B.Sc. Zoology

(Choice Based Credit System)
For the students admitted in the academic year
2018 - 2019

PG AND RESEARCH DEPARTMENT OF ZOOLOGY
Bishop Heber College (Autonomous)
(Nationally Reaccredited at the A+ level by NAAC)
(Reaccredited with 'A' Grade (CGPA – 3.58/4.0) by the NAAC &
Identified as College of Excellence by the UGC)
TIRUCHIRAPPALLI – 620017
TAMIL NADU, INDIA

2018 - 2019

Under – Graduate Programme in Zoology

Structure of the Curriculum

Parts of the Curriculum	No. of Courses	Credits
Part – I : Language	4	12
Part – II : English	4	12
Part – III		
Major		
Core(Theory)	8	43
Core(Practical)	6	16
Elective	3	15
Allied		
Allied (Botany)	3	10
Allied (Chemistry)	3	10
Group Project	1	5
Part – IV		
SBEC	3	6
NMEC	2	4
VLOC	1	2
Env. Studies	1	2
SBC	1	1
Part – V		
Extension Activities	1	1
Gender Studies	1	1
Total	**42**	**140**

B.Sc. Zoology – Programme Description
(For the students admitted from the year 2016 onwards)

Sem.	Part	Course	Course Code	Course Title	Prerequisites	Hours/ week	Credits	Marks		
								CIA	ESA	Total
I	I	Tamil I /*	U15TM1L1	nra;As› ,yf;fpa tuyhW› ciueilL›nkhopg;gaw;rpAk giLg;ghf;fKk		6	3	25	75	100
	II	English I	U16EGPL1	English Communication Skills-I		6	3	40	60	100
	III	Core I	U16ZY101	Invertebrata I		6	6	25	75	100
		Core Prac. I	U16ZY1P1	Major Practical - I		3	2	40	60	100
		Allied I	U16BYY11	Allied Botany I		4	3	25	75	100
		Allied Prac.	U16BYYP1	Allied Botany Practical		3	--	--	--	--
		VLOC	U14VL1:1 / U14VL1:2	Value Education (RI / MI)		2	2	25	75	100
II	I	Tamil II /*	U15TM2L2	nra;As› ,yf;fpa tuyhW› rpWfijj;jpuL;L› nkhopg;gaw;rp & giLg;ghf;fk		6	3	25	75	100
	II	English II	U16EGPL2	English Communication Skills –II		6	3	40	60	100
	III	Core II	U16ZY202	Invertebrata II	U16ZY101	6	6	25	75	100
		Core Prac. II	U16ZY2P2	Major Practical - II		3	2	40	60	100
		Allied II	U16BYY22	Allied Botany II		4	4	25	75	100
		Allied Prac.	U16BYYP1	Allied Botany Practical		3	3	40	60	100
	IV	Env. Stud.	U16EST 21	Environmental Studies		2	2	25	75	100
III	I	Tamil III/*	U15TM3L3	nra;As - fhg;gpaq;fs› ,yf;fpa tuyhW› ehty› nkhopg;gaw;rp		6	3	25	75	100
	II	English III	U16EGPL3	English for Competitive Examinations		6	3	40	60	100
	III	Core III	U16ZY303	Chordata	U16ZY202	4	4	25	75	100
		Core Prac. III	U16ZY3P3	Major Practical - III		3	2	40	60	100
		Allied III	U16CHY33	Allied Chemistry- I		4	3	25	75	100
		Allied Prac.	U16CHYP2	Volumetric and Organic Analysis		3	--	--	--	--
	IV	SBEC I	U16ZYPS1	Vermitechnology		2	2	40	60	100
		NMEC I		***To be selected from courses offered by other departments***		2	2	25/ 40	75/ 60	100

Sem.	Part	Course	Course Code	Course Title	Prerequisites	Hours/ week	Credits	Marks		
								CIA	ESA	Total
IV	I	Tamil IV/*	U15TM4L4	nra;As - ehLfk> ,yf;fpa tuyhW> nkhopg;gapw;rp		5	3	25	75	100
	II	English IV	U16EGPL4	English through Literature		5	3	40	60	100
	III	Core IV	U16ZY404	Ecologyand Evolution	U16ZY303	4	4	25	75	100
		Core Prac. IV	U16ZY4P4	Major Practical - IV		3	2	40	60	100
		Allied IV	U16CHY44	Chemistry for Life Sciences		4	4	25	75	100
		Allied Prac.	U16CHYP2	Volumetric and Organic Analysis		3	3	40	60	100
	IV	NMEC II		***To be selected from courses offered by other departments***		2	2	25/ 40	75/ 60	100
		SBEC II	U16ZYPS2	Pisciculture		2	2	40	60	100
		SBC	U16LFS41	Life Skills		2	1	100	--	100
	V	Extension Activities	U16ETA41	NSS, NCC, Rotaract, Leoclub, etc...			1	-	-	-
V	III	Core V	U16ZY505	Cell and Molecular Biology	U16ZY303	6	6	25	75	100
		Core VI	U16ZY506	Genetics	U16ZY303	6	6	25	75	100
		Core Prac. V	U16ZY5P5	Major Practical - V		6	4	40	60	100
		Elective I	U16ZY5:1	Biochemistry and Microbiology		5	5	25	75	100
		Group Project	U16ZY5PJ	Project		5	5	25	75	100
	IV	SBEC III	U16ZYPS3	Sericulture		2	2	40	60	100
VI	III	Core VII	U16ZY607	Animal Physiology	U16ZY303	6	6	25	75	100
		Core VIII	U16ZY608	Developmental Biologyand Immunology	U16ZY303	6	5	25	75	100
		Elective II	U16ZY6:2	Biotechnology	U16ZY506	6	5	25	75	100
		Core Prac. VI	U16ZY6P6	Major Practical - VI		6	4	40	60	100
		Elective III	U16ZY6:3	Biophysics, Biostatistics and Bioinformatics	U16ZY506	6	5	25	75	100
	V		U16GST 61	Gender Studies			1	20	80	100
Total							**140**			**4100**

SBEC- Skill Based Elective Course **NMEC- Non Major Elective Course**
VLOC- Value added Life Oriented Course **SBC- Skill Based Course**
CIA- Continuous Internal Assessment **ESA- End Semester Assessment**

* Other Languages	Hindi	Sanskrit	French		Hindi	Sanskrit	French
Semester I	U14HD1L1	U15SK1L1	U14FR1L1	Semester III	U14HD3L3	U15SK3L3	U14FR3L3
Semester II	U14HD2L2	U15SK2L2	U14FR2L2	Semester IV	U14HD4L4	U15SK4L4	U14FR4L4

NMEC offered by the Dept.:
1. Public Health and Hygiene U16ZY3E1
2. Industrial Zoology U16ZY4E2

CORE I :INVERTEBRATA – I

Semester :I **Code : U16ZY101**
Credits: 6 **Total Hrs. : 90**

General Objectives:

1. To gain knowledge of diversity, adaptations, organization and taxonomic status of invertebrates.
2. To know the parasites and the diseases caused by the parasites to human beings.

INVERTEBRATA - I

UNIT I

Animal kingdom: Classification, taxonomy and nomenclature.

General characters and classification of Phylum Protozoa upto orders with suitable examples of biological interest.

Detailed study - Paramecium

General Topics: Nutrition in protozoa - Host-parasitic interactions in Entamoeba and Plasmodium- Locomotion in protozoa

UNIT II

General characters and classification of Phylum Porifera upto orders with suitable examples of biological interest.

Detailed study – Sycon
General Topics:
Canal system in sponges - Reproduction in sponges

UNIT III

General characters and classification of Phylum Coelenterataupto orders with suitable examples of biological interest

Detailed study - Obelia

General Topics: - Economic importance of corals and coral reefs - Polymorphism in Hydrozoa

UNIT IV

General characters and classification of Phylum Platyhelminthes and Nemathelminthesupto orders with suitable examples of biological interest.

Detailed study- Fasciola

General Topic: Host- parasitic interactions of Helminth parasites

UNIT V

General characters and classification of Phylum Annelida upto orders with suitable examples of biological interest.

