon E.Z and P.S. Verma (1995). Invertebrate Zoology 12th ed. Sultan Chand and co.
4. Kotpal R.L., (All series) (2012) Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca and Echinodermata – Rastogi publications.
5. Barnes R.D (1940-1995). The invertebrates. Volume I to IV, Mc graw hill book co.

Course outcomes

CO1 : Acquire knowledge of importance of systematics, taxonomy, general taxonomic rules on animal classification and structural organization of invertebrate animals.

CO2 : Gain knowledge on salient features of phyla such as Protozoa, Porifera, Coelenterata, Platyhelminthes, Annelida, Arthropoda, Mollusca and Echinodermata.

CO3: Know invertebrates that gave rise to the modern day vertebrates and interpret the gradual emergence of life on earth.

CO4 : Learn the larvae of crustacean and their significance.

CO5 : Understand the role of water vascular system in echinodermata. Appreciate the economic values of each phylum of invertebrate.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5 PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

INVERTEBRATA PRACTICAL

Course Code	:U21ZC102P		
Practical Hours	: 3	Credits	: 2
Exam Hours	: 3	Marks	:40+60

Objectives: To dissect the organ systems of invertebrates. To compare the structure and function of invertebrate groups. To understand adaptations in invertebrates.

MAJOR PRACTICAL:

1. Dissection of Earthworm digestive system
2. Dissection of Earthworm nervous system
3. Dissection of Pila digestive system
4. Mounting of Prawn appendages

MINOR PRACTICAL:

1. Mounting of Earthworm body setae
2. Mounting of Pila radula
3. Mounting of Housefly Mouthparts
4. Mounting of Honeybee Mouthparts

SPOTTERS:

A. CLASSIFY GIVING REASON

Protozoa: Amoeba, Paramecium; **Porifera:** Sponge; **Cnidaria:** Physalia, Aurelia, **Annelida:** Nereis; **Arthropoda:** Prawn; **Mollusca:** Pila, Chiton; **Echinodermata:** Starfish, Sea urchin

B. RELATE THE STRUCTURE AND FUNCTIONS

Porifera: Sponge spicules; **Platyhelminthes:** Tapeworm scolex; **Annelida:** Nereis Parapodium; **Echinodermata:** Pedicellaria, Aristotle's lantern

C. BIOLOGICAL AND EVOLUTIONARY SIGNIFICANCE

Platyhelminthes: Planaria; **Cnidaria:** Madrepora; **Annelida:** Heteronereis; **Arthropoda:** Peripatus (connecting link), Limulus, *Bombyx mori*, Honeybee; **Echinodermata:** Ophiuroid

D. ANIMAL ADAPTATIONS

Protozoa: Plasmodium; **Platyhelminthes:** Liver fluke, Tape worm; **Nemathelminthes:** Ascaris (male and female), Enterobius; **Annelida:** Cheatopterus, Leech; **Arthropoda:** Nauplius larva, Zoea larva, Mysis larva

E. IDENTIFY AND DRAW DIAGRAM

Protozoa: Paramecium binary fission; **Cnidaria:** Obelia entire, Sea anemone; **Annelida:** Cheatopterus.

Course Outcome

Upon completion, students should be able to

CO1 : Have hands on experience of dissecting invertebrates.

CO2 : Obtain the ability to identify the important microscopic animals of different phyla

CO3 : Able to understand the structural features of invertebrates.

CO4 : Understand the structural complications of invertebrates

CO5 : Able to correlate the components of mouth parts of different animals with their functions.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:60

QUESTION NO.I – Major Practical

15 Marks

QUESTION NO.II – Minor Practical

10 Marks

QUESTION NO.IV – 4 Spotters

5 X 4 MARKS =20 Marks

Record

10 Marks

Viva

5 Marks

ALLIED – I - ALLIED ZOOLOGY
BIOLOGY OF INVERTEBRATES AND CHORDATES

Theory Hours	: 5	Course Code	:U211AZ1
Practical Hours	: --	Credits	:4
Exam Hours	: 3	Marks	: 25+75

Objectives: To acquire knowledge on the biological aspects of Invertebrata and phylum Chordata along with general characters, classification and general topics.

UNIT- I

Phylum: Protozoa, Porifera and Cnidaria - General characters and classification up to class level with suitable examples.

Detailed Study: Paramecium.

General Topic: Canal system in Sponges.

UNIT- II

Phylum: Platyhelminthes and Annelida - General characters and classification up to class level with suitable examples.

Detailed Study: Earthworm.

General Topic: Human nematode parasites (Ascaris and Enterobius).

UNIT- III

Phylum: Arthropoda, Mollusca and Echinodermata - General characters and classification up to class level with suitable examples.

Detailed Study: Starfish.

General Topic: Mouth parts in Insects (Honey Bee and Mosquito).

UNIT- IV

Class: Pisces, Amphibia and Reptilia - General characters.

Detailed Study: Shark.

General Topic: Identification of Poisonous and non poisonous snakes.

UNIT- V

Class: Aves and Mammalia - General characters.

Detailed Study: Rabbit.

General Topic: Migration of Birds.

Reference books:

1. Ekambaranatha Ayyar. M.& ananthkrishnan(2012) Manual of Zoology. Viswanathan Publication.
2. Jordan E.L.(2009). Invertebrate Zoology. S. Chand and co.,
3. Jordan E.L.(2014) Chordate Zoology. S. Chand and co.,
4. Kotpal R.L.(2017) Modern Text book of Zoology. First edition Invertebrates. Rastogi publications.

5. Hyman I.H. (1949)The Invertebrates. Vol-I. McGraw Hill Publications in the Zoological Sciences.
6. Hyman I.H. (1951)The Invertebrates. Vol-II. McGraw Hill Publications in the Zoological Sciences.

Course outcomes

CO1: Understand the general characters of unicellular and multicellular organisms.

CO2: Acquire knowledge of importance of systematics, taxonomy, general taxonomic rules on animal classification and structural organization of invertebrate animals.

Gain the indepth knowledge of general characters & classification up to class level - Platyhelminthes, Annelida and a detailed study of Human nematode parasite.

CO3: Understand the general Characters of Pisces, amphibian, Reptiles and a detailed study of Shark

CO4: Gain the knowledge about general characters of phylum Aves, Mammals and a detailed study of Rabbit

CO5: Learn about the migration of birds and identification of poisonous, non poisonous snakes.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

PART – IV - VALUE EDUCATION (YOGA)

Theory Hours	: 2	Course Code	: U211VE
Practical Hours	: --	Credits	:2
Exam Hours	: 3	Marks	: 25+75

Objectives: To gain knowledge on Values of life, behaviour, responsibilities, health, disorders and reforms values of life with morality and its impact of globalization, self control regulation, Exercise, meditation, yoga.

Course outcomes:

UNIT I

Introduction to values: Values of life, Factors affecting values of life, significance of life value education

UNIT-II

Behaviour: Respect to the parents, respect to the teachers, worship, self respects

UNIT-III

Social oriented values: Unity, equality, family, Citizen's responsibility, Patriotism

UNIT-IV

Physical and mental health: Quality food, personal hygiene, women's health, Thought power

UNIT-V

Disorders and Reforms: Values of life with morality and its impact of globalization, Impact of media, Reforms, Self control regulation, Exercise, meditation, yoga.

References

1. Jayakrishna (2016). Value education with section on Yoga. Viva Publication.
2. B.K.S.Iyengar (2006). Light on yoga, Thorson Publication.
3. Swami Vishnu Devanandha (1995). Complete Illustration of Yoga, RHUS Publishers.
4. Hansaji J.Yogendra (2018). Yoga for all, Rupa Publications, India.

Course outcomes

CO1: Understand the values of life.

CO2: Learn the behaviour of different respects and worship.

CO3: Understand the social oriented values.

CO4: Gain the knowledge of physical and mental health.

CO5: Understand and acquire knowledge for disorders and it reforms.

QUESTION PATTERN

THEORY - 5 QUESTIONS X 15 MARKS (EITHER OR PATTERN) = **75** MARKS

II - SEMESTER
Core –III - CHORDATA

Theory Hours	: 6	Course Code	:U21ZC203
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To comprehend the knowledge on phylum chordate (Sub phylum Prochordata and Sub phylum Vertebrata) - their general characters, classification (Prochordates, Fishes, Amphibians, Reptiles, Birds and Mammals) along with interesting general topics of the subject.

UNIT – I

Sub Phylum: Prochordata - General characters and classification up to order level with suitable examples.

Detailed Study: Amphioxus (Exclusive of endoskeleton).

General Topic: 1. Origin of Chordates.

2. Retrogressive metamorphosis in ascidians.

UNIT – II

Class: Pisces and Amphibia: General characters and classification up to order level with suitable examples.

Detailed study: Scoliodon and Frog (Exclusive of endoskeleton).

General topics: 1. Accessory respiratory organs in fishes.

2. Parental care and Migration in fishes.

UNIT – III

Class: Reptilia: General characters and classification up to order level with suitable examples.

Detailed study: Calotes (Exclusive of endoskeleton).

General topics: 1. Identification of poisonous and non poisonous snakes.

2. Golden age of Reptiles.

UNIT – IV

Class: Aves: General characters and classification up to order level with suitable examples.

Detailed study: Pigeon (Exclusive of endoskeleton)

General topics: 1. Migration in birds.

2. Flight adaptations.

3. Flightless birds.

UNIT – V

Class: Mammals: General characters and classification up to order level with suitable examples.

Detailed study: Rabbit (Exclusive of endoskeleton).

General topics: 1. Aquatic mammals.

2. Dentition in mammals.

Reference Books:

1. Ekambaranatha Iyer and T.N. Anantha Krishnan (1992). A manual of Zoology. Vol-I (Invertebrata) Part I and 2 Viswanathan and co.
2. Dhami D.S and J.K Dhami (1978). Chordate Zoology. R. Chand and co.
3. Jordon E.L and P.S Verma (1995). Chordate Zoology. S. Chand and co.
4. Muthukumarasamy P and K. Palanivel (1990). Thandudaiya vilangugal. BARD.

Course outcomes

CO1 : Impart conceptual knowledge of vertebrates and understand the emergence and diversity of chordates. Interpret the gradual emergence of life on earth.

CO2 : Understand different classes of chordates, levels of organization and evolutionary relationship between different subphyla and classes, within and outside the phylum.

CO3 : Acquire knowledge of diversity in animals, making students understand about their distinguishing features and appreciate similarities and differences in life functions among various groups of animals in Phylum Chordata

CO4 : Learn about migratory birds, flight and flightless adaptations of birds and their importance.

CO5 : Comprehend the physiological systems of chordates.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

CORE COURSE IV – CHORDATA – PRACTICAL

Course Code	:U21ZC204P		
Practical Hours	: 3	Credits	: 3
Exam Hours	: 3	Marks	:40+60

Objectives: To study the diversity of chordates. To understand the origin and evolution of prochordates. To understand the adaptations in chordate groups.

MAJOR PRACTICAL:

1. Dissection of Fish digestive system
2. Dissection of Fish- 5th Cranial nerve, 9th and 10th cranial nerves,
3. Virtual Dissection of Frog digestive system using video clippings
4. Virtual Dissection of Frog nervous system using video clippings
5. Virtual Dissection of Frog Male and female urinogenital system using video clippings

MINOR PRACTICAL:

1. Mounting of Shark Placoid scales
2. Mounting of Flat fish Ctenoid scales
3. Observation of frog egg and tadpoles.
4. Observation of metamorphosis in frog.