Detailed study -Leech

General Topics: Nephridium and coelomoducts - Modes of life in Annelids

Text Book

1. Ayyar, E.K. and Ananthakrishnan, T.N. - A Manual of Zoology. Vol 1(Invertebrata). Part I, Viswanathan Pvt. Ltd.1998.

Reference Books

1. Hyman L.H, The invertebrates, Vol. I to Vol. VII, McGraw Hill Book Co.1940-1955.
2. Jordan E.L. and Verma P.SInvertebrate Zoology., 12thedn. S.Chand& Co. 1995.
3. Kotpal R.L., Agarwal, R.P.R., Khertarpa. I., Modern text book of Zoology, Rastogi Publications 1989.
4. Kotpal R.L. Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca, Echinodermata, Rastogi Publication, 1988, 1992.
5. Parker J and Haswell, A text book of Zoology Vol. I, Williams and Williams 1978.
6. Srivastava M.D.L and Srivastava U.S., A text book of Invertebrate Zoology, Central Book Depot, Allahabad, 1969.

MAJOR PRACTICAL I: INVERTEBRATA I

Semester : I **Code : U16ZY1P1**
Credits: 2 **Total Hrs. : 60**

General Objectives:

1. To acquire knowledge on organ systems through virtual dissection
2. To know the diversity of Invertebrates

I. VIRTUAL DISSECTIONS/ DISSECTION (DEMO)

Earthworm	:	Digestive system, Nervous system, Circulatory system and Reproductive system

II. MOUNTINGS

Paramecium	:	Hay culture and observation
Earthworm	:	Body setae

III. SPOTTERS

Protozoa	:	Amoeba, Euglena, Paramecium, Parameciumconjugation, Entamoeba.
Porifera	:	Sycon, Spicules, Gemmule
Coelenterata	:	Obeliacolony, Physalia, Sea anemone, Aurelia, Fungia , Meandrina, Tubipora
Platyhelminthes	:	Fasciola, Redia larva offasciola, Cercaria larva offasciola, Tapeworm, Scolex of Tapeworm
Nemathelminthes	:	Ascaris: male and female,*Enterobiusvermicularis, Wuchereriabancrofti, Anclyostomaduodenale*
Annelida	:	Leech, Nereis,Heteronereis, Parapodium of Nereis,

CORE II : INVERTEBRATA – II

Semester : II **Code : U16ZY202**
Credits: 6 **Total Hrs. : 90**

General Objectives:

1. To know the diversity, adaptations, organization of invertebrates
2. To understand the economic importance of insects

UNIT I

General characters and classification of Phylum Arthropodaupto orders with suitable examples of biological interest.

Detailed study: Penaeus.

GeneralTopics: Affinities of Peripatus - Larval forms in Crustacea - Organization of Centipede and Millipede.

UNIT II

General characters and classification of Phylum Mollusca upto orders with suitable examples of biological interest.

Detailed study: Pila

GeneralTopics: Foot in Mollusca - Economic importance of Molluscs - Cephalopoda as the most advanced invertebrate.

UNIT III

General characters and classification of Phylum Echinodermata upto orders with suitable examples of biological interest

Detailed study: Starfish

GeneralTopics: Water vascular system in Echinodermata - Larval forms of Echinoderms.

Balanoglossus:Organisation and affinities.

UNIT IV

Economically important insects: Honey bees, Silkworms and Lac insect -Insect pollinators- predators - parasites.

Insects associated with human diseases: Mosquitoes, housefly, bed bug, human head louse.

Insects associated with household materials: Ants, Termites, Silver fish, cockroach.

UNIT V:

Insect pests, life cycle and types of damage to plants.

Pest of rice: Rice stem borer (*Scirpophagaincertulas*) - **Pest of Sugarcane**: The shoot borer (*Chiloinfuscatellus*) - **Pest of coconut**: The rhinoceros beetle (*Oryctes rhinoceros*) **Pest of cotton**: The spotted bollworm (*Eariasinsulana*) - **Pests of vegetables**: Brinjal-The shoot and fruit borer(*Leucinodesorbonalis*) – Cauliflower: The diamond black moth(*Plutellaxylostella*)-**Pests of fruits**: Citrus butterfly(*Papiliodemoleus*) - **Pest of stored products**: The rice weevil(*Sitophilusoryzae*). Principles of Integrated Pest Management.

Text Books

1. Ayyar, .E.K. and Ananthakrishnan, A Manual of Zoology,Vol 1(Invertebrata). Part II - T.N. Viswanathan Pvt. Ltd.1998.
2. Vasantharaj David,B -Elements of Economic Entomology,Popular Book Depot.2001.

Reference Books

1. Hyman L.H, The Invertebrates Vol. I to Vol. VII, McGraw Hill Book Co., 1940-1955.
2. Jordan E.L. and Verma P.S., Invertebrate Zoology, 12th Edn., S. Chand & Co., 1995.
3. Kotpal R.L., Agarwal, R.P.R., Khertarpa. I, Modern Text Book of Zoology, Rastogi Publications, 1989.
4. Kotpal R.L, Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca, Echinodermata, Rastogi Publication., 1988, 1992.
5. Parker J. and Haswell, A text book of Zoology Vol. I, Williams and Williams, 1978.
6. Srivastava M.D.L and Srivastava, U.S., A text book of Invertebrate Zoology, Central Book Depot, Allahabad, 1969.
7. Shukla G.S and Updhay V.B, Economic Zoology, Rastogi Publications 2004.

MAJOR PRACTICAL II : INVERTEBRATA II

Semester : II **Code : U16ZY2P2**
Credits: 2 **Total Hrs. : 45**

General Objectives:

1. To understand organ systems through virtual dissection
2. To learn diversity of Invertebrates

I. VIRTUAL DISSECTIONS / DISSECTION (DEMO)

Cockroach	:	Digestive system, Nervous system, Circulatory system and Reproductive system

II. MOUNTINGS

Mouth parts	:	Cockroach (Demo), Housefly and Mosquito
Radula	:	Pila

III. SPOTTERS

Arthropoda	:	Millipede, Centipede, Penaeus, Nauplius larva of Penaeus, Zoea larva of Penaeus, Peripatus, Scorpion, Limulus
Mollusca	:	Fresh water mussel, Pearl oyster, Chiton , Dentalium , Sepia, Glochidium larva
Echinodermata	:	Starfish, Bipinnaria larva ofStarfish, Pedicellaria, Sea Cucumber Seaurchin,
Hemichordata	:	Balanoglossus
Economically Important Insects	:	Honey bee, *Bombyx mori*, Termites, Silver fish, *Oryctes rhinoceros*, *Leucinodesorbonalis*, *Papiliodemoleus*, *Sitophilusoryzae*.

CORE III : CHORDATA

Semester : III **Code : U16ZY303**
Credits: 4 **Total Hrs. : 60**

General Objectives:

1. To study the diversity and adaptations of chordates.
2. To comprehend the organization and taxonomic status of Chordates.