SPOTTERS:

A. CLASSIFY GIVING REASON

Prochordata: Amphioxus, Petromyzon; **Pisces:** Shark, Clarius, Hippocampus; **Amphibia:** Alytes, Hyla; **Reptilia:** Calotes, *Chelone mydas*; **Aves:** Pigeon; **Mammalia:** Bat, Rabbit

B. RELATE THE STRUCTURE AND FUNCTIONS

Fish: Echineis, Exocoetus; **Reptilia:** Draco; **Aves:** Quill feather; **Mammalia:** Bat

C. BIOLOGICAL AND EVOLUTIONARY SIGNIFICANCE

Prochordata: Ascidian, Tornaria larva; **Pisces:** Eel, *Gambusia*; **Amphibia:** Axolotl larva; **Reptilia:** Chaemeleon; **Aves:** Passer; **Mammals:** Manis

D. ANIMAL ADAPTATIONS

Pisces: Echineis; **Amphibia:** Ichthyophis; **Reptilia:** Varanus; **Aves:** Dinopium; **Mammals:** Macropus

E. IDENTIFY AND DRAW DIAGRAM / DENTITION FORMULA

Dentition in Rabbit, Dentition in Dog, Dentition in Man, Frog skull, Frog pectoral girdle, Frog pelvic girdle, Frog forelimb bones, Frog hind limb bones.

Course Outcome

CO1 : Obtain hands on experience on mounting of shark placoid scales.

CO2 : Understand the structural modifications of chordates.

CO3 : Assess the development of adaptive features.

CO4 : Identify teleosts, elasmobranchs, amphibians, reptiles, aves & chosen Mammals.

QUESTION PAPER PATTERN

Exam Hours : 5

Max.marks:60

QUESTION NO.I – Major Practical

15 Marks

QUESTION NO.II – Minor Practical

10 Marks

QUESTION NO.IV – 4 Spotters

5 X 4 MARKS =20 Marks

Record

10 Marks

Viva

5 Marks

ALLIED – II - GENERAL PRINCIPLES AND APPLIED ZOOLOGY

Theory Hours	: 5	Course Code	: U212AZ3
Practical Hours	: --	Credits	:4
Exam Hours	: 3	Marks	: 25+75

UNIT-I

Human physiology: Circulation - Structure and functions of Heart. Respiration-Mechanism of transport of gases.

Excretion-Structure of Kidney and Urine formation.

UNIT-II

Genetics: Mendalism-monohybrid and dihybrid crosses.Multiple alleles:ABO and Rh, Blood groups.

Evolution: Theories of Evolution-Lamarckism,Darwinism.

UNIT-III

Developmental Biology:Gametogenesis, Types of egg,Clevage in Frog,Cell Biology:Comparision of prokaryotic and eukaryotic cells.Types of tissues-epithelial,vascular and muscular.

Cell division-Mitosis and Meosis.

UNIT-IV

Apiculture:Species of Honey Bees-Types of Bee hives-Care and Management honey extraction-nutritive and medicinal values od honey.

UNIT-V

Vermiculture and vermicomposting-types of earthworm-vermicomposting methods-pit,heap,tank-economic importance-Vermiwash.

Reference Books:

- 1.Lehninger L.,1990 Biochemistry,W.H.Freeman &Co.,
- 2.Hoar W.S.1983.General and comparative physiology.Prentice Hall of India
- 3.Balinsky,B.I.1981.An introduction to embryology. W.B.Saunders company Philadelphia.
- 6.Gupta P.K(2005)-Elements of Biotechnology
- 7.Goldsky Kuby (2013) immunology, W.H.Freeman Comopany.

Course outcomes

CO1 : Learn the basic knowledge of Circulation, respiration, Excretion in Human

CO2: Acquire knowledge of Mendelism, Multiple alleles , Lamarckism and Darwinism.

CO3: Understand the basic information on types of egg, cleavage in frog, gametogenesis, types of tissues and cell division

CO4: Gain knowledge of apiary management.

CO5: Gain knowledge of earthworm rearing and vermicomposting.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

ALLIED ZOOLOGY COURSE II – PRACTICAL

Course Code	:U212AZ2P		
Practical Hours	: 2	Credits	: 4
Exam Hours	: 3	Marks	: 40+60

Major Practical

- 2) Earthworm – Digestive system.
- 3) Enumeration of RBC.
- 4) Blood Grouping.
- 5) Observation of mitotic stages in Onion root tip.

Minor Practical

- 1) Mounting of body setae.
- 2) Mounting of placoid and ctenoid scales.
- 3) Preparation of buccal smear and observation of squamous epithelium.
- 4) Mounting and observation of hind limb modifications of honey bees

Spotters

Amoeba, Sponges, Hydra, *Taenia solium*, Leech, Grasshopper, Pila and Starfish.

Shark, *Rana hexadactyla*, *Naja naja*, Pigeon and Rabbit.

Epithelial, muscular and vascular tissues.

Newton's bee hive, Honey, Major Indian bees, identification of Queen, drone and worker bee

Submissions

- 1) Report submission on Vermicompost prepared in groups.
- 2) Record

Course outcomes

CO1: Understand the anatomy of animals

CO2: Able to apply the knowledge of physiology and genetics in day today life.

CO3: Understand the morphological characteristics of tissues, cells and animals and organizational levels in biology.

CO4: Learn the preparation of vermicompost.

CO5: Obtain the skill for apiary

QUESTION PAPER PATTERN

Exam Hours	:	Max.marks:60
QUESTION NO.I – Major Practical		15 Marks
QUESTION NO.II – Minor Practical		10 Marks
QUESTION NO.IV – 4 Spotters		5 X 4 MARKS =20 Marks
Record		10 Marks
Viva		5 Marks

ENVIRONMENTAL STUDIES

Theory Hours	: 2	Course Code	:U212ES
Practical Hours	: --	Credits	:2
Exam Hours	: 3	Marks	: 25+75

Objectives: To acquire the knowledge on the Environment - principles, definition and importance, it influence the living organism through ecosystem structure and components, various habitats, sources of pollution and conservation of wild life, influence of population growth, health and rights.

UNIT-I

The Multidisciplinary Nature of Environmental Studies

- Definition, Scope and Importance.
- Renewable and Non- Renewable Resources.
- Nature Resources and associated problems.

UNIT-II

Biodiversity and its Conservation

- Introduction – Definition.
- Biodiversity at global, national and local levels.
- India as a mega – diversity nation.
- Hot – spots of biodiversity.
- Conservation of Biodiversity : In – Situ and Ex – situ conservation of Biodiversity.

UNIT – III

Environmental Pollution Definition

- Causes, Effects one layer and Control Measures of :
 - a. Air Pollution – Climate Change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
 - b. Water pollution.
 - c. Soil pollution.
 - d. Noise pollution.
- Solid Waste Management : Causes, Effects and Control measures of urban and Industrial Wastes.
- Role of an individual individual in prevention of pollution
- Disaster Management : Floods, Earthquake, Cyclone and landslides.

UNIT – IV

Social Issues and the Environment

- From un – sustainable to sustainable development.
- Urban Problems related to energy.
- Water Conservation, rain water harvesting, Watershed Management.

- Resettlement and rehabilitation of people : its problems and concerns case studies.
- Environment protection Act.
- Air (prevention and control of pollution) Act.
- Wildlife protection Act.
- Forest conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

UNIT – V

Human Population and the Environment

- Population growth explosion, variation among nations – Family Welfare programme.
- Environment and Human Health.
- Human Rights.
- HIV/AIDS.
- Women and child welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Reference Books:

- 1 Bernis Anandharaj (2016) Soolnilaiyial. Chrisolite publications. Adyar, Chennai.
- 2 Odum E.P (1971). Fundamentals of ecology. W.B Saunders Company, Philadelphia.
- 3 Kendeigh S.C (1961). Animal ecology. Prentice Hall.
- 4 Clarks GL (1954). Elements of Ecology. John Wiley and sons, Newyork.
- 5 Purohit S.S., Shami DH and A.K Agarval (2004). Environmental sciences - A new approach. Agrobi, Jodhpur.
- 6 Krishnamurthy K.V (2003). Introduction to Biodiversity. Oxford and IBH.

Course Outcomes

- CO1: Gain knowledge of surrounding environment.
 CO2: Understand the diversities at local and national levels.
 CO3: Learn the impact of various pollutants in Air, Water and Noise.
 CO4: Understand the various acts to control the pollution and creating awareness.
 CO5: Acquire knowledge of the significance of Natural resources and recent advances in information technology

QUESTION PATTERN

THEORY - 5 QUESTIONS X 15 MARKS (EITHER OR PATTERN) = 75 MARKS

III SEMESTER

Core - V - CELL BIOLOGY

Theory Hours	: 6	Course Code	:U21ZC305
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To understand the structure and functions of cellular organelles - their ultra structure and applications of microscope for better understanding of molecular structure of cells.

UNIT - I

The cell - Definition, Cell theory, types of cells, size, shape, volume and number.
Detailed study of cell structure. Prokaryotic and eukaryotic cells.
Microscopes- Compound, fluorescent and Electron.
Centrifuge and Electrophoresis. Principle and applications.

UNIT - II

Plasma membrane - Ultra structure & Functions.
Cytoplasm - Composition and physicochemical properties.
Golgi complex - Ultra structure and Functions.

UNIT - III

Ultra structure and functions of Endoplasmic reticulum, ribosomes - mitochondria and Lysosome.

UNIT - IV

Interphase nucleus- Ultra structure and functions.
Chromosomes - Ultra structure, types and functions - Giant chromosomes.

UNIT - V

Cell cycle - cell division - Amitosis, Mitosis and Meiosis.
Cancer: Types and Characters.

Reference Books:

1. Verma P.S and Agarwal, V.K (2016). Cell biology S. Chand and & Company PVT, LTD, New Delhi.
2. Power, C.P. (1983). Cell biology. Himalaya publishing house, PVT, LTD, Mumbai.
3. Gupta, P.K. (2018). Cell biology, Rastogi Publications, Meerut.
4. Rastogi, S.C. (2011). Cell and Molecular biology, New Age International (P), LTD, Publishers, New Delhi.
5. Robert M.Dowben (1971). Cell biology, Harper and Row, Publishers, London.
6. Geoferey M. Cooper and Robert E. Hausman, (2007). The cell, A molecular approach, Fourth edition, ASM Press, Washington, D.C.
7. Sundara Rajan. S, (1998). Introduction to cell biology, Vikas Publishing House, PVT, LTD, New Delhi.

Course outcomes

- CO1: Understand the basic fundamental principles of cell biology.
CO2: Understand the structure and functions of various cell organelles and how there is a coordination in the basic unit of life.
CO3: Understand and gain knowledge about the cells and their functions.
CO4: Acquire knowledge about the types of cell division and their significance.
CO5: Learn the cell cycle and characters of cancer cell lines.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

Core - VI – CELL BIOLOGY PRACTICAL

Course Code	:U21ZC306P		
Practical Hours	: 3	Credits	: 2
Exam Hours	: 3	Marks	: 40+60

Major Practical

1. Onion root tip- Squash preparation and study of mitotic stages
2. Mounting of polytene chromosome in chironomous larva.
3. Measurement of cells using stage and ocular micrometers.

Minor practical

1. Handling of dissection and compound microscopes
2. Preparation and observation of squamous epithelial cells.
3. Separation of cells from chicken liver tissue or blood using centrifugation.

Spotters: Epithelial (3 types), muscular (3 types), Vascular (2 types) and nervous tissues.
Centrifuge, Electrophoresis, Cell cycle, USB Camera.

Course outcomes

CO1: Acquire knowledge of handle microscopes.

CO2: Familiarize with cellular structure and functions.

CO3: Understand the events in cell division.

CO4: Understand the different structure and functions of various tissues.

CO5: Update the knowledge of principle and application of different equipments used in cell biology labs.

QUESTION PAPER PATTERN

Exam Hours	: 3	Max.marks:60
QUESTION NO.I – Major Practical		15 Marks
QUESTION NO.II – Minor Practical		10 Marks
QUESTION NO.IV – 4 Spotters		5 X 4 MARKS =20 Marks
Record		10 Marks
Viva		5 Marks

PART-IV -VERMICULTURE – NMEC I

Theory Hours	: 2	Course Code	: U21Z3NME1:1
Practical Hours	: --	Credits	:2
Exam Hours	: 3	Marks	: 25+75

Objectives: To inculcate the knowledge on the importance of Vermiculture (Earthworms) with special emphasis on morphological, anatomical characters, selection of suitable earthworm, soil condition, small and large scale vermicomposting and their beneficial application in agriculture and horticulture.

UNIT- I

Earthworms - Morphological and anatomical characteristics - Ecological Classification - Saprophages, Geophages, Epigeic, Endogeic and Anaecic forms.

UNIT – II

Selection of suitable earthworm species for vermicomposting - Biology of composting earthworms - *Eudrilus eugeniae* and *Lampito mauritii*.

UNIT - III

Soil organic matter decomposition - earthworms and humus formation - Sources of organic wastes - problems in traditional composting - Importance of vermicomposting.

UNIT - IV

Vermiculture and Vermicomposting - small scale and large scale vermicomposting-requirements - phases - methods: Pit, Box, Heap and windrow - collection of vermicompost and vermicast - Principles - Precautions - Factors affecting vermicomposting.

UNIT- V

Applications of vermicompost in agricultural and horticultural practices - Economics of vermicomposting - Financial supports - Eligibility for financial support.

References Books:

1. Ramalingam R (2006). Manpuzhu valarppu. Tamil Nadu Higher Education Board, Chennai.
2. Edwards C.A and P.J. Bohlen (1996). Ecology of Earthworms. 3rd Edition. Chapman and Hall.
3. Ismail S.A (1970). Vermicology. The Biology of Earthworms. Orient Longman, London.
4. Lee K.E (1985). Earthworms - Their ecology and Relationship with soil and Land use. Academic Press. Sydney.

Course outcomes

CO1: Acquire knowledge of classification and characteristics of earthworms.

CO2: Learn the biology of earthworm and species selection for vermicompost.

CO3: Understand the importance of traditional and modern vermicomposting.

CO4: Acquire knowledge of vermiculture and its vermicomposing.

CO5: Understand the role of economic importance of vermicompost for agriculture and horticulture, self employment and finance assistance from funding agencies.

QUESTION PATTERN

THEORY - 5 QUESTIONS X 15 MARKS (EITHER OR PATTERN) = **75** MARKS

BASIC MEDICAL KNOWLEDGE – NMEC I

Theory Hours	: 2	Course Code	: U21Z3NME1:2
Practical Hours	: --	Credits	:2
Exam Hours	: 3	Marks	: 25+75

Objective: To make knowledge on importance of basic medical with reference to blood test analysis, biochemical studies (including blood and urine) and pregnancy test using the application of medical instruments for the benefit of mankind.

UNIT-I

Basic Blood tests- complete blood count, white blood cell count, differential WBC count, RBC count, hematocrit, packed cell volume, hemoglobin, Erythrocyte sedimentation rate, platelet count. Bleeding time, clotting time, Hemostasis and Coagulation.

UNIT-II

Biochemical studies – Blood glucose-fasting and post prandial, Glucose tolerance test.

Thyroid function test – free thyroxine T3 and T4 TSH.

Lipo protein test – Total cholesterol HDL, LDL, VLDL, Triglycerides.

Liver function test.

UNIT-III

Urine analysis – Routine analysis – Urine volume, colour, urine protein, bilirubin, urobilinogen. Renal function test.

UNIT-IV

Pregnancy – Ultra sound scan – Amniocentesis. Amniotic fluid analysis.

UNIT-V

Types of endoscopy, ECG, EEG, CT scan, MRI scan.

Reference Books:

1. Frances Fischbach and Marshall B. Dunning (2014). A manual of laboratory and diagnostic test. Fifth edition, LWW Publisher, Lippincott.
2. Ditmer W.M Norwalk, CT, Appleton and Lane et al, (1992). Pocket Guide to Diagnostic test.
3. Fischbach FT., Philadelphia and JB Lippincott (1995). Quik Reference to common laboratory and Diagnostic Tests.

4. Wallach J (1992). Interpretation of Diagnostic tests. Fifth edition. Boston, little, Bronn and co.

Course outcomes

CO1: Understand the significance of importance of routine blood tests and investigations.

CO2: Gain the knowledge of blood glucose, thyroxine, lipo-protien and liver function tests.

CO3: Learn the routine urine and renal function tests.

CO4: Understand Pregnancy and amniotic fluid tests.

CO5: Acquire the knowledge of radiological Analysis including CT, MRI scan.

QUESTION PATTERN

THEORY - 5 QUESTIONS X 15 MARKS (EITHER OR PATTERN) = **75** MARKS

SELF STUDY COURSE

(Offered for all III year Undergraduate students from 2017 – 2018 on wards)

Title of the course: Mathematical Aptitude For Competitive Exam

Theory Hours	: --	Course Code	: U213SS1
Practical Hours	: --	Credits	:2
Exam Hours	: 2	Marks	:100

UNIT I :

H.C.F and L.C.M of numbers - problems on factors and Multiples – Factorization method – Division method – Finding H.C.F of more than two numbers – Factorization methods finding L.C.M – Common division method (L.C.M) – Co-prime – Comparison of fractions.

UNIT II :

Profit and Loss – Problems under cost price, selling price and gain or loss. Ratio – comparison of ratio and compounded ratio – proportion – Fourth proportional, Third proportional and mean proportional – Variation.

UNIT III :

Problems on Time and Work – Problems on Time and Distance.

UNIT IV :

True Discount – Problems under sum due, present worth, true discount – Problems on Banker's Discount, Banker's gain

UNIT V :

Heights and distances – Problems under Trigonometrical identities, Values of T-ratios angle elevation and angle of depression – Problems on Odd man out and Series.

TEXT BOOK :

1. Dr. R.S. Aggarwal Quantitive aptitude for Competitative Examinations, S. Chand & Company LED, Ram Nagar, New Delhi – 110 055.

UNIT I :chapter :2

UNIT II :chapter : 11 and 12

UNIT III :chapter 15 and 17

UNIT IV :chapter 32 and 33

UNIT V :chapter :34 & 35

References :

1. Arojamt 'Expert team', Clerical cadre assistants and stenographers recruitment exam, Arihant publications India limited.
2. R. Gopal, J.V. Subramany, M.Uma Bala 'Arithmetic and Quantitative Aptitude for Competitive Exams' Sura Books (PVT) Ltd.Chennai.

QUESTION PAPER PATTERN

100 x1 = 100 - (20 Questions from each Unit) - (Objective Type(15 Questions), Match the following (3Questions), Assertion and Reasoning (2 Questions)

**IV SEMESTER
ENVIRONMENTAL BIOLOGY**

Theory Hours	: 5	Course Code	:U21ZC407
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To imbibe the knowledge on the Environment - their general principles, definition and scope, which influence the living organism through ecosystem structure and components, various habitats, sources of pollution and conservation of wild life.

UNIT - I

Ecology: Definition, scope and branches. Abiotic factors: water, soil, temperature, light. Biotic factors: Animal relationship - symbiosis, commensalism, mutualism, antagonism, antibiosis, parasitism, predation and competition.

UNIT - II

Ecosystem: Definition, ecological hierarchy, A typical ecosystem: Pond ecosystem, Primary production, Secondary production, food chains, food web, Trophic levels, energy flow, pyramids of biomass and energy - Biogeochemical cycles- nitrogen and phosphorus.

UNIT - III

Community ecology: Types and characteristics - stratification - community interdependence - ecotone - edge effect - ecological niche - ecological succession. Population ecology: Definition, density, natality, mortality, age distribution, age pyramids, population growth, population equilibrium, biotic potential, dispersion and fluctuation.

UNIT - IV

Habitat Ecology: Habitat characteristics and fauna and its adaptation in rivers, muddy, rocky, mangroves, estuaries and deep sea, forest, desert and cave.

UNIT - V

Environmental pollution - sources, effects of air, water, soil and noise pollution.
Bio accumulation, bio magnification and bio remediation.
Wild life and conservation - IUCN categorization, *in situ* and *ex situ* conservation.

Reference Books:

- 1 Bernis Anandharaj (2016) Soolnilaiyiyal. Chrisolite publications. Adyar, Chennai.
- 2 Odum E.P (1971). Fundamentals of ecology. W.B Saunders Company, Philadelphia.
- 3 Kendeigh S.C (1961). Animal ecology. Prentice Hall.
- 4 Clarks GL (1954). Elements of Ecology. John Wiley and sons, Newyork.
- 5 Purohit S.S., Shami DH and A.K Agarval (2004). Environmental sciences - A new approach. Agrobi, Jodhpur.
- 6 Krishnamurthy K.V (2003). Introduction to Biodiversity. Oxford and IBH.

Course outcomes

CO1: Understand the basic theories and principles of ecology.

CO2: Learn current environmental issues based on ecological impacts.

CO3: Gain critical understanding of human impacts on environment.

CO4: Develop positive attitude towards biodiversity and conservation.

CO5: Understand how animals are adapted to their habit and habitat.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

PART-VII -ENVIRONMENTAL BIOLOGY PRACTICAL

Course Code	:U21ZC408P		
Practical Hours	: 3	Credits	: 2
Exam Hours	: 3	Marks	: 40+60

Major Practical

1. Estimation of Dissolved oxygen.
2. Estimation of salinity
3. Estimation of soil pH and moisture.

Minor practical

4. Collection and observation of freshwater planktons.
5. Observation of marine planktons.
6. Construction of a food web diagram based on a local visit and collected samples.

Spotters: pH meter, Water analyzer, Sacchi disc, Sandy, Muddy and Rocky shore fauna.

Course outcomes

CO1: Student obtains the ability to analyze different water quality parameters so they get real practical knowledge about it.

CO2: Students get experience, knowledge and awareness related to ecosystem through field visits.

CO3: Practical knowledge on observation and identification of fresh water planktons.

CO4. Obtain practical knowledge on the eat and to be eaten concept.

QUESTION PAPER PATTERN

Exam Hours	: 5	Max.marks:60
QUESTION NO.I – Major Practical		15 Marks
QUESTION NO.II – Minor Practical		10 Marks
QUESTION NO.IV – 4 Spotters		5 X 4 MARKS =20 Marks
Record		10 Marks
Viva		5 Marks

NMEC II – APICULTURE

Theory Hours	: 2	Course Code: U21Z4NME2:1
Practical Hours	: --	Credits :2
Exam Hours	: 3	Marks : 25+75

Objectives: To comprehend the knowledge on honey bees species, colonies; natural and artificial lives; apiary care and management, natural enemies and diseases of honey bees and management; honey extractors and nutritive and medicinal values; prospectus of apiculture and funding agencies for financial support.