UNIT I

Origin of Chordates - General characters and classification of phylum Chordata

Prochordata:

Amphioxus:Organisation and affinities. Ascidia: Retrogressive metamorphosis

General characters and classification of Super Class Pisces upto orders with suitable examples of biological interest

Detailed study: Shark (excluding endoskeleton)

General topics: Accessory respiratory organs in fishes

UNIT II

General characters and classification of Class Amphibiaupto orders with suitable examples of biological interest

Detailed study: Frog (including endoskeleton)

General Topics:
- Parental care in Amphibia
- Neoteny

UNIT III

General characters and Classification of Class Reptiliaupto orders with suitable examples of biological interest

Detailed study: Calotes (excluding Endoskeleton)

General topics:
- Identification of poisonous and non- poisonous snakes in India, Poison apparatus, biting mechanism and Venom

UNIT IV

General characters and Classification upto orders with suitable examples of biological interest

Detailed study: Pigeon (excluding Endoskeleton)

General topics:

- Flight adaptations in birds
- Migration in birds

UNIT V

General characters and Classification upto orders with suitable examples of biological interest

Detailed study: Rabbit (excluding Endoskeleton)

General topics:

- Aquatic mammals and their adaptations
- Adaptive radiation in mammals

Text Book

1. Ayyar E.K. and Ananthakrishnan, T.N Vol II. Part I.- Manual of Zoology –Viswanathan Pvt. Ltd. 1992.

Reference Books

1. Jordan E.L, Verma P.S, Chordate Zoology, S. Chand & Company Ltd., 2008.
2. Kotpal R.L., A Modern text book of Zoology Vertebrates, Rastogi publications, 2009.
3. Sinha, Adhikari, Ganguly, Bharati Goswami, Biology of animals Vol. II, New Central Bo ok Agency (p) Ltd. 2004

SBEC I : VERMITECHNOLOGY

Semester : III **Code : U16ZYPS1**
Credits: 2 **Total Hrs. : 30**

General Objectives:

1. To understand the economic importance of earthworms.
2. To imbibe skills in establishing vermiculture unit.

Unit I

Scope and economics of vermiculture. Ecological classification of earth worm: epigeic, endogeic,anecic- morphology and life cycle of *Eudriluseugeniae*

Unit II

Optimal conditions for Vermiculture: temperature, moisture, pH, soil type, organic matter, protection from sun light, rain, pests and predators, microbes, castings.

Unit III

Organic waste sources – various types and ratios of organic waste sources - vermicomposting methods: small scale, large scale, pit method, heap method, shadow method,Windrow's method, indoor method, advantages -Vermiwash.

Unit IV

Field visit:

Field visit to a vermiculture unit to observe various methods of Vermicomposting (pit method, heap method, shadow method, indoor method, breeding pits and Vermiwash

Unit V

1. Effect of vermicompost on the growth of plants (Group projects)
2. Estimation of nitrogen in vermicasts (Demo)

SPOTTERS:

Eudriluseugeniae, Perionyxexcavatus, Lampitomauritii, Eiseniafoetida, cocoon, vermicasts, vermiwash.

Text Book

1. Gupta P.K, - Agrobios - Vermicomposting ,(India)2003

Reference Books

1. Ismail S.A.,Vermicology, The biology of earth worm, Orient longman, London, 1970.
2. Lee, K.E., Earthworms-their ecology and relationship with soil and land use., Acadamic Press, Sydney,1985.
3. Edwards, C.A. and P.J. Bohlen, 1996., Ecology of earthworm, 3rd Edn., Chapman and Hall.

MAJOR PRACTICAL III : CHORDATA

Semester : III **Code : U16ZY3P3**
Credits: 2 **Total Hrs. : 45**

General Objectives:

1. To acquire knowledge on organ systems through virtual dissection
2. To study the adaptations comparatively in various classes of animals
3. To observe and study the diversity of chordates

I. Virtual dissection of frog

Digestive system, respiratory system, arterial system, venous system, male and female reproductive systems, Nervous system

II. Mountings

Scoliodon (Shark)	:	Placoid scales
Labeorohita (Rohu)	:	Cycloid scales
Mugil	:	Ctenoid scales
Fish	:	Brain

III. Spotters

Prochordates	:	*Amphioxus, Ascidian.*
Pisces	:	*Scoliodon, Narcine, Arius, Gambusia, Hippocampus, Exocoetus, Anabas, Echeneis, Anguilla.*
Amphibia	:	*Bufo, Hyla, Ambystoma, Ichthyopis*, *Axolotyl*larva
Reptiles	:	*Hemidactylus*, *Draco, Varanus, Najanaja, Hydrophis, Viper,* Chelone
Aves	:	Pigeon, Quill feather.
Mammalia	:	Rabbit, Rat, Bat.
Skeletal system of frog	:	Skull, pectoral girdle, pelvic girdle, forelimb and hind limb.
Dentition	:	Rabbit, Man, Dog.

CORE IV :ECOLOGY AND EVOLUTION

Semester :IV **Code : U16ZY404**
Credits: 4 **Total Hrs. : 60**

General Objective:

1. To understand the importance of environment, its protection and conservation.

UNIT I

Abiotic factors: Light, temperature, soil, water – Biotic factors: symbiosis, commensalism, mutualism, predation, parasitism and competition- **Biogeochemical cycles**: Nitrogen, phosphorous. **Ecosystem**: Pond ecosystem: definition, structure - Trophic levels: Food chain, Food web -**Ecological Pyramids**: Pyramid of biomass, number, and energy - energy flow- primary and secondary production.

UNIT II

Population : Definition -natality- mortality- age pyramids- population equilibrium- fluctuation- regulation- **Community Ecology**: Types of community - characteristics of community - stratification -ecotone- edge effect - ecological Niche - ecological succession.

UNIT III

Terrestrial Habitats: Types, characteristics and adaptations of Forest, Grassland, Desert- **Aquatic habitats**: Fresh water characteristics and adaptations of lentic(ponds and Lakes) and lotic (River, estuary and Marine)**Biodiversity**: Concepts and levels of biodiversity - hotspots - threats and conservation.

EVOLUTION

UNIT IV

Origin of Earth–Theories : Abiogenesis, Biogenesis, Special creation, Biochemical theories of evolution of life.Evidences for evolution: a)Comparative anatomy b) Paleontology - Geological time scale c)Biochemical evidences.Theories of Evolution: Lamarckism- Darwinism –DeVries theory of mutation - Modern Synthetic theory of evolution

UNIT V

Speciation: Species concept, Patterns of speciation- factors influencing speciation.

Isolating mechanisms: geographical and reproductive. Hardy Weinberg Principle-Genetic drift- Founder's principle. Evolutionary process: Mimicry and animal colouration, Adaptive Radiation - Evolution of Man.

Text Books

1. Rastogi V.B, Organic Evolution, Kedar Nath Ram Nath Publications, 1985
2. Rastogi V.B. and Jayaraj M.S., Animal Ecology and Distribution of Animals, Kedarnath Ramnath Pub., 1987.
3. Odum E.P., Fundamentals of ecology, W.B Saunders Company, V Edition, 2012.

Reference Books

1. Sinha, Adhikari, Ganguly, Bharati Goswami, Biology of Animals Vol. II., New Central Book Agency (p) Ltd., 2004.
2. Sanjib Chattopadhyay, Evolution Adaptation Ethology, Books and Allied (p) Ltd., 2002.
3. Tomar B.S. Singh, Evolutionary Biology, S.P. Rastogi Publications, 2003.
4. Strickberger Monroe, Evolution, W., CBS, 1994.
5. Verma P.S. and Agarwal, Principles of Ecology, S. Chand & Co., 2003.
6. Kendiegh S.C., Animal Ecology, Prentice Hall, 1961.
7. Sharma P.D., Ecology and Environment, Rastogi Publications, 1990.
8. Clarke. G.L John, Elements of Ecology, Wiley & Sons, 1954.

SBEC II: PISCICULTURE

Semester :IV **Code : U16ZYPS2**
Credits: 2 **Total Hrs. : 30**

General Objectives:

1. To study the economic importance of freshwater fish.
2. To acquire skills in establishing Fish farm.

UNIT I:

Scope and economics- Important cultivable fresh water fishes -Major carps: *Catla, Rohu, Mrigal* - Ornamental fishes.

UNIT II:

Pond construction- site selection- water source and hydro metrological parameters-types of

Pond:Breeding, nursery, stocking, rearing pond and Marketing pond

UNIT III:

Types of culture: mono, poly and integrated farming - feed: Live, artificial and probiotics. Induced breeding. Major diseases of freshwater fishes

UNIT IV:

Field visit to nearby aqua farm: observation and recording of breeding, stocking, culture and harvesting practices.

UNIT V:

1. Measurement of pH in the pond water samples
2. Analysis of Phytoplanktons and Zooplanktons

Spotters : Catla – Rohu – Mrigal - Common carp -Fries- Fingerlings.