UNIT – I

Honey Bee: Systematic position - species of honey Bees. Bee Colony, Castes. Natural colonies.

UNIT - II

Types of Bee hives - Structure of natural beehive. Artificial beehive - different types.

UNIT - III

Apiary care and Management - selection of sites - Catching and transforming a colony - Handling and maintenance of the colony - Natural enemies and diseases of honey bees and control methods.

UNIT - IV

Instruments employed in Apiary. Newton's hive, honey extractors and smokers.
Honey: Extraction - Chemical composition - nutritive and medicinal values.

UNIT - V

Present status of apiculture in India. Prospectus of apiculture as self employment venture.
Preparing proposal (Layout and budget) for financial assistance from funding agencies.

Reference Books:

1. Mishra R.C (1985). Honey bees and their management in India. ICAR.
2. Morse R.A (1990). The ABC and XYZ of Bee culture. 40th edn. A. I. Root and Co., Ohio
3. Rare S (1998). Introduction to Bee keeping. Vikas Publishing House.
4. Singh S (1982). Bee keeping. ICAR.
5. Sharma P and L Singh (1987). Hand book of bee keeping. Controller printing and Stationery, Chandigarh.

Course outcomes

CO1: Understand and acquire the knowledge of taxonomy of honey bees to identify the species level.

CO2: Learn the identification of the types of bee hives.

CO3: Gain the knowledge of handling and maintenance of the colony.

CO4: Understand the extraction of honey and its medicinal values.

CO5: Understand role of apiculture for self employment and get finance assistance from funding agencies.

QUESTION PATTERN

THEORY - 5 QUESTIONS X 15 MARKS (EITHER OR PATTERN) = **75 MARKS**

NMEC II – PUBLIC HEALTH AND HYGIENE

Theory Hours	: 2	Course Code:	U21Z4NME2:2
Practical Hours	: --	Credits	:2
Exam Hours	: 3	Marks	: 25+75

Objectives: To understand the health and hygiene, spreadable disease, non communicable diseases, individual health with nutritional requirements and hazard drugs.

UNIT- I

Introduction to health and hygiene – Mental and Physical Health. Hygiene and disease - TB, Typhoid, Cholera, Jaundice and HIV.

UNIT- II

Epidemiology of communicable diseases – air borne (small pox, tuberculosis) food and water borne diseases (food poisoning, amoebiasis) zoonoses (leptospirosis) arthropod borne (filariasis)

UNIT- III

Epidemiology of non - communicable diseases – Cancer, Diabetes.

UNIT- IV

Individual health – nutritional requirements (balanced diet, malnutrition) Mental health, personal hygiene, hazards of drugs, tobacco and alcohol.

UNIT- V

Community health – environment, housing plan, occupational health hazards, family planning, maternity and child care, health education.

Reference Books:

1. K. Park – Text book of Social and Prevention medicines.

Course outcomes

CO1: Understand the health and hygiene for disease.

CO2: Learn the communicable diseases.

CO3: Gain the knowledge on Non-spreadable diseases.

CO4: Acquire knowledge on nutritional requirements for individuals and hazard drugs.

CO5: Understand role of community health.

QUESTION PATTERN

THEORY - 5 QUESTIONS X 15 MARKS (EITHER OR PATTERN) = **75** MARKS

SKILL BASED ELECTIVE COURSE I – VERMITECHNOLOGY

	COURSE CODE : U214ZOSE1		Credits : 2 Marks		TOTAL
	Instruction Hours	Exam hours	Internal	External	
Theory	1	2	20	-	100
Practical	1	2	20	60	

Objectives: To acquire the knowledge on the culture of earthworm for the effective agriculture practices through vermitechique methods.

UNIT- I

Earthworms - Morphological and anatomical characteristics - Ecological Classification - Saprophages, Geophages, Epigeic, Endogeic and Anaecic forms - Selection of suitable earthworm species for vermicomposting.

UNIT – II

Vermiculture and Vermicomposting - small scale and large scale vermicomposting-requirements - phases - methods: Pit, Box, Heap and windrow - collection of vermicompost and vermicast - Principles - Precautions - Fctors affecting vermicomposting.

UNIT- III

Applications of vermicompost in agricultural and horticultural practices - Importance of vermicomposting - Economics of vermicomposting - Financial supports - Financial supports for Vermicompost - Khadi and Village Industries Commission (KVIC) -National Bank for Agriculture and Rural Development (NABARD) - eligibility for financial support.

PRACTICAL

UNIT- IV

1. Identification of earthworm species (Epigeic, Endogeic and Anecic)
2. Preparation and maintenance of vermicompost.
3. Collection of vermicast.
4. Collection of cocoon.
5. Collection of hatchlings.

UNIT- IV

1. Collection of organic wastes..
2. Preparation of vermicompost bed.
3. Preparation of feed and managements.
4. Visit a vermiculture unit.
5. Submission of vermicompost report.

References Books:

1. Edwards C.A and P.J Bohlen (1996). Ecology of Earthworms. 3rd Edition. Chapman and Hall.
2. Ismail S.A (1970). Vermicology. The Biology of Earthworms. Orient Longman, London.
3. Lee K.E (1985). Earthworms – Their ecology and Relationship with soil and Land use. Academic Press. Sydney.

Course Outcomes:

CO1: Acquire knowledge of classification and characteristics of earthworms.

CO2: Learn the biology of earthworm and species selection for vermicompost.

CO3: Understand the importance of traditional and modern vermicomposting.

CO4: Understand and acquire knowledge of vermiculture.

CO5: Understand the role on economic importance of vermicompost for agriculture and horticulture, self employment and get finance assistance from funding agencies.

QUESTION PATTERN

THEORY - 5 X 2=10 MARKS, 2 X 5=10 MARKS(TWO OUT OF FIVE)

PRACTICAL – 60 MARKS

ONE MAJOR PRACTICAL FOR 20 MARKS AND

ONE MINOR PRACTICAL FOR 10 MARKS +RECORD 10+VIVA-5 +SUBMISSION OF VERMICOMPOST =15

SELF STUDY COURSE - II
SOCIAL STUDIES FOR COMPETITIVE EXAMINATION

Theory Hours : -

Course Code : U214SS2

Practical Hours: -

Credits : 2

Exam Hours : 2

Marks : 100

Objectives:

- To Understand the geographical features.
- To gain knowledge of Cultures.
- To motivate them to know the Indian economy.

UNIT- I: GEOGRAPHY:

Earth and Universe-Solar system-Monsoon, rainfall, weather & climate Water resources -- rivers in India-Soil, minerals & natural resources-Forest & wildlife-Agricultural patternTransport including surface transport & communication-Social geography - population density and distribution Natural calamities - Disaster Management.

UNIT - II: HISTORY AND CULTURE OF INDIA AND TAMIL NADU:

Indus Valley civilization-Guptas, Delhi Sultans, Mughals and Marathas-Age of Vijayanagaram and the bahmanis-South Indian history-Culture and Heritage of Tamil people-India since independence-Characteristics of Indian culture-Unity in diversity - race, colour, language, custom-India- as secular state-Growth of rationalist, Dravidian movement in TN- Political parties and populist schemes.

UNIT-III: INDIAN POLITY:

Constitution of India--Preamble to the constitution- Salient features of constitution Union, state and territory- Citizenship-rights amend duties Fundamental rights Fundamental duties- Human rights charter- Union legislature Parliament- State executive- State Legislature - assembly- Local government - panchayat raj - Tamil Nadu Judiciary in India - Rule of law/Due process of law-Elections- Official language and Schedule- VIII Corruption in public life- Anti-corruption measures - CVC, lok- adalats, Ombudsman, CAG - Right to information- Empowerment of women Consumer protection forms.

UNIT-IV: INDIAN ECONOMY:

Nature of Indian economy- Five-year plan models-an assessment - Land reforms & agriculture-Application of science in agriculture Industrial growth Rural welfare oriented programmers - Social sector problems - population, education, health, employment, poverty - Economic trends in Tamil Nadu.

UNIT-V: INDIAN NATIONAL MOVEMENT :

National renaissance - Emergence of national leaders Gandhi, Nehru, Tagore - Different modes of agitations-Role of Tamil Nadu in freedom struggle Rajaji, VOC, Periyar, Bharathiar & others.

Course Outcomes :

On the completion of the course, students will be able to,

CO 1 : Understand the natural sources and its value.

CO 2 : Asses the culture and heritage of India under different dynasties

CO 3 : Analyse the constitutional laws and its importance.

QUESTION PAPER PATTERN

100 x1 = 100 - (20 Questions from each Unit) - (Objective Type(15 Questions), Match the following (3Questions), Assertion and Reasoning (2 Questions)
--

V SEMESTER

CORE COURSE IX– EVOLUTION

Theory Hours	: 5	Course Code	: U21ZC509
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To understand the scientific principles and concepts of animal evolution by means of understanding their evidences, mechanism and animal distribution passing the way forward greater evolution including man.

UNIT – I

Theories of Origin of life - abiogenesis, biogenesis, cosmozoic theory, special creation theory, Theory of biochemical origin of life.

Theories of Evolution: Lamarckism, Darwinism, Devries theory of mutation and modern synthetic theory of evolution.

UNIT – II

Geological time scale.

Evidences of evolution - Anatomical, Embryological, Biochemical Paleantological (Fossils, fossilization), living fossils (Limulus and Nautilus) and connecting links (Peripatus, and Balanoglossus, Archeopteryx).

Patterns of evolution - sequential, convergent, divergent, straight-line evolution.

UNIT-III

Types of Evolution- Micro, Macro, Mega, Quantum, Monophyletic, Polyphyletic, Parallel and iterative evolution.

Species Concept, Speciation - types, factors influencing speciation.

Isolating mechanisms.

Mimicry and coloration.

UNIT- IV

Mutation: Gene Mutation, Chromosomal mutations - Structural and numerical.

Population Genetics: Hardy Weinberg principle, Factors affecting Hardy Weinberg equilibrium.

UNIT-V

Animal distribution - continuous and discontinuous. Evolution of horse. Human evolution - Biological and Cultural evolution of man.

Reference Books:

1. Darwin C (1872). The origin of species. Grolier Enterprises Corp, USA.
2. Savage G.M (1979). Evolution. CMS Printing press.
3. Rastogi VB. (1985). Organic Evolution. Kedarnath and Ramnath press.
4. Strickberger M.W (2000). Evolution. Jones and Barlett publishers.
5. Hall,B.J(1992).Evolutionary developmental Biology. New York,Chapan and Hall
6. Roff D.A.(1992) The Evolution of life Histories,New York, Chapan and Hall

Course outcomes

CO 1: Understand the Origin of Life through several Theories proposed by Biologists

CO 2: Learn the significance fossils through Geological Times

CO 3: Gain knowledge on the types of evolution through the factors influencing speciation,
isolating mechanism, mimicry & coloration

CO 4: Learn the impact of mutation through mathematical application

CO 5: Acquire knowledge on the distribution of animals and human evolution.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

CORE COURSE X– DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY

Theory Hours	: 5	Course Code	:U21ZC510
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To inculcate the present perspective on the development of animal embryos of various taxonomic groups through experimental analysis using modern biological tools and also to understand the immune system of living organism.

UNIT – I

Historical perspective - Aim and scope of Developmental Biology.

Gametogenesis - Spermatogenesis and Oogenesis, Vitellogenesis, Egg membranes.

Fertilization - Sperm - Egg interaction (acrosome reaction), biochemical events, post Fertilization events.

Parthenogenesis.

UNIT – II

Types of animal eggs.

Cleavage - Patterns of cleavage, Blastulation and gastrulation in frog and chick.

Cell lineage, fatemap. Differentiation - Organizer concept, Competence, Nuclear transplantation.

UNIT – III

Organogenesis of eye and ear in frog.

Extra embryonic membranes in chick and physiology of placenta in Mammals.

Metamorphosis in frog - Regeneration in Invertebrates and limb of salamander - Concept of Test tube baby.

UNIT – IV

Immunology: Immunity - Types of Immunity.

Lymphoid organs - Types, Function, Organization.

Lymphoid cells, Antigen - Antibody - structure and type.

Antigen antibody reaction.

UNIT – V

Immune Response: Humoral and cell Mediated.

Transplantation Immunology: Types of Grafts. Mechanism of Allograft Rejection, Auto Immunity - Rheumatoid Arthritis.

Hypersensitivity - Types.

Reference Books:

1. Verma P.S and V.K Agarwal (1975). Chordate Embryology. Published by S. Chand and Company
2. Chandrasekaran R and Thiagarajan (2012). Developmental Biology. Sri Murugan Publications.
3. Rastogi Balinsky. (2012). Introduction to Embryology. WBSAUNDER CO.
4. Scott F.Gilbert (2013). Developmental Biology. SINAUER Associates, INC.10th Edtn.
5. Lewis Wolpert (2009). A Very Short Introduction for Developmental Biology. Oxford Publications.
6. Arumugam.N (2017). A Text Book of Embryology, Sara Publications.

Course outcomes

CO1: Understand the basic concepts and events in developmental biology.

CO2: Acquire the information on types of eggs, and gain knowledge how life is forming from a cell and organs are forming from a ball of cells during organogenesis.

CO3: Some related topics like metamorphosis, regeneration and concept of test tube baby are made to understand.

CO4: Understand the immune system, immune cell, immunogen, antibodies, antigen – antibody interaction.

CO5: Acquire knowledge of immune response, types of grafts, autoimmunity and hypersensitivity.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

CORE - XI – ANIMAL PHYSIOLOGY

Theory Hours	: 5	Course Code	:U21ZC511
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+7

Objectives: To acquire knowledge on the structure and functions of animals - their body parts, organs and behaviour through understanding of their nutrition, respiration, circulation, excretion, endocrine system with physico - chemical coordination.

UNIT – I

Food and Nutrition: Physiological importance of carbohydrates. Proteins, Lipids, Vitamins and Minerals, Balanced diet - Malnutrition.

Digestion: Feeding mechanisms - Microphages, Liquid Feeders. Types of Digestion, Mechanism of Digestion, Gastro Intestinal Hormones

Absorption and assimilation in Man.

UNIT – II

Respiration: Structure of lungs, Respiratory pigments in animals, Transport of O₂ and CO₂ in man.

Circulation: Blood - Composition, function and clotting.

Heart – structure and function of human heart.

UNIT – III

Excretion: Types of Excretion - Excretory products.

Excretion in mammals - Structure of Kidney, nephron. Mechanism of Urine formation.

Osmoregulation: Euryhaline, stenohaline, osmoregulators and Osmo conformers.

Osmoregulation in freshwater and marine.

UNIT – IV

Muscles: Types of muscles, ultra structure of skeletal muscle - Properties and mechanism of muscle contraction - sliding filament theory.

Nervous system: Types of neuron - structure of neuron - conduction of nerve impulse - reflex action - Neurotransmitters.

Receptor - Types of Receptors - Structure of photo and phono receptors.

UNIT – V

Endocrine gland - structure and functions of pituitary, thyroid, parathyroid, Islets of langerhans, adrenal, sex glands, thymus, pineal gland.

Reproduction: Types of reproduction –

Reproduction in man - Reproductive cycle - Hormonal control.

Reference Books:

1. Agarwal RA (1998). Animal physiology and biochemistry. S. Chand publication, Ahil. K. Srivastava Ramnagar, Kaushal kumar, New Delhi.
2. Bernis Anandharaj (2014)., Udarcheyaliyal. Chrisolite publications. Adyar,Chennai.
3. Guyton and Hallm (2009). Textbook of Medical physiology. IX ed WB. Saunders Publication.
4. Hoar W.S (1983). General and Comparative physiology. Prentice Hall of India.
5. Harper H.A (1993). Review of Physiological chemistry. Muruzen Asian Ed.
6. Hill,Richard W,Golden A.Wyse and margeret Anderson (2008)Animal physiology.
7. Berry A.K.(2008) Animal physiology Emkay publications,New delhi.

Course Outcomes:

CO1: Understand the physiological properties of bio molecules and understanding digestion, absorption and assimilation of food.

CO2: Learn the mechanism of respiration and blood circulation in man.

CO3: Detailed understanding of excretion in man and osmoregulation of freshwater, marine and terrestrial animals.

Co4: Acquires a clear understanding of structure, mechanism of muscles contraction, transmission of nerve impulses and photo and phono-receptors.

CO5: Gain knowledge on the structure, function of endocrine glands and regulation of reproduction in man.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

XII- PRACTICAL

EVOLUTION, DEVELOPMENTAL BIOLOGY, IMMUNOLOGY, ANIMAL PHYSIOLOGY AND BIostatISTICS

Course Code	:U21ZC512P		
Practical Hours	: 6	Credits	: 4
Exam Hours	: 3	Marks	: 40+60

Evolution

1. Animals of evolutionary significance - Peripatus, Archaeopteryx.
2. Homologous organ - Fore Limb modification.
3. Analogous organ - Wings of insect and bird.
4. Colouration - Chameleon, Lycodon and Krait.
5. Mimicry - Leaf insect, Stick insect, Monarch and Viceroy Butterfly.

Developmental Biology

1. Observation of prepared micro slides to study the following.
Frog: Egg, Cleavage, Blastula, Yolk Plug stage.
Chick: Egg, Developmental stages 24, 48, 72, 96hrs.
2. Yolk sac placenta.

Animal Physiology

1. Salivary amylase activity of human saliva in relation to Temperature.
2. Qualitative tests for Ammonia, Urea and uric acid.
3. Enumeration of RBC.
4. Enumeration of WBC.
5. Haemoglobinometer, Kymograph, Sphygmomanometer (Spotters).
6. Models of haemoglobin and ATP.

Immunology

- Dissections – Immunological Organs in fish (demonstration only).
ABO Blood grouping.
Spotters: IgG and Thymus.

Biostatistics

- Calculation mean, median, mode, standard deviation, Standard error for any one animal data.
Diagrammatic representation (Pie and Bar) of data collected among class students (Hb, Height, Weight).

Course outcomes

CO 1: Acquire knowledge on the evolutionary significant animals; and role of adaptation in evolution.

CO 2: Gather experience about the embryonic developmental stages

CO 3: Understand the role of enzymes in digestion and obtain skills for clinical lab tests.

CO 4: obtain skills to dissect out immunological Organs in fish and immunological techniques.

CO 5: Acquire the skill to apply statistical tools in biological samples.

QUESTION PAPER PATTERN

Exam Hours : 5

Max.marks:60

QUESTION NO.I – Major Practical

15 Marks

QUESTION NO.II – Minor Practical

10 Marks

QUESTION NO.IV – 4 Spotters

5 X 4 MARKS =20 Marks

Record

10 Marks

Viva

5 Marks

MAJOR BASED ELECTIVE COURSE I – (1) BIOSTATISTICS

Theory Hours	: 5	Course Code	:U21Z5MBE1:1
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To comprehend the knowledge on methods of data collection and analysis in biostatistics, tabulation of data and types of presentation, measures the tendency of data and hypothesis testing of data.

UNIT - I

Biostatistics: Introduction, Definition and Scope. Methods of data Collection - primary and secondary data, Variables and types, Sampling techniques. Functions of statistics and limitations of statistics.

UNIT - II

Processing of data: classification and tabulation of data. Presentation of Data. Diagrammatic (Bar and Pie) and graphical presentation (Histogram, Frequency curve, Frequency polygon).

UNIT - III

Analysis of Data: Measures of central tendency - mean, median, mode.

UNIT - IV

Measures of dispersion: SD, SE, Variance and Co-efficient of Variation - Correlation (Karl Pearson) and Regression (Simple Linear).

UNIT - V

Hypothesis testing: Introduction to test of significance - Chi square test, Students t-Test (based on mean with two samples, Testing correlation co-efficient and paired t-Test), ANOVA - one way.

Introduction to statistical packages – SPSS.

Reference Books:

1. Ramakrishnan P (1996). Biostatistics. Saras publications, Nagercoil.
2. Dr. Gurusamy M.P., Dr. Kamsa Mohaideen. M and Prof. Kamalraj M (2011). 14th edition Statistics. Vannan publications, Sivakasi.
3. Ramachandran V (2007). Biostatistics. Vol-I and II. Nithyaas printers, Chennai.
4. Arora.P.N (1998). Biostatistics. Himalaya Publishing House.
5. Sokal.R.J and Rohlf. S.J(1981). Introduction to Biostatistics, W.H. Freeman, London.

Course outcomes

CO1: Acquire the knowledge of biostatistics and sampling.

CO2: Understand the processing and presentation of data.

CO3: Learn to measure the central tendency and variance

CO4: Understand the measures of dispersions, correlation and regression.

CO5: Understand the hypothesis of testing, ANOVA and basics of SPSS.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

MAJOR BASED ELECTIVE COURSE I – (2) AGRICULTURAL PEST MANAGEMENT

Theory Hours	: 5	Course Code	:U21Z5MBE1:2
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To understand the types of plant damaging insects, pests for specific crops, types of pest control methods, damage causing birds and beneficial birds for crops.

UNIT – I

Introduction - Types of damage to plants by Insects - Direct and indirect effects - Types of insect pest - Assessment of insect population.

UNIT – II

Insect pests of crops – paddy (planthopper, stem borer, leaf roller), sugar cane (root borer, early shoot borer, top shoot borer), Coconut (black head caterpillar, red caterpillar, red palm weevil, rhinoceros beetle) and Cotton (American bollworm, tobacco caterpillar, Cotton aphids).

UNIT – III

Methods used in pest control - Physical, mechanical, chemical and Biological methods used to control insect pests, IPM - Biological pesticides NPV, CVP- Predators Bell.

UNIT – IV

Birds: Damage causing birds - Parakeet, Munia, Sparrow, Pigeon, biological control measures - Beneficial birds: bee - eater, drango and owls.

UNIT – V

Field Rodents - Biology and control measures of Bandicoot, soft furred filed rat, Field mouse, Indian gerbil and house rats.