Text Book

1. Manual of freshwater aquaculture. – Santhanam. R. Oxford and IBH

Reference Books

1. Shukla G.S and Updhay V.B, Economic Zoology, Rastogi Publicatio ns, 2004.
2. Jhingaran, Fish and fisheries, Hindustan Publishing Corporation, New Delhi, 1982.
3. Ramasamy P, Diseaes in freshwater aquaculture systems, Vanitha publications, 1992.
4. Biswas K.P., A text book of fish, fisheries and technology, Narendra publishing House, 1980.
5. S.K. Gupta, P.C. Gupta, General and Applied Ichthyology, Chand Publications.

MAJOR PRACTICAL IV : ECOLOGY AND EVOLUTION

Semester :IV **Code : U16ZY4P4**
Credits: 2 **Total Hrs. : 90**

General Objectives:

1. To develop the skill of analysing water quality through quantitative estimations observation of fauna in different habitats
2. To understand the Evolutionary Significance of animals

ECOLOGY

1. Estimation of Dissolved oxygen in water samples
2. Estimation of Free CO_2 in water samples
3. Estimation of salinity in water samples
4. Animal association-Parasitism, Mutualism, Commensalism, Predation
5. Identify the animals related to Inter tidal habitat- Rocky,Sandy and Muddy (4 examples in each)
6. Identification of marine planktons

Spotters: Anemometer, Hygrometer, Seechi disc

EVOLUTION

Animals of evolutionary significances	:	Peripatus, Archeopteryx.
Homologous organs	:	Fore limb modifications
Analogous organs	:	Wing modifications
Coloration and mimicry	:	Chamaeleon, leaf insect, stick insect.
Fossils	:	Ammonite, Nautiloid, Limulus

FIELD VISIT

Paleontological field visit to Ariyalur and submission of field report.

CORE V : CELL AND MOLECULAR BIOLOGY

Semester :V **Code : U16ZY505**
Credits: 6 **Total Hrs. : 90**

General Objectives:

1. To understand cell as the structural and functional unit
2. To learn about heredity and its variations

CELL BIOLOGY

UNIT I

Cell theory-Prokaryotic and Eukaryotic cells -Physico-chemical properties of cytoplasm-- Colloids: Properties of colloids: Brownian movement - Tyndall Phenomenon.

Ultrastructure and function of plasma membrane, Endoplasmic reticulum, Golgi complex, Lysosomes and Ribosomes.

UNIT II

Ultrastructure and function of Mitochondria - Ultrastructure and function of nucleus.Chromosomes: Chromosomal Organisation,Polytene and Lampbrush chromosomes - Cell cycle-Cell division: Mitosis and Meiosis.

UNIT III

Cytoskeleton: Microtubules, microfilaments and Intermediate filaments. Cell-cell interactions: cell junction-cell adhesion-general principles of cell signaling. Cytology of cancer – Carcinogens - Effects of radiations on cell.Biology of aging- Apoptosis .

MOLECULAR BIOLOGY

UNIT IV

Structure and types of DNA - DNA replication and repair mechanisms- Transcription process - types of RNA- Genetic code- Translation process.

Protein biosynthesis: initiation-elongation – termination- PostTranscription and translational modifications.

UNITV

Gene concept:cistron, recon, muton.Regulation of gene expression in prokaryotes: Operon hypothesis-positive and negative feedback mechanism- Lac and Tryptophan Operons.

Text Books

1. De Robertis, E.D.P and De Robertis, E.M.F., Cell and Molecular Biology, International Edition, Hong Kong, 8th Edition, 1998.
2. Verma P.S and Agarwal V.K, Cytology (Cell Biology and Molecular Biology), S Chand & Co. Ltd., 2006.
3. Jeyanthi, G.P., Molecular Biology, MJP Publishers, Chennai, 2009.

References

1. Albert's B. *et al.,* Molecular Biology of the Cell, 4th Edition Garland Science, 2002.
2. Karp, G John, Cell and Molecular Biology, Wiley & Sons, 2008.
3. Cooper, G.M and Hausman R.E, The Cell-A molecular approach, 4th edn, Sinauer Associates Inc. USA., 2007.
4. Ed: Lewin , B.*et al* , Cells, Jones and Barlett Publishers, USA, 2007.
5. Rastogi, S.C, Cell Biology, New Delhi, Tata McGraw Hill, 1998.
6. Lodish, H.*et.al*., Molecular Cell Biology, W. H. Freeman & Co., 2000.
7. Malacinski G, M Freifelder's Essential of Molecular Biology, Narosa Publishing House, New Delhi, 2003.
8. Sadava.D.E., Cell biology, organalle, structure and function, Panima publishing Corporation, New Delhi, 2004.
9. Clark D. P. Molecular Biology, Understanding the Genetic Revolution, Elsevier, 2005
10. Epstein, R.J., Human Molecular biology, An Introduction to the molecular basis of health and disease, Cambridge University press, 2003.
11. Ed: Colldo Vides, J. *et.al*., Integrative approaches to Molecular Biology, Ane books, New Delhi, 2004

CORE VI : GENETICS

Semester : V **Code : U16ZY506**
Credits: 6 **Total Hrs. : 90**

General Objective:

1. To learn the mechanism of inheritance pattern and its use in medical science.

UNIT I

Introduction to Genetics: Mendel and his experiments, Mendel's laws of inheritance.

Interaction of genes: Allelic and nonallelic inte raction, Complementary genes, epistasis, pleotropism. Polygenic action: skin colour - Multiple alleles: ABO blood group system, Rh group and its inheritance.

UNIT II

Linkage, crossing over: types - mechanism- recombination - chromosome mapping.

Sex determination: Chromosomal control of sex determination, genic balance theory in drosophila, hormonal control of sex determination, environmental control of sex determination, dosage compensation and Lyon hypothesis.

Sex linkage: Sex linked inheritance of man: colour blindness and haemophilia - Sex limited genes and sex influenced genes.

UNIT III

Mutation: Types of mutation: somatic, germinal, spontaneous, induced, autosomal and allosomal, Chromosomal aberrations in number and structure, Molecular basis of mutation, phenotypic effects of mutation, significance and practical application of mutation, mutagenic agents. **Extra chromosomal inheritance:** Kappa particles in paramecium, maternal effect in snail shell coiling. Drosophila mutants

UNIT IV

Bacterial Genetics: Conjugation: F+ - Hfr Cells - Plasmid - DNA mediated Transformation - - Transduction:Generalized transduction, Specialized Transduction – Sexduction.

UNIT V

Human genetics: Karyotyping, pedigree analysis, sex linked and autosomal: dominant and rece ssive; - Human Syndromes (Down)- Inborn errors of Metabolism – PKU – Alkaptonuria – Tyrosine metabolism

Text Books

1. Gardner E.J. *et al*., Principles of Genetics, 8th edition, Wiley India, 2007.
2. Alice Marcus, Genetics, MJP publishers, 2009.

References

1. Miglani G.S., Advanced Genetics, 2nd Edn, Narosa Publishing House, New Delhi, 2007.
2. Klug W.S and Cummings M.R., Concepts of Genetics, 7th edition, Pearson Education, 2003.
3. Lewin B, Genes IX, Jones and Bartlett Publishers, Boston, 2008.
4. Russel P.J., Genetics: A Molecular approach, 2nd Edn, Pearson Education, 2006.
5. Maloy S.R. *et.al*., Microbial Genetics, 2nd edition, Narosa Publishing House, New Delhi, 2008.

ELECTIVE I : BIOCHEMISTRY AND MICROBIOLOGY

Semester :V **Code : U16ZY5:1**
Credits: 5 **Total Hrs. : 75**

General Objectives:

1. To understand the basic principles of Biochemistry and Metabolism
2. To study the structure of microbes and methods for culturing the microbes.
3. To know the various microbial diseases and its preventive measures.

BIOCHEMISTRY

UNIT I: Water - chemical bonds–isotopes **–** pH- Buffers - Enzymes: characteristics – mechanism and factors affecting enzyme action – Classification and functions of vitamins – Minerals and their importance.

UNIT II:. classification and functions of carbohydrates, proteins and lipids –Metabolism of carbohydrates: Glycogenesis -Glycogenolysis – Glycolysis – Citric acid cycle -Electron transport chain. Metabolism of lipids: β Oxidation of fatty acids – Metabolism of proteins:oxidative deamination and transamination of aminoacids.