Reference Books:

1. Chapman R.F (1993). The Insects. Structure and Functions. ELBS. London
2. Chandler A.C and C.P Read (1961). Introduction to Parasitology. John Wiley and Sons, New York.
3. David B.V., Muralirangan N.C and Meera Muralirangan (1992). Hamful and beneficial Insects. Popular book Depot.
4. David B.V and T. Kumaraswami (1998). Elements of Economic Endomology. Popular Book Depot., Chennai.
5. David B.V (1992). Pest management and Pesticides. Indian Scenario Namrutha publications.
6. Krishnan N.T (1993). Ecolomic Entomology. J.J. Publications, Chennai.
7. Mani M.S (1973). General Entomology. Oxford and Delhi.
8. Nayar K.K., Ananthkrishnan T.N and David, V.D (1990). General and applied Entomology. Tata Mc Grow Hill. New Delhi.

Course outcomes

Co1: Understand the types of damages and its effects by insects in plants, types of pest and its assessment.

Co2: Gain the knowledge on damage of paddy, sugar cane, Coconut and Cotton.

Co3: Learn the techniques of pest control, biological pesticides, predators Bell.

Co4: Understand the crop damage by birds and biological control measures.

Co5: Acquire the knowledge on biology and control measures of Rodents.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

MAJOR BASED ELECTIVE COURSE I – (3) APICULTURE

Theory Hours	: 5	Course Code	:U21Z5MBE1:3
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To comprehend the knowledge on honey bees species, colonies; natural and artificial lives; apiary care and management, natural enemies and diseases of honey bees and management; honey extractors and nutritive and medicinal values; prospectus of apiculture and funding agencies for financial support.

UNIT – I

Honey Bee: Systematic position - species of honey Bees. Bee Colony, Castes. Natural colonies.

UNIT - II

Types of Bee hives - Structure of natural beehive. Artificial beehive - different types.

UNIT - III

Apiary care and Management - selection of sites - Catching and transforming a colony - Handling and maintenance of the colony - Natural enemies and diseases of honey bees and control methods.

UNIT - IV

Instruments employed in Apiary. Newton's hive, honey extractors and smokers.

Honey: Extraction - Chemical composition - nutritive and medicinal values.

UNIT - V

Present status of apiculture in India. Prospectus of apiculture as self employment venture.

Preparing proposal (Layout and budget) for financial assistance from funding agencies.

Reference Books:

1. Cherian R and K. Ramanathan (1992). Bee Keeping in India.
2. Mishra R.C (1985). Honey bees and their management in India. ICAR.
3. Morse R.A (1990). The ABC and XYZ of Bee culture. 40th edn. A. I. Root and Co., Ohio (check).
4. Rare S (1998). Introduction to Bee keeping. Vikas Publishing House.
5. Singh S (1982). Bee keeping. ICAR.
6. Sharma P and L Singh (1987). Hand book of bee keeping. Controller printing and Stationery, Chandigarh.

Course outcomes

CO1: Understand and acquire the knowledge of taxonomy of honey bees to identify the species level.

CO2: Learn the identification of the types of bee hives.

CO3: Gain the knowledge of handling and maintenance of the colony.

CO4: Understand the extraction of honey and its medicinal values.

CO5: Understand role of apiculture for self employment and get finance assistance from funding agencies.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

SKILL BASED ELECTIVE COURSE - II

AQUARIUM FISH KEEPING

	COURSE CODE : U215ZOSE2		Credits : 2 Marks		TOTAL
	Instruction Hours	Exam hours	Internal	External	
Theory	1	2	20	-	100
Practical	1	2	20	60	

(1 Hour Theory and 1 Hour Practical)

Objectives: To learn the culture practices and methods in ornamental fishes along with popular ornamental fishes, mass production through breeding techniques, food and feeding and disease management.

UNIT -1

Importance and scope of the ornamental fish culture - commercial and potential values of ornamental fish farming in the world and in India. Significance features of ornamental fishes (Zebra Fish, Gold Fish, Angel fish, Molly and Guppy),

UNIT-II

Feeding recruitment for ornamental fishes, Mass production of fancy fishes through fish farming- Preparation for breeding, Live feed culture: rotifers, tubifex, artemia and artificial feed production: ingredients, pelletizer.

UNIT – III

Aquarium design, construction and preparation- Size, Shape, Substrate, Ornamental aquatic plants, hood and lights, nets, suction tube and maintenance of water quality: controlling ammonia, pH, Disease management: common viral (lymphocytosis), bacterial (fin rot, fish dropsy, pop eye), fungal (saprolegnia) and parasites (velvet disease, head and lateral line erosion) infections and their treatment and control.

PRACTICAL

UNIT- IV

1. Identification of hatchling and fingerlings of ornamental fish species.
2. Identification of male and female of ornamental fish species.
3. Reproduction: induced breeding
4. Techniques of live feed culture: rotifers, tubifex, artemia.
5. Formulated feed preparations – pellet.

UNIT- V

1. Aquarium tank designing.
2. Water quality parameters: temperature, DO, salinity, pH and ammonia.
3. Identification of diseased fishes with morphological changes.
4. Control measures for diseases.
5. Report submission based on field visit – Fish farm/Feed mill

References Books:

1. Rath R.K (2000). Fresh water aquaculture. Scientific Publishers (India). P) O Box 91, Jodhpur.
2. Jhingaran AVG (1991). Fish and fisheries of India. Hindustan Publication Company.
3. Jameson, JD and R Santhanam (1996). Manual of ornamental fishes and farming technology. Fisheries College and Research Institute, Thoothukudi
4. Michael Beazley (1998). Complete guide to tropical aquarium fish care. Read and consume book Ltd. London.

Course outcomes

CO1: Understand the scope and commercial values of ornamental fishes, morphological characteristics of some important ornamental fish species.

CO2: Learn the feeding regime, breeding, mass production, live feed culture techniques and synthetic feed preparation.

CO3: Gain the knowledge of tank designing, maintenance of water quality parameters and disease management.

CO4: Have practical knowledge about the male and female identifications, breeding techniques, live and synthetic feed productions.

CO5: Understand the hands on trainings in tank designing, water quality parameters, identify the pathogenic forms and its control measures.

QUESTION PATTERN

THEORY - 5 X 2=10 MARKS, 2 X 5=10 MARKS(TWO OUT OF FIVE)

PRACTICAL – 60 MARKS

ONE MAJOR PRACTICAL FOR 20 MARKS AND

ONE MINOR PRACTICAL FOR 10 MARKS +RECORD 10+VIVA-5 +SUBMISSION OF REPORT =15

SKILL BASED ELECTIVE COURSE-III

BASIC COMPUTER APPLICATION

Course Code	: U215ZOSE3		
Practical Hours	: 2	Credits	: 2
Exam Hours	: 2	Marks	: 40+6

Practical Hours: 2 hr

List of Practical

MS - word

1. Creating, editing, saving and printing text documents.
2. Font and Paragraph formatting
3. Simple character formatting
4. Inserting tables, smart art, Page breaks, images

MS - Excel

5. Creating, editing, saving and printing spreadsheets
6. Working with functions& formulae
7. Modifying worksheets with color & auto formats
8. Graphically representing data: Charts & Graphs

MS - Powerpoint

9. Opening , Viewing, Creating and printing Slides
10. Applying auto layouts
11. Adding custom animation
12. Using slide transitions
13. Inserting: Charts& Graphs
14. Creating Professional Slide for Presentation

Internet applications

15. Understanding how to use search engines
16. Bookmarking and visiting to a specific Website
17. Downloading internet contents
18. Copy and paste Internet content into your word and file and emails

Question Paper Pattern

One major Practical = 1 X 30 marks = 30

One minor practical = 1 X 15 marks = 15

Record = 10 marks

Viva = 5 marks

VI – SEMESTER

CORE COURSE XIII – GENETICS AND MOLECULAR BIOLOGY

Theory Hours	: 6	Course Code	:U21ZC613
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To comprehend the knowledge on the fine structure of genetic materials their regulation and action and to know the molecular aspects of DNA – fine structure, transcription, and translation.

UNIT- I

Genetics: Mendelian laws

Interaction of genes - complementary, supplementary, inhibitory and lethal. Multiple alleles
- ABO blood group system.

Linkage and Crossing over in *Drosophila* - types, mechanism

UNIT- II

Sexdetermination - Man, *drosophila* and *Bonellia*.

Sex linked inheritance, Sex limited and Sex influenced inheritance

Extra chromosomal inheritance – Shell coiling in *Limnae*, Kappa particles in *paramecium*.

UNIT - III

Human Genetics: Pedigree analysis, Karyotype - Autosomal and Sex chromosomal syndromes in man.

Inborn errors of metabolism with reference to phenylalanine metabolism, Sickle cell anemia. Eugeneics and Euthenics.

UNIT - IV

Molecular Biology:

DNA as the genetic material - Griffith experiment. Gene concept, Fine structure of DNA and RNA - DNA Replication.

UNIT - V

Transcription - Genetic Code - Translation.

Gene expression and regulation in prokaryotes.

Lac operon model.

Reference Books:

1. Verma P.S and V. K. Agarwal (1997). Genetics. S.chand and Co. New Delhi.
2. Bernis Ananandharaj (2006).Genetics.Chrisolite Publications.
3. Winchester A (2008). Genetics. Oxford and IBH Publications.
4. Sinnot Dunn and Dobzhansky (1998). Principles of genetics. Mc Graw Hill Co, London.
5. Elden J and Gardner (2006). Principles of Genetics. Wiley Eastern Publication.
6. Veer Bala Rastogi (2010). A text book of Genetics. Kerdarnath Ramnath Publication.
7. Verma P.S and V.K Agarwal (1997). Genetics. S. Chand and Co. New Delhi.

Course outcomes

CO1: Gain the knowledge of genetics and its interactions, multiple alleles, linkage and crossing over.

CO2: Acquire knowledge of sex determination, sex-linked, limited, influenced inheritance and extra chromosomal inheritance.

CO3: Understand and acquire the knowledge of human genetics, inborn error metabolisms, eugenic and eutherics.

CO4: Understand about the DNA, gene concept, DNA structure, RNA-DNA replication.

CO5: Understand the transcription, gene expression and its regulation of prokaryotes, Lac operon model.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to 25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10

XIV- MICROBIOLOGY AND BIOTECHNOLOGY

Theory Hours	: 6	Course Code	:U21ZC614
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To learn the general structure of bacteria, virus and fungi - their culture, food spoilage and recombination in bacteria and also to understand the biotechnological, principles - Scope and importance through gene cloning, tools of genetic engineering vectors - their application in medicine and Intellectual Property Right Values.

UNIT - I

Outline classification of microorganisms - General structure of Bacteria, virus and fungi.
Sterilization techniques, bacterial growth, methods of culturing bacteria - pure culture and culture characteristics.
Food microbiology - food poisoning, food spoilage and food preservation.

UNIT - II

Recombination in bacteria, transformation, conjugation and sexduction.
Recombination in bacteriophage, transduction, lytic and lysogenic cycles of bacteriophage.
Medical microbiology - Tuberculosis, Dengue and AIDS.

UNIT - III

Biotechnology: Scope and importance.
Genetic Engineering: Gene cloning: Isolation of desired DNA - insertion of DNA into vector - introducing rDNA into host - identification, selection and expression of cloned DNA.
Tools - Tools of genetic engineering: Restriction endonucleases (Eco R1, Hind III, B and H1) and DNA ligases.
Vectors - Plasmids - pBR322, Cosmids.

UNIT - IV

Molecular probes: Blotting techniques - Southern, Northern and Western blotting PCR, DNA finger printing.
Gene bank and libraries.
Monoclonal Antibodies: production and uses.
Stem cell technology.