MICROBIOLOGY

UNIT III

History and scope of Microbiology - Whittaker's five kingdom Concept - morphology and structure of bacteria (E.coli) - nutritional types of bacteria - Reproduction and bacterial growth. Viruses: General characteristics - major DNA and RNA viruses- Structure of fungi

Microbial metabolism: energy production by anaerobic processes - energy production by aerobic processes.

UNIT IV

Sterilization techniques - types of culture media - methods of isolating pure cultures-methods of preservation of pure cultures-colony characteristics - staining: simple staining, Gram's staining and Acid fast staining.

Applied Microbiology: Microbiology of soil: Biogeochemical role of soil microorganisms.Microbiology of Domestic water: Water Portability tests: MPN of coliforms, Drinking water standard – Microbiology of Air.

UNIT V

Microbial diseases: Causative organisms, mode of transmission, pathogenicity, diagnosis and their preventive measures of Bacterial Diseases: Tuberculosis, Typhoid and Syphilis - Viral Diseases: Hepatitis-B, Rabies, AIDS - Fungal Diseases: Candidiasis and Dermatophytosis.

Text Book

1. Dubey, R.C, Text Book of Microbiology, S Chand & Co 2005.

References

1. Pelczar M.J and Reid, Microbiology, Tata McGraw Hill, 1996.
2. Powar C.B and Daginawala, General Microbiology H.F., Himalaya Publishing House.
3. Roberts T.A. and F.A. Skinner (Eds.) 1983, Food Microbiology: Advances and Prospects, Academic Press, Inc. London, 393 pp.
4. Ananthanarayanan R and Jayaram Panicker, Text Book of Microbiology, C.K Orient Longman,1990.
5. Presscott L. M., 5thedition, McGraw, Microbiology, Hill Higher Education, Singapore, 2003.
6. Tartora, G.J. *et al.,* Microbiology, An Introduction, 8th edition, Pearson Benjamin Cummings, NewYork, 2004.
7. Prescott & Dunn's Reed, G., 4th Ed., 1983, Industrial Microbiology, AVI Publishing Co., Inc. Connecticut, 883.pp.

PROJECT

Semester : V **Code : U16ZY5PJ**
Credits: 5 **Total Hrs. : 90**

SBEC – III : SERICULTURE

Semester : V **Code : U16ZYPS3**
Credits: 2 **Total Hrs. : 30**

General Objectives:

1. To know the economic importance of silkworms.
2. To develop skills in establishing sericulture unit.

UNIT I

Scope and economics of sericulture-Sericulture in India:Central Silk Board – Types of Silk worm;Mulberry and non- mulberry (Tasar,Eri and Muga) – Life cycle of Bombyxmori- Anatomy of silk gland

UNIT II

Mulberry varieties – Harvesting and preservation– Rearing and rearing appliances for silkworm.

UNIT III

Methods of mounting – Commercial characters of cocoons – Reeling of cocoons – Stifling and storage-diseases of silk worm: Pebrine, Muscardine and Flacherie

UNIT IV

Field visit: Field visit to the egg production unit - Field visit to the modern sericulture unit

UNIT V

Spotters : Bombyxmori - Eggs, larvae, pupa, silk gland, adult male and adult female - cocoons - local and hybrid varieties -netrika-chandrika- silk.

Text Book

1. An Introduction to Sericulture, Ganga and Sulochana Chetty, Oxford & IBH Publishing Co Pvt Ltd., 2001.

References

1. Shukla G.S and Updhay.V.B., Economic Zoology, Rastogi Publications, 2004.
2. Pradip V Jabde, Text book of Applied Zoology, BPH, 2005.
3. Manual of Sericulture, FAO Volume.

MAJOR PRACTICAL V : CELLBIOLOGY, GENETICS, MICROBIOLOGY, BIOCHEMISTRY, BIOPHYSICS AND BIOINFORMATICS

Semester : V **Code : U16ZY5P5**
Credits:4 **Total Hrs. : 90**

General Objectives:

1. To develop practical skills for the analysis of cell organells
2. To aquire knowledge on the genetic significance in human and drosophila
3. To understand the principle of microbial culture techniques
4. To apply practical skills in analytical techniques

CELL BIOLOGY

1. Preparation and Identification of salivary gland Polytene chromosomes in Chironomous larva
2. Squash preparation of mitosis in onion root tip
3. Buccal Smear preparation and Identification of Barr Body

GENETICS

1. Recording of Mendelian traits in man
2. Pedigree analysis
3. Drosophila genetic importance and culture
4. Human karyotype: Normal male and female, Klinefelter's syndrome, Down's syndrome and Turner's syndrome.

MICROBIOLOGY

1. Serial dilution technique, pour plate technique, streaking plate
2. Observation of bacterial mobility by hanging drop method
3. Quality of milk testing – Methylene blue reductase test
4. Staining – Gram Staining, Acid fast staining.

Spotters:
Autoclave, Hot air oven, Inoculation loop, Petridish
Prepared microslides: AFB, Candida, Nutrient agar, Nutrient Broth, Agar Slant,

BIOCHEMISTRY AND BIOPHYSICS

1. pH measurement of various samples using pH meter
2. Qualitative tests for Proteins
3. Qualitative tests for carbohydrates
4. Qualitative tests for Lipids
5. **Quantitative estimation of protein by Biuret method**

Spotters:

Microscope, Centrifuge, Microtome, Haemoglobinometer, pH meter, Spectrophotometer and TLC

CORE VII : ANIMAL PHYSIOLOGY

Semester : VI **Code : U16ZY607**
Credits: 6 **Total Hrs. : 90**

General Objectives:

1. To understand the structural organization of the animals.
2. To analyse the functional aspects of organ systems in the body of animals.

UNIT I

Nutrition:Nutrition types - feeding mechanism in animals- Physiology of digestion in mammal.

Respiration: Respiratory pigments in animals.Transport of oxygen and carbondioxide in mammals,Physiology of respiration.

UNIT II

Circulation: Types of heart.Structure and function of Human heart, cardiac rhythm- pace maker.Composition and functions of blood -coagulation of blood - **Muscle Physiology**: Types of muscles, chemistry and mechanism of muscle contraction

UNIT III

Excretion: Nitrogenous wastes -ammonotelism, ureotelism, uricotelism - Ornithine cycle –structure and function of mammalian kidney - urine formation and elimination in man

Osmo-iono regulation in aquatic animals

UNIT IV

Nerve Physiology:Types of neurons nerve impulse and its transmission- neuromuscular junction- synaptic transmission- reflex action

Receptors: optic, olfactory, auditory, gustatory, tango receptors in man.

UNIT V

Structure and physiology of **Endocrine glands**: pituitary, adrenal, thyroid, parathyroid, Islets of Langerhans, gonads

Physiology of reproduction: Anatomy of male and female reproductive system in man- hormonal control of menstrual cycle

Text Books

1. Goyal A, Sasthry KV, Animal Physiology, Rastogi Publications, 2004.
2. Hoar, W.S, General Comparative Physiology, Prentice Hall of India, 1983.

References

1. Rastogi SC, Essentials of Animal Physiology, New Age International Publication, 2001
2. Parameshwaran R, Anathakrishnan, Outline of Animal Physiology, TN,
3. Anantha Subramaniam K.S., Viswanathan Publishers, Pvt, LTD.,1980.
4. Sasthry K.V., Animal Physiology and Biochemistry, Rastogi Publications, 2003-2004.
5. Verma P.S., Agarwal S, Animal Physiology, S Chand and Co, NewDelhi, 1997.
6. Wilson J.A., Principles of Animal Physiology, MacMillan, 1984.
7. Harper H.A., Review of Physiological Chemistry, Muruzen Asian Ed, 1973.
8. Prosser C.L., Brown FA, Comparative Animal Physiology, Saunders W.B, 1985.

CORE VIII : DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY

Semester : VI **Code : U16ZY608**
Credits: 5 **Total Hrs. : 90**

General Objectives:

1. To study the process of fertilization and development.
2. To understand the post embryonic developmental events.
3. To comprehend the immune system and functions of lymphoid organs.
4. To study the various immunological techniques and its applications.

DEVELOPMENTAL BIOLOGY

UNIT I

Historical review of embryology- Theories of Development: Germplasm theory, Biogenetic law, Hertwig's law - Gametogenesis: Spermatogenesis, Oogenesis - structure of mammalian sperm and ovum- Ovulation-Fertilization- Physiological changes during fertilization -Parthenogenesis.

UNIT II

Types of eggs - Cleavage planes and patterns - types of blastula - Blastulation and gastrulation in frog - Fate map of frog-Organogenesis: Development of eye, brain and heart in frog - Organizer: Spemann's primary organizer - mechanism of induction.

UNIT III

Foetal membranes in chick - Placentation in mammals- Nucleocytoplasmic relationship- Post embryonic developmental events: Metamorphosis (Insects and amphibians); Regeneration in various animals; Basics of stem cells- Basic concepts of cloning- IVF and Embryo transfer technology.

IMMUNOLOGY

UNIT IV

Immune system: Innate and acquired immunity- active and passive- Primary lymphoid organs: thymus, bone marrow and Secondary lymphoid organs: spleen, lymph node, GALT, MALT, tonsil, Peyer's patches - cells of lymphoid lineage: lymphocytes and NK cells-Cells of myeloid lineage: monocytes, PMN leukocytes, accessory cells.Transplantation immunology - Types of graft.

UNITV

Immune response: nature of antigen - types of antibodies- General structure of Immunoglobulin - types and functions of Immunoglobulins - cell mediated and humoral immunity- MHC- Auto immunity – Hypersensitivity - Immune techniques: principles of precipitation- double immunodiffusion, immunoelectrophoresis and immunoblot - ELISA.

Text Books

1. Verma P.S., Agarwal V.K and Tyagi R, Chordate Embryology, Chand & Co., Ltd.,1991.
2. Rao C.V., An Introduction to Immunology, Narosa, New Delhi, 2002.

References

1. Balinsky B.I, An Introduction to Embryology, W.B. Saunders Company, Philadelphia, 1981.
2. S.K. Gupta, Immunology, Narosa Publishing House, New Delhi, 1999.
3. Muller Werner A, Developmental Biology, Berlin, Springer, 2010
4. Gilbert, Scott F, Developmental Biology, Sunderland, Sinaver Associates, 2000.
5. Kuby, Richard A, Goldsby *et al*., Immunology, 4th edition, W.H. Freeman & Co., 2003.
6. Roitt J.M, Essential Immunology, Blackwell Scientific Publishers,1998.
7. Kenneth Murphy, Paul Travers and Mark Walport, Janeway's Immunobiology, 7th Edition Garland Science, Taylor and Francis Group, LLC., 2008.
8. Berril, N.T, Developmental Biology, 1971, McGraw Hill Co., New York.
9. Berril, N.T, Karp, G, Development, 1988. Tata McGraw Hill Co., New York.

ELECTIVE II : BIOTECHNOLOGY

Semester : VI **Code : U16ZY6:2**
Credits: 5 **Total Hrs. : 90**

General Objectives:

1. To understand the basic concepts of Biotechnology
2. To acquire knowledge in the recent trends of biotechnology.

UNIT I

Scope and importance of Biotechnology - **Animal cell culture**:Concepts in tissue culture: Basic requirements, equipment, growth kinetics- Primary and established cell lines, stem cell culture, organ culture, applications of cell culture.

UNIT II

Genetic engineering: Scope and importance - Tools and techniques of genetic engineering: Enzymes, Vectors: plasmids, phagemids, cosmids - cDNA Library-**Gene cloning**: Isolation of desired DNA, insertion of DNA vector- introducing rDNA-Identification and selection of cloned DNA.**Molecular tools**: Electrophoresis, Western-Southern-Northern blotting, PCR

UNIT III

Industrial Biotechnology: Fermenter design and types - Process of fermentation: Upstream and Downstream process - Production of ethanol, antibiotics, SCP.

Enzyme technology: Sources, applications of enzymes - Extraction, purification-Immobilization of enzymes: methods and types.

UNIT IV

Animal biotechnology: Transgenic methods, electroporation, viral mediation, biolistics, Transgenic sheep and mice production.**Medical Biotechnology**: Monoclonal antibodies - Vaccines- Insulin-Interferons- gene therapy, DNA finger printing, DNA micro array. **Agriculture Biotechnology**: Biofertilizers - Nitrogen Fixation: Nitrogen fixing organisms, mechanism of fixation- Biopesticides.

UNIT V

NanoBiotechnology: Nanoparticles and its synthesis - nanotechnology in agriculture –Nanomedicine. **Environmental Biotechnology:**Bioremediation-Bioleaching, Biofuel, Biochips and Biosensors.Bioethics and Biosafety: Biosafety guidelines and regulations- IPR.

Text Book

1. Dubey R.C, Text book of Biotechnology, S Chand & Co., 1995.

References

1. Gupta P.K, Elements in Biotechnology, Rastogi Publications, Meerut, 1997.
2. Balasubramaniam D, Concepts in Biotechnology, University Press (India) Ltd., 1996.
3. Dharmalingam M, Genetic Engineering, Viswanathan, S Chand & Co., 1989.
4. Glick, B.R. and Pasternak J.I., Molecular Biotechnology, SSM Press, Washington,1998.
5. Primrose, S.M., Modern Biotechnology, Blackwell Scientific Publishers, Oxford, 1990.
6. Trehan K, Biotechnology, Wiley Eastern Ltd., New Delhi, 1996.
7. Satyanarayana U, Biotechnology, Kolkata, Books and Allied, 2009.
8. Chatwal G.R, Text book of Biotechnology, New Delhi, Anmol, 1995.
9. Barnum, Susan R, Biotechnology: An Introduction, Australia, Thomson, 2000.
10. Rastogi S.C., Biotechnology: Principles and Applications, New Delhi, Narosa, 2008.

ELECTIVE III : BIOPHYSICS, BIOSTATISTICS AND BIOINFORMATICS

Semester :VI **Code : U16ZY6:3**
Credits: 5 **Total Hrs. : 90**

General Objectives:

1. To learn the importance of physics in biology
2. To understand biologically important predictions from annotated data and transformation of these data for DNA analyses

BIOPHYSICS

UNIT I

Tools in cell biology: Light and Electron microscopes - Microtechnique- Cell fractionation by centrifugation - Analytical techniques: DNA, RNA and plasmid extraction.

Laws of thermodynamics – concept of free energy and entropy.

Instrumentation: Principle and applications of pH meter, Spectrophotometry,
Chromatography: Paper, thin layer – column – Ion-exchange – Gas Chromatography – HPLC, GCMS.

BIOSTATISTICS

UNIT II

Biostatistics: Collection of data – Types of Data – Measurement of Data – Types of sampling.

Descriptive statistics: Measures of central tendency-Mean, median, mode. Measures of dispersion – Standard deviation, Standard error.

UNIT III

Diagrammatic representation- Bar diagram, Pie diagram, histogram, frequency curve and line graph.

Inferential statistics: Hypothesis testing, Student t' test - Correlation .

BIOINFORMATICS

UNIT IV: Scope and importance of Bioinformatics – Genomics: Genome mapping - Sanger's method of DNA sequencing – Expressed sequence tags. Proteomics: Protein sequencing – Determination and prediction of protein structure – DNA microarrays. Human genome project (HGP): goals- major scientific strategies and approaches.

UNIT V: Biological databases: Nucleic acid sequence databases: NCBI, EMBL, GenBank, and DDBJ - Protein sequence databases: Swiss- Prot and TrEMBL – Sequence alignment: pair wise alignment: Dot Matrix - FASTA – BLAST, Multiple sequence alignment: Clustal X -Phylogenetic Tree – Structural Data Bases (PDB) – Secondary Data bases (SCOP).