UNIT - V

Application of biotechnology in Medicine: Gene Therapy, Vaccine production – Recombinant vaccine, drug designing.
Transgenic animals.
Biotechnology and future: IPR and ethical concerns.

Reference Books:

1. Balasubramanian. D (1996). Concepts in Biotechnology. University Press (India) Ltd., Hyde
2. Dharmarajan.M (1989). Genetic Engineering. S.Viswanathan and Co.,
3. Dubey R. C (1995). Text book of Biotechnology. S.Chand and Co.,
4. David Freifelder. (2017) Microbial genetics. Narosa Publishing house
5. Singh B.D (2003). Text book of Biotechnology. Kalyani Publishers, Rajinder Nagar, Ludhiana.

Course outcomes

CO 1: Understand the classification, structure of microbes and culture techniques of bacteria.

CO 2: Acquire exhaustive knowledge of recombinant bacteria and medical microbiology, and equip the students to get job opportunity in these field of biotechnological, microbiological and medical laboratories and companies.

CO 3: Understand and acquire the knowledge of cloning vector, artificial chromosome preparation, gene transfer techniques and equip the students to get job opportunity in these field of biotechnological companies.

CO 4: Gain knowledge of blotting techniques, antibody productions and learn the stem cell technology.

CO 5: Understand the developments of gene therapy, drug designing and vaccine production.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

PRACTICAL - VI - SEMESTER

ECOLOGY, BIOTECHNOLOGY, MICROBIOLOGY, BIOCHEMISTRY AND BASIC MEDICAL KNOWLEDGE

Theory Hours	: 6	Course Code	:U21ZC615P
Practical Hours	: --	Credits	:3
Exam Hours	: 3	Marks	: 40+60

Objectives: To understand the ecology - physical parameters in water, rocky, sandy and muddy shore animal distributions, biotechnology- DNA isolation and blotting technique, PCR, vector, microbiology - simple and differential staining of bacteria, serial dilution for bacterial counting and isolation of bacteria, biochemistry- measurement of hemoglobin concentration and measurement of blood pressure.

I. ECOLOGY

Practical:

1. Estimation of salinity in the given water samples
2. Estimation of the amount of Carbon Dioxide present in the given water samples.
3. Estimation of the amount of dissolved oxygen present in the given water samples.
4. Detection of pH in different water samples.

Spotters: Hygrometer, pH meter, Sacchi disc, Distribution of Animals: Rocky shore, Sandy shore and Muddy shore. Marine Planktons

II. BIOTECHNOLOGY

Practicals:

1. Isolation of DNA, Southern blotting method.

Spotters: Vectors, Polymerase Chain Reaction (PCR)

III. MICROBIOLOGY

Practicals:

1. Bacterial stabilization and simple staining, Gram staining of bacteria, Bacterial mobility.
2. Counting of bacteria by continuous dilution method, Bacterial growth isolation.
3. Laboratory safety measures.

Spotters: Autoclave, Micropipette, Bac5teriophage

IV. BIOCHEMISTRY

Practical:

1. Measuring of haemoglobin using haemoglobinometer in human blood

V. BASIC MEDICAL KNOWLEDGE

Practical:

1. Observation of human blood pressure (BP)

Field Report

Course outcomes

CO1: Understanding the distribution of animals in different environment like rocky shore, sandy shore and muddy shore. Identifying the marine planktons. Learning the methods of estimation of salinity, CO₂, dissolved O₂ and pH in different water samples. Acquiring the knowledge on various equipments used for water sample analysis

CO2: Understanding the methods of DNA and learning the Vectors, Polymerase Chain Reaction (PCR)

CO3: Acquiring knowledge on microbiological techniques through counting, stabilizing and simple staining and isolation methods. Understanding about the usage of Autoclave, Micropipette, Bacteriophage, Knowing the measures adopted in laboratory safety

CO4: Understanding the importance of haemoglobin counts using the haemoglobinometer

CO5: Acquiring knowledge on the importance of human blood pressure

QUESTION PAPER PATTERN

Exam Hours	: 5	Max.marks:60
QUESTION NO.I – Major Practical		15 Marks
QUESTION NO.II – Minor Practical		10 Marks
QUESTION NO.IV – 4 Spotters		5 X 4 MARKS =20 Marks
Record		10 Marks
Viva		5 Marks

MAJOR BASED ELECTIVE COURSE II- (1) BIOCHEMISTRY

Theory Hours	: 6	Course Code	:U21Z6MBE2:1
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To imbibe the knowledge on biochemical substances with scope of biochemistry, classification and metabolism of carbohydrates, classification and metabolism of proteins, classification and metabolism of fat and enzymes - their role in the metabolic events in the living organisms.

UNIT - I

Introduction, Definition and Scope of biochemistry. Water - physical properties, Structure and role of water in life - pH and Buffers - Biological buffer systems.

UNIT - II

Carbohydrates - structure and classification (with one example) - Metabolism - Glycolysis, Glycogenolysis - TCA cycle and Oxidative phosphorylation.

UNIT - III

Structure and classification of amino acids and proteins.
Protein metabolism - Oxidative deamination, transamination, Decarboxylation and Transmethylation.

UNIT - IV

Structure and Classification - Fatty acids and Lipids.
Metabolism - β -oxidation.
Structure and functions of Nucleic acids.

UNIT - V

Enzymes - Classification and Characteristics.
Mechanism of Enzyme action – Lock and key hypothesis.
Biochemical Classification and characteristics of Hormones.

Reference Books:

1. Jain J.L., Sunjay Jain and Nithay Jain (2005). Fundamentals of Biochemistry. Chand Publications.
2. Jain J.L. (2015). Fundamentals of Biochemistry. Chand Publications.
3. Ambika Shanmugam (2016). Fundamental of Biochemistry for Medical students. Wolters Kluwer India, P. Ltd.
4. Abraham Mazur and Benjamin Harrow (1971). Text Book of Biochemistry. Saunders (W.B) Co. Ltd.
5. Satyanaraayanan. U (1999). Biochemistry, Uppala Author- Publisher Interlinks, Vijayavada.

Course Outcomes:

CO1: Learn unique properties and biological importance of water, acquires clear understanding about pH, acid-base balance and biological importance of body buffer.

CO2: Understand the structure, classification and metabolism of carbohydrates.

CO3: Acquires a clear understanding of structure, classification and metabolism of proteins and amino acids.

CO4: Learn the structure, classification, and metabolism of lipids and nucleic acids.

CO5: Understand of mechanism, kinetics, regulation of enzymes and hormones.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

MAJOR BASED ELECTIVE COURSE II- (2) ENDOCRINOLOGY

Theory Hours	: 6	Course Code	:U21Z6MBE2:2
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To gain the knowledge on the scope and functions of endocrine system – their hormones in invertebrates and chordates, hormonal control of metabolism and reproduction and therapeutic uses of hormones.

UNIT – I

Endocrinology - Scope; Historical perspectives; Endocrine glands in vertebrates: Localisation and organization; Rat: Hypothalamus, pineal, pituitary, thymus, thyroid, pancreas, adrenal, ovary and testis.

UNIT – II

Hormonal regulation in vertebrates: Hypothalamus – Releasing hormones. Adenohypophysis - Adrenocorticotrophic hormone (ACTH), Growth hormone (GH), Prolactin (PRL), Luteinizing hormone (LH), Follicle stimulating hormone (FSH), Thyroid stimulating hormone (TSH). Neurohypophysis - Oxytocin, Vasopressin. Pars intermedia - Melanocyte stimulating hormone.

UNIT - III

Adrenal - glucocorticoid and mineralocorticoids. Thyroid - Thyroid hormones. Gonads - Progesterone, androgens and estrogens. Pancreas - Insulin, Glucagon. Pineal - Serotonin, Melatonin.

Hormonal control in invertebrate reproduction - crustacea and Insecta;
Role of Pheromone in pest control.

UNIT – IV:

Endocrine abnormalities: Acromegaly, Cretinism, Dwarfism, Gigantism, Goiter, Diabetes mellitus and infertility - Etiology, symptoms, diagnosis.

UNIT – V

Hormones in induced breeding of fish and Prawn. Uses of hormones in assisted reproduction (farm animals and human).

Hormonal contraceptives.

Reference Books:

1. Adiyodi KG and RG Adiyodi (1983). Reproductive biology of invertebrates. John wiley and sons Ltd, New York.
2. Bentley PJ (1982). Comparative vertebrate endocrinology. 2nd edition, Cambridge University press, England.

3. Hadley ME (1992). Endocrinology. 3rd edn. Prentice hall, New jersey.
4. Matsumoto A and S Ishi (1992). Atlas of endocrine organs: Vertebrates and Invertebrates. Springer Verlag, Germany.
5. Tumer CD and JT Bagnara (1984). General endocrinology. 6th edn. Saunders WB company, Philadelphia.
6. Wilson JD and DW Foster (1992). William's Textbook of endocrinology. 8th edn. Saunders company, Philadelphia.

Course outcomes

CO1: Understand the scope and structure of endocrine glands in vertebrates.

CO2: Gain the knowledge of hormonal regulation in vertebrates.

CO3: Learn the hormonal regulation of reproduction in crustacean and hormone – behaviour for pest control.

CO4: Acquire knowledge of various endocrine abnormalities (acromegaly, cretinism, dwarfism, gigantism, goiter, diabetes mellitus and infertility - etiology, symptoms, diagnosis).

CO5: Understand the mechanism of induced breeding in fish and Prawn.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

MAJOR BASED ELECTIVE COURSE II - (3)
VALUE ADDITION OF FISH PRODUCTS AND PROCESSING

Theory Hours	: 6	Course Code	:U21Z6MBE2:3
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To understand the methods of fish processing techniques through the nutritional properties, role of microbes on the spoilage of fishes, fresh fish handling preservation and canning methods during fish preservation.

UNIT – I

Fish Biochemistry – nutritive components of fish. Nutritive enzymes and their role in fish spoilage - Nutritive value of protein - General characters of fish fat, spoilage of fish at different stages.

UNIT – II

Fish Microbiology - Microbial spoilage of fish - plant sanitation - importance - regulatory measures, Microbial spoilage of fish - plant sanitation - importance - regulatory measures, microbial flora in various type of semi - processed and processed fishery products.

UNIT – III

Fresh fish handling and preservation: Mechanism of spoilage - (Fish analysis, bacterial chemical reactions). Handling of fish on board and shore - use of ice and salt, use of antibiotics and chemicals.

UNIT – IV

Freezing of fishes - different techniques - physico chemical changes and nutritional changes during freezing - spoilage of frozen fish.

UNIT - V

Preservation of fishes - Canning of fishes - preservatives, additives and pickle salting - salting of fish - Indian curing - smoking of fish - hot and cold smoking - smoking methods.

Reference Books:

1. Biswas KP (1980). A text book of fish, fisheries and Technology. Narendra publishing house.
2. Gopakumar K (2000). Tropical fishery products. Oxford and IBH.
3. Govindan TK (1992). Fish processing technology. Oxford and IBH.
4. Mpeda (1995). Dried fish and fishery products.
5. Santhanam R (1987). Fisheries science. Daya publishing House.
6. Winton AL and Winton KB (1993). Fish and fish products. Agro Botanical Publishers.