Text Books

1. Basic Bioinformatics S, Ignacimuthu, Narosa Publishing House, Chennai, 2008.
2. Biophysics: Concepts and Mechanism, Casey, E.J, East West Press Pvt. Ltd., New Delhi, 1962

References

1. Harper H.A, Review of Physiological Chemistry, Muruzen Asian Ed, 1973.
2. Lehninger L. Albert, David. L. Nelson, Michael M. Cox, Principles of Biochemistry 1993, CBS Publishers and Distributors, Delhi, 1993.
3. Stryer, L, Biochemistry, W.H Freeman and Company, New York,1988.
4. Voet D and Voet, Biochemistry, John Wiley and Sons, New York, 1995
5. McCLEERY, R.H. and WATT, T.A., Introduction to Statistics for Biology, 3rd Ed., Chapman & Hall/CRC, 2007.

MAJOR PRACTICAL VI : ANIMAL PHYSIOLOGY, DEVELOPMENTAL BIOLOGY, BIOTECHNOLOGY AND IMMUNOLOGY

Semester : VI **Code : U16ZY6P6**
Credits: 4 **Total Hrs. : 90**

General Objectives:

1. To analyse the physiological functions of animals through experiments
2. To observe the developmental stages of various animals
3. To develop skills in the advanced Biotechnological and Immunological Techniques

ANIMAL PHYSIOLOGY

1. Salivary amylase activity in human saliva in relation to pH
2. Qualitative test for ammonia, urea and uric acid
3. Effect of temperature on the ciliary activity of fresh water mussel
4. Estimation of Hemoglobin content.

Spotters:

Haemoglobinometer, Haemocytometer, Sphygmomanometer and Spectrophotometer

DEVELOPMENTAL BIOLOGY

1. Sperm observation in Bull's semen
2. Examination of prepared microslides
   a) **Frog:** 2cellstage, blastula, gastrula and yolk plug stage.
   b) Chick developmental stages-24hrs, 48hrs, 72hrs

BIOTECHNOLOGY

1. Isolation of Chromosomal DNA in Eukaryotes
2. Electrophoretic separation of Proteins
3. Polymerase Chain Reaction (Demo)

Spotters: PCR, Western blotting, Southern blotting, Vector PBR 322,

IMMUNOLOGY

1. Isolation and Observation of Macrophages in Blood
2. WBC Differential count
3. ABO blood grouping in man
4. Phagocytosis of RBC by Macrophage and in- vitro assay (Demo)
5. Double Immunodiffusion (Demo)
6. Lymphoid organs in mouse (Demo)

SPOTTERS: T.S of thymus, T.S of spleen, T.S of lymph node, Bone marrow

BIOINFORMATICS

1. Basic Sequence Retrieval – NCBI
2. Literature Data Base – PubMed
3. Basic Alignment – BLAST, FASTA
4. Pair wise and Multiple Alignment –Clustal X
5. Structural Data Base – PDB, Swiss Prot
6. Secondary Data Bases – SCOP

Spotters

Sequences: Amino acid, Nucleotide, Multiple sequence alignment,Dot Plot, Phylogenetic tree

EDUCATIONAL TOUR

Educational Tour to the places of ecological importance and observation of org anisms in their Natural habitat and submission of tour report

Allied Zoology Courses offered to students of Under Graduate Programme in Botany
(For the candidates admitted from the year 2016 onwards)

Sem.	Course	Code	Title	Hrs./ week	Credits	Marks		
						CIA	ESA	Total
I	I	U16ZYY11	Biology of Invertebrates And Chordates	4	3	25	75	100
II	II	U16ZYY22	Human Physiology And Commercial Zoology	4	4	25	75	100
II	III	U16ZYYP1	Biology of Invertebrates, Chordates, Human Physiology And Commercial Zoology	6	3	40	60	100

Allied Zoology Courses offered to students of Under Graduate Programme in Chemistry
(For the candidates admitted from the year 2016 onwards)

Sem.	Course	Code	Title	Hrs./ week	Credits	Marks		
						CIA	ESA	Total
I	I	U16ZYY11	Biology of Invertebrates And Chordates	5	5	25	75	100
II	II	U16ZYY22	Human Physiology And Commercial Zoology	4	4	25	75	100
II	III	U16ZYYP1	Biology of Invertebrates, Chordates, Human Physiology And Commercial Zoology	4	3	40	60	100

ALLIED ZOOLOGY – I : BIOLOGY OF INVERTEBRATES AND CHORDATES

Semester : I **Code : U16BYY11**
Credits: 3(Bot), 5(Chem) **Total Hrs.: 60(Bot), 75(Chem)**

General Objectives:

1. To understand biodiversity and adaptation of invertebrates and Chordates
2. To understand the organization and taxonomic status of invertebrates and chordates

INVERTEBRATES

UNIT I

General characters of the Phyla Protozoa, Porifera and Coelenterata.

Type study:
1. Paramecium
2. Obelia

UNIT II

General characters of the Phyla Platyhelminthus,Aschelminthus and Annelida

Type study:

1. Tapeworm
2. Earthworm

UNIT III

General characters of the Phyla Arthropoda, Mollusca and Echinodermata

Type study:

1. Cockroach
2. Starfish

CHORDATES

UNIT IV

General characters of the Class Pisces and Amphibia

Type study:

1. Shark (all systems excluding endoskeleton)
2. Frog (all systems excluding endoskeleton)

UNIT V

General characters of the Class Reptilia, Aves and Mammalia

Type study:

1. Rabbit (all systems excluding endoskeleton)

Text Book

1. Ayyar E.K. Ananthakrishnan, T.N. Invertebrata, Outlines of Zoology, Vol-I, Viswanathan Pvt. Ltd., 1993.

References

1. Jordan E.L. and Verma P.S., Invertebrate Zoology, 12th edn., S. Chand & Co., 1995.
2. Kotpal R.L., Agarwal, R.P.R., Khertarpa. I., Modern text book of Zoology, Rastogi Publications, 1989.
3. Kotpal R.L, Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca, Echinodermata, Rastogi Publication, 1988, 1992
4. Dhami D.S and Dhami J.K.R, Chordate Zoology, Chand & Co., 1978

ALLIED ZOOLOGY - II : HUMAN PHYSIOLOGY AND COMMERCIAL ZOOLOGY

Semester : II **Code : U16BYY22**
Credits: 4 **Total Hrs. : 60**

General Objectives:

1. To understand the structural and functional aspects of organ systems in human being s
2. To acquire skills in Vermiculture, Apiculture, Sericulture, Pisciculture and Poultry farming.

HUMAN PHYSIOLOGY

UNIT I

Nutrition types - Physiology of digestion, Physiology of respiration - . Structure and function of Human heart, Composition and functions of blood -coagulation of blood

UNIT II

Muscle- Types, structure and function- Structure and function of mammalian kidney: urine formation in man-Photo and phono receptors in man

COMMERCIAL ZOOLOGY

UNIT III

Vermiculture: Introduction –Ecological classification of earthworm - Preparation of vermibed– management - vermiwash - Economic Importance

Apiculture: Introduction - species of honeybees - bee colony – Newton'sbeehive - care and management- extraction of honey - nutritive and medicinal value of honey

UNIT IV

Sericulture: Introduction - types of silkworm - life cycle of silkworm (*Bombyxmori*) Species of Mulberry - rearing – reeling - Economic importance of silk

Pisciculture: types of ponds: Nursery, stocking - management of a pond- Freshwater cultivable fishes: Major carps: *Catlacatla*, Rohu,Mrigala - induced breeding

UNIT V

Poultry farming: Classes of poultry: Desi: Aseel,Gagus, Exotic: leghorn. Rhode Island - housing of chicken: deep litter system, cage system, brooder housings, grower housings - poultry equipments: feeder, waterer, brooder, cages.

Text Books

1. Goyal A, Sasthry KV, Animal Physiology, Rastogi Publications, 2004.
2. Shukla G.S and Upadhay, Economic Zoology, V.B. Rastogi Publications, 2004.

References:

1. Jordon E.L and Verma P.S., Chordate Zoology and Elements of Animal Physiology, 1995.
2. FAO Sericulture Training Manual, Oxford and IBH, 1992.
3. Gnanamani M.R, Poultry Keeping, Deepam Publication, 1978.
4. Srinivasaulu Reddy M, Sambasiva Rao, A Text Book of Aquaculture, KRS, DPH, 1994

ALLIED ZOOLOGY PRACTICAL : BIOLOGY OF INVERTEBRATES, CHORDATES, HUMAN PHYSIOLOGY AND COMMERCIAL ZOOLOGY

Semester : II **Code : U16BYYP1**
Credits: 3 **Total Hrs. : 90(Bot),60 (Che)**

General Objectives:

1. To acquire knowledge on organ systems through virtual dissection
2. To study the diversity of Invertebrates and Chordates
3. To develop practical skills in the Haematology
4. To study the Economic Importance of a few species

BIOLOGY OF INVERTEBRATES AND CHORDATES
VIRTUAL DISSECTIONS / DISSECTIONS (Demo)

Earthworm	:	Digestive system and Nervous system
Frog	:	Digestive system and reproductive system

MOUNTINGS

Mouth parts	:	Housefly and Mosquito
Earthworm	:	Body setae
Shark	:	Placoid scale

SPOTTERS

Amoeba, Paramecium, Paramecium conjugation, Obelia colony, Tapeworm, Scole x of tape worm, Ascaris, Leech, Millipede, Centipede, Pila, Freshwater mussel, Starfish, Shark, Calotes, Pigeon, Rabbit.

HUMAN PHYSIOLOGY AND COMMERCIAL ZOOLOGY

1. Preparation of Blood smear
2. ABO blood grouping in man

Spotters

Hemoglobinometer, Haemocytometer, *Eudrilus eugeniae,*Vermicasts, Honey Bee, Honey, Silk moth, Silk gland, Silk threads*, Catlacatla, Rohu*, Fowls Egg.

Slides : Nerve cell, Striated muscle

UG - Non Major Elective Courses (NMEC)
(Offered to Students of other Disciplines)
(For the candidates admitted from the academic year 2016 onwards)

Sem.	Course	Code	Title	Hrs./ week	Credits	Marks		
						CIA	ESA	TOTAL
III	NMEC– I	U16ZY3E1	Public Health and Hygiene	2	2	25	75	100
IV	NMEC - II	U16ZY4E2	Industrial Zoology	2	2	25	75	100

NMEC-I : PUBLIC HEALTH AND HYGIENE

Semester - III **Code : U16ZY3E1**
Credits : 2 **Total Hrs. : 30**

General Objective:

1. To create awareness on health and hygiene .

Unit Ieine

Health: Definition and concepts, spectrum, indicators and determinants of health - morbidity and mortality.

Unit II

Nutrition: major nutrients - food types - importance of food- balanced diet- malnutrition and its effects- Brief account on major Indian diseases: cardio vascular diseases, diabetes, and obesity.

Unit III

Maternal and child health: Maternity - MCH problems- antenatal, intra natal – Post natal care and vaccination.

Unit IV

Mental health: Types, causes and prevention of mental health- crucial points in the life of human beings- Addiction: Alcoholism, Smoking, drug-deaddiction.

Unit V

Health education: Definition- objectives-principles- practices of health education. Sex education-AIDS- Methods of family welfare.

Text Book

1. Park, J.E and Park.K, Text book of preventive and social medicine, 13thEdn- Banarsidas. Bhanot, Jabalpur -1990.

References

1. Swaminathan.M, Bappco, Hand book of food and Nutrition, Bangalore -1989.
2. Swaminathan, M., Essentials of food and Nutrition. Vol.I and II 1989

NMEC- II : INDUSTRIAL ZOOLOGY

Semester :IV **Code : U16ZY4E2**
Credits: 2 **Total Hrs. : 30**

General Objectives:

1. To understand the importance of Industrial Zoology
2. To acquire skills in establishing poultry farm, sericulture unit and fish farm

UNIT I

Introduction: scope and economics of Industrial zoology - Integrated Farming System.

Vermiculture:Ecological classification of earthworm: Preparation of vermibed - management: - vermiwash - Economic Importance

UNIT II

Apiculture: - species of honeybees - bee colony – Newton's beehive - care and management- extraction of honey - nutritive and medicinal value of honey

UNIT III

Sericulture: Introduction - types of silkworm - life cycle of silkworm (*Bombyx mori*) Species of Mulberry - rearing – reeling - Economic importance of silk

UNIT IV

Poultry farming: Classes of poultry: Desi: Aseel,Gagus, Exotic: leghorn. Rhode Island - housing of chicken: deep litter system, cage system, brooder housings, and grower housings - poultry equipments: feeder, waterer, brooder, cages.

UNIT V

Pisciculture: types of ponds: Nursery, stocking - management of a pond- Freshwater cultivable fishes: Major carps: *Catlacatla*, Rohu, Mrigala - induced breeding.

Text Books

1. Shukla G.S and Upadhay V.B.,Economic Zoology ,Rastogi Publications 2004.
2. Jordon E.L and Verma, P.S.,Chordate zoology and elements of Animal Physiology, 1995.

Reference Books

1. FAO Sericulture Training Manual, Oxford and IBH,1992
2. Gnanamani M.R, Poultry Keeping , Deepam Publication, 1978
3. Srinivasaulu Reddy.M ,A text book of Aquaculture, Sambasiva Rao KRS.,DPH 1994

UG – Skill Based Courses (SBC)

Sem.	Course	Code	Title	Hrs./ week	Credits	Marks		
						CIA	ESA	TOTAL
IV	SBC– I	U16LFS41	Life Skills	2	1	100	-	100

LIFE SKILLS

Semester IV **Course code: U16LFS41**
Total Hrs : 30 **Credit : 1**

General Objectives:

1. To acquire skills and abilities for adaptive and positive behavior that helps to deal effectively with the demands and challenges of everyday life.

2. To develop creative, communicative and critical thinking skills necessaryfor employability

Unit I Basics of Communication skills & Effective Communication

Features of Communication – Process of Communication Verbal, nonverbal,Body Language – Postures & Etiquette –Listening& speaking Skills- Communication Barriers – Listening & speaking Skills.

Unit II Personal Effectiveness

Maslow's theory – Self-esteem- Role Conflict – Intra & Inter personal Skills – Efficiency Vs effectiveness – Team Building – Emotional Intelligence & Quotient

Unit III Interview Skills

Types of Interviews – Resume Formats & preparation - Cover letters – Simple rules to face interviews – Dos &Don'ts in a an Interview – Telephonic Interview and Etiquette - Group Discussions – Types – Methods – Ingredients and Tips for a Successful Group Discussion.

Unit IV Test of Reasoning & Numerical Ability

A. Numerical Ability: Problems related to Average – Percentage – Profit /Loss – Simple & Compound Interest- Time & Work – Boats & Streams etc.
B. Logical reasoning: Logical Detection – Nonverbal reasoning – Problems related to seating arrangements – Relationship model – Assertion & Reasoning etc.
C. Online Tests:Aptitude – Logical Reasoning – Problem Solving –Time management in Online tests- Online tests on Language skills- Aptitude and technical rounds

Unit V Outbound Learning

Physical, Mental, and emotional exercises

Texts for Reference:

1. Barun.K.Mitra, Personality Development and Soft Skills, 6th edition, Oxford University press Noida 2012.
2. M.Sarada, The complete Guide to Resume Writing, Sterling Publishers Pvt Ltd, New Delhi 2012.
3. Gloria J.Galances& Katherine Adams,Effective Group Disscussions,Theory & practice,12th Edition, Tata McGrawHillpvt Ltd 2012.
4. Francis Soundararaj, Basics of Communication in English, SoftSkills for Listening Speaking, Reading& Writing, Macmillan Publishers India Ltd. 2013.

Scheme of evaluation

1.	EQ test		10 Marks
2.	Resume		10 Marks
3.	Numerical Ability Test		10 Marks
4.	Online test 1(aptitude)		10 Marks
5.	Group Discussion		10 Marks
6.	Team Work		10 Marks
7.	OBL Observation / Work book		40 Marks
		Total	**100 Marks**