Course outcomes

CO1: Understand the major components in fish, nutritive enzymes and their role in fish spoilage, nutritive values and different stages of fish spoilage.

CO2: Understand the microbial spoilage and sanitation awareness in semi – processed, processed fish and fishery products.

CO3: Gain the knowledge on fresh fish handling and preservation.

CO4: Acquire knowledge on preservation techniques in fish.

CO5: Understand the Canning techniques for fishes, preparation of pickle and curing techniques.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

MAJOR BASED ELECTIVE COURSE III- (1) HUMAN NUTRITION

Theory Hours	: 5	Course Code	:U21Z6MBE3:1
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To incubate the knowledge on the values of nutritive substances for healthy living of mankind through nutritive foods, balanced diet, gastrotrich nutrition and managing the faculty food habits by therapeutic diets.

UNIT - I

Food as a source of nutrition, Physiological importance of carbohydrates, Proteins, Lipids, Vitamins and Minerals

UNIT - II

Water as nutrient - regulation of water balance. Determination of energy value of foods - direct and indirect calorimetry - basal metabolic rate.

UNIT - III

Nutritional value of foods - cereals, fruits, milk, egg, meat, fish - Nutritional value of common Indian recipes - Balanced diet.

UNIT - IV

Effect of cooking and heat processing on the nutritive value of foods - Nutritional requirements: Infants, School children, Pregnant and lactating mothers - Geriatric Nutrition.

UNIT - V

Faulty food habits: obesity, Diabetes and cardiac problems - Health education - Malnutrition: Marasmus and Kwashiorkor - Therapeutic diets, Role of FDA and WHO.

Reference Books:

1. Banerjee G.C (1978). Animal Nutrition. Oxford & IBH publishing co, New Delhi.
2. Swaminathan M (1978). Advanced text book on Food and Nutrition, Volume II, The Bangalore printing and Publishing Co, Ltd. Bangalore.
3. Swaminathan M (1989). Handbook of Food and Nutrition. A Bappco Publication Bangalore.
4. Sheel Sharma (2006). Human Nutrition and Meal Planning. Jnanada Prakashan (P&D), New Delhi.

Course outcomes

CO1: Understand the nutrition and physiological importance of biochemical properties.

CO2: Acquire knowledge about role of water, determination of energy values, direct and indirect calorimetry and basal metabolic rate.

CO3: Gain the knowledge of nutritional value of foods and value of common Indian recipes.

CO4: Learn the effect of cooking process on the nutritive value of foods and its requirements for infants, pregnant and lactating mothers.

CO5: Understand the faulty food habits, health education and malnutrition.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

MAJOR BASED ELECTIVE COURSE III- (2) POULTRY FARMING

Theory Hours	: 5	Course Code	:U21Z6MBE3:2
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To familiarize the students in learning the poultry science through identification of stocks, poultry housing, manure preparation, and management aspects.

UNIT – I

Introduction - Progress of Poultry industry in South India. Some common types of poultry birds- Plymouth rock, Light Sussex, Minorca, Rhode island Red and White leghorn, their advantageous features - choosing commercial laying stock - Poultry housing - The deep litter system - Poultry manure.

UNIT – II

Management - practical aspects of chick rearing - Management of growers, layers and broilers - Lighting and temperature - Summer and Winter Management - Debeaking.

UNIT – III

Poultry Nutrition - Requirements - Food additives - Food stuffs for Poultry - Feed ingredients.

UNIT - IV

Factors affecting egg size - storage, preservation methods, marketing - grading - economics of poultry production - maintenance of farm records and accounts.

UNIT – V

Diseases of poultry birds and their control measures – etiology, symptoms.

Reference books:

1. Bioster S (1989). Diseases of poultry. Oxford and IBH.
2. Felwel and Fox (1992). Practical Poultry feeding. ELBS Edition.
3. Jull MA (1972). Poultry Husbandry. Tata McGraw Hill
4. Ganamani K. (1997). Modern aspects of Poultry keeping. Hytone Publishers, Madurai.
5. Sastry, Thomas and Sigh (1982). Farm Animals Management and poultry production. Vikas Publishing house.
6. Sigh J and More EN (1982). Live stock and poultry production. Prentice Hall of India.

Course outcomes

CO1: Understand about the progress of poultry industry in South India, types of poultry farms, features of layer birds, poultry housing and its manure.

CO2: Acquire knowledge of chick rearing, growers, layers and broilers, lighting provision, management of temperature in summer and winter.

CO3: Gain the knowledge of nutrition, requirements, food additives and feed ingredients for poultry farm.

CO4: Learn the effect of factors affecting egg size, preservation types, marketing, maintenance of records and accounts for farm.

CO5: Understand the diseases of poultry birds and their control measures.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 20 –Objective type question:MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:21 to25 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:26 to 30 - One question from each Unit (3 out of 5)

3X10=30

MAJOR BASED ELECTIVE COURSE III- (3) ECONOMIC ENTOMOLOGY

Theory Hours	: 5	Course Code	:U21Z6MBE3:3
Practical Hours	: --	Credits	:5
Exam Hours	: 3	Marks	: 25+75

Objectives: To imbibe the knowledge on the beneficial insects utilizing them for economic gain through pest control, public health and role of honeybee and silkworm for livelihood options.

UNIT – I

Classification of Insects up to orders and their diagnostic characters with familiar and important examples. Insect Reproduction, Development and Metamorphosis.

UNIT - II

Harmful Insects: Classification of Insects pests; Injuries and Damages caused by Insect pests. Assessment of Insect pest population, Assessment of pest damage. Pest surveillance and forecasting pest outbreak. Methods and principles of pest control - Chemical, Mechanical Biology - IPM.

UNIT – III

Insect pests: Destructive insects; Their bionomics and life cycle. Pest of Cultivated crops – Predominantly occurring pests in Rice (eg.), Sugarcane(eg.), Coconuts(eg.), Cotton(eg.). Pest of vegetables (brinjal). Pest of stored products (groundnut).

UNIT – IV

Insects in relation to public health and household. Insects associated with human beings. Insects associated with household materials.

UNIT – V

Beneficial insects - Their bionomics, life cycle and by products. Honeybees, silkworm and Lac insect. Helpful Insects: Insect pollinators, predators and parasites, soil builders and scavengers.

Reference Books:

1. Chapman RF (1993). The Insects. Structure and Functions. ELBS. London.
2. Chandler AC and CP Read (1961). Introduction to Parasitology. John Wiley and Sons, New York.
3. David BV, Muralirangan NC and Meera Muralirangan (1992). Harmful and beneficial Insects. Popular book Depot.
4. David BV and Kumaraswami (1998). Elements of Economics Entomology. Popular Book Depot. Madras.
5. David BV (1992). Pest management and pesticides: Indian Scenario. Namrutha publications.
6. Krishnan NT (1993). Economics Entomology. JJ Publications, Madurai.
7. Mani MS (1973). General Entomology. Oxford and TEM.
8. Nayar KK, Ananthakrishnan TN and VD David (1990). General and applied Entomology. Tata Mc Grow Hill New Delhi.

Course outcomes

CO1: Understand the insect classification and their diagnostic characters, reproduction, development and metamorphosis.

CO2: Gain the knowledge of classification of harmful insects, pests damages, pest population assessment, assessment of damage, surveillance and forecasting its outbreak. Pest control techniques.

CO3: Learn the destructive insects and their bionomics, life cycle, pest of cultivated Crops and stored products.

CO4: Acquire knowledge of insects in relation to public health and household.

CO5: Understand the beneficial insects and their bionomics, life cycle and by products.

QUESTION PAPER PATTERN

Exam Hours : 3

Max.marks:75

PART-I (Answer ALL) 20X1=20

Q.No:1 to 10 –Objective type question :MCQ – 5; Fill up the blanks -5; True or false – 5; Match the following-5

PART-II (Either OR)

Q.No:11 to15 - One question from each Unit

5X5=25

PART-III (Answer any THREE)

Q.No:16 to 20 - One question from each Unit (3 out of 5)

3X10=30

ABILITY ENHANCEMENT – GENDER STUDIES

Theory Hours : 1	Course Code : U216GS
Practical Hours: -	Credits : 1
Exam Hours : 3	Marks : 25 +75 =100

myF – 1

ghypdk; njhlu;ghd Nfhl;ghLfs; : ghypay;-ghypdk; - clw;\$WuPjpahf epu;zaj;jy; - Mzhjpf;fk; - ngz;zpak; - ghypd ghFghL – ghypd Ntiyg;ghFghL – ghypd xUgbj;jhditfs; - ghypd czu;t+l;ly; - ghypd rktha;g;G – ghypd rkj;Jtk; - ghypd ika ePNuhl;lkhf;fy; - mjpgfhug;gLj;Jjy;.

myF- 2

kfspupay; Vs ghypd rkj;Jtf;fy;tp – gy;fiyf;fHf khdpaf;FOtpd; topf;fhl;Ljy;fs; - VohtJ Ie;jhz;Lj;jpl;lk; Kjy; gjpNduhtJ Ie;jhz;Lj;jpl;lk; - ghypd rkj;Jtf;fy;tp : nga;Ipq; khehL kw;Wk; ngz;fSf;F vjpuhd midj;J td;KiwfisAk; xopg;g;fw;fhd ru;tNjr cld;gbf;if - ,izj;jy;/ cl;gLjds;Jjy; - xJf;fy;

myF – 3

ghypay; ghFghl;bw;fhd jsq;fs; : FLk;gk; - ghypd tpfjhr;rhuk; - fy;tp – Mnuhf;fpak; - MSik – kjk; - Ntiy Vs Ntiytha;g;G – re;ij – Clfq;fs; - murpay; - rl;lk; - FLk;g td;Kiw - ghypay; Jd;GWj;jy; - muR nfhs;iff; kw;Wk; jpl;lq;fs; .

myF- 4

ngz;fs; Nkk;ghL kw;Wk; ghypd rkj;Jt Nkk;ghL : Kaw;rpfs; - ru;tNjr ngz;fSf;fhd jrhg;jk; - ru;tNjr ngz;fs; Mz;L – ngz;fspd; Nkk;ghl;bw;fhd Njrpa nfhs;if – ngz;fs; mjpfhu Mz;L 2001 – ru;tNjr nfhs;iffis ika ePNuhl;lkhf;fy;

myF – 5

ngz;fs; ,af;fq;fs; kw;Wk; ghJfhg;G epwtd Vw;ghLfs; : Njrpa kw;Wk; khepy kfspu; Mizak; - mizj;J kfspu; fhty; epiyaq;fs; - FLk;g ePjp kd;wq;fs; - FLk;g td;KiwapypUe;J ngz;fisg; ghJfhf;Fk; rl;lk; 2005- gzpaplq;fspy; ngz;fs; kPjhd ghypay; Jd;GWj;jy;fis jLg;g;fw;fhd cr;rePjpkd;w topf;fhl;Ljy;fs; - jha;Nra; kw;Wk; jtwhf gad;gLj;Jjiy jil nra;jpLk; rl;lk; - <t;Brpq; (ngz;fis njhy;iy nra;jy;) jLg;Gr; rl;lk; - Ra cjtpf;FOf;fs; - gQ;rhaj;J mikg;GfSf;fhd 73 – tJ kw;Wk; 74 –tJ rl;l;jpUj;jk;.

gFjp

fl;Liu tbt tpdhf;fs; - 5

5x15 = 75

(my;yJ Kiw tpdh)