Table : CS-03 : Common Course Structure for other **UG Degree Programmes in Sciences-B.Sc., in Zoology Major**

(with effect from the academic year 2017-2018 onwards)

Sem.	Pt.I/ II/III IV/V	Subject Status	Subject title	Course /paper	Contact Hrs./ Week	C Credits
I	I	Language	Tamil/Other Language	1	6	4
	II	Language	English	1	6	4
	III	Core	Animal Diversity-I Invertebrata	1	4	4
	III	Core	Animal Diversity-II Chordata	1	4	4
	III	Major Practical-I	Animal Diversity-I Invertebrata & Animal Diversity-II Chordata	1	2	1
	III	Allied-I	Cell Biology, Genetics and Bio-Technology/Industrial Fish and Fisheries-Biology of Fish	1	4	3
	III	Allied Practical-I	Cell Biology, Genetics and Bio-Technology/Industrial Fish and Fisheries-Biology of Fish	1	2	1
	IV	Common	Environmental Studies	1	2	2
			Sub total	**8**	**30**	**23**
II	I	Language	Tamil/Other Language	1	6	4
	II	Language	English	1	6	4
	III	Core	Developmental Zoology	1	4	4
	III	Core	Ecology & Toxicology	1	4	4
	III	Major Practical-II	Developmental Zoology & Ecology & Toxicology	1	2	1
	III	Allied-II	Developmental Zoology, Ecology, Animal Physiology & Evolution/Industrial Fish and Fisheries-capture Fisheries	1	4	3
	III	Allied Practical- II	Developmental Zoology, Ecology, Animal Physiology & Evolution/Industrial Fish and Fisheries-capture	1	2	1

			Fisheries			
	IV	Common	Value based education/Social harmony	1	2	2
			Sub total	**8**	**30**	**23**
III	I	Language	Tamil/Other Language	1	6	4
	II	Language	English	1	6	4
	III	Core	Cell and Molecular Biology	1	4	4
	III	Major Practical-III	Cell and Molecular Biology	1	2	1
	III	Allied-III	Cell Biology, Genetics and Bio-Technology	1	4	3
	III	Allied Practical-III	Cell Biology, Genetics and Bio-Technology	1	2	1
	IV	Skilled based-core	(Any one) 1.Home aquarium 2. Nutrition and Dietetics	1	4	4
	IV	Non- Major Elective	(Any one) 1. BeeKeeping 2. ClinicalBiology	1	2	2
		Common	YOGA*		2	2
			Sub total	**8**	**30**	**25**
IV	I	Language	Tamil/Other Language	1	6	4
	II	Language	English	1	6	4
	III	Core	Genetics	1	4	4
	III	Major Practical-IV	Genetics	1	2	1
	III	Allied-IV	Developmental Zoology, Ecology, Animal Physiology and Evolution	1	4	3
	III	Allied Practical-IV	Developmental Zoology, Ecology, Animal Physiology and Evolution	1	2	1
	III	Skilled based	Biophysics and Bioinstrumentation OR Vermitechnology	1	4	4
	IV	Non-Major Elective	(Any one) 1.Public Health and Hygiene 2. Community and Social preventive Medicine.	1	2	2
	V	Extension Activity	NCC/NSS/YRC/YW/PE			1

		Common	Computer for Digital Era*		2	2
			Sub total	**8**	**30**	**26**
V	III	Core	Animal Physiology	1	5	4
	III	Core	Animal Biotechnology	1	5	4
	III	Elective	(Any one) 1. sericulture 2. Economic Entomology 3. Dairy farming	1	5	4
	III	Elective	(Any one) 1. Apiculture 2. Food and Food Processing Technology 3. Poultry Science	1	5	4
	III	Major Practical-V	Animal physiology	1	3	4
	III	Major Practical-VI	Animal Biotechnology	1	3	
	III	Major Practical-VII	Corresponding Electives	1	2	
	IV	Skill based common	Personality Development/Effective Communication	1	2	2
			Sub total	**8**	**30**	**22**
VI	III	Core	Evolution	1	5	4
	III	Core	Immunology and Microbiology	1	5	4
	III	Core	Biostatistics, Computer applications & Bioinformatics	1	5	4
	III	Major Practical-VIII	Evolution	1	3	4
	III	Major Practical-IX	Immunology and Microbiology	1	3	
	III	Major Practical-X	Biostatistics, Computer applications & Bioinformatics	1	2	
	III	Project Group		1	7	7
			Sub total	**7**	**30**	**23**

All practical examinations are at end of each semester

*Extra credit for extra hours

Total number of hours: 180

Total number of Credits : 142

SEMESTER I

Core Subject: Course 1.1. ANIMAL DIVERSITY - I – INVERTEBRATA
4 Hrs. /Week 4 Credits

OBJECTIVE:

To elucidate the importance of taxonomy, to know the methods of nomenclature, to realize the differences between Protozoa and Metazoa and to study the structure, functional organization, adaptations and the economic importance of lower and higher Invertebrates.

OUTCOME:

Students can identify the animals.

UNIT I

Introduction to Principles of taxonomy – Binominal nomenclature.
Protozoa: General Characters and classification up to classes with the examples.
Type study:-*paramecium:* morphology – nutrition – Osmoregulation – Excretion – Reproduction(binary fission and conjugation)
General structure, life cycle, Pathogeny and Control Measures of the following:
(a) *Entamoeba histolytica (b) plasmodium*
Porifera: General Characters and classification up to classes with the names of the examples.
Type study:- *Leucosolenia* – External morphology – Body wall – Reproduction.
General topic: Canal system in sponges.
(12L)

UNIT II

Coelenterata: General characters and classification up to classes with the names of the examples.
Type study:- Obelia – External Characters (structure of the colony) – life history.
General Topics: Corals, Coral reefs and their significance.
Platyhelminthus: General characters and classification up to classes with the names of the examples.
General topic: (i) External morphology and life cycle of fasciola hepatica.
(ii) Parasitic adaptations of platyhelminthes.
(12L)

UNIT III

Aschelminthes (Nematoda): External morphology, life cycle, pathogeny, Parasitic adaptations and control measures of the following:

- Ascaris lumbricoides (Round worm)
- Dracunculus medinensis (Guinea worm)
- Wuchereria bancrofti (Filarial worm)

Annelida: General characters and classification up to classes with the names of the examples.
External characters
General topics: (i) Metamerism in Annelida.
(ii) Biological significance of Earthworm.
(12L)

UNIT IV

Arthropoda: General Characters and classification up to class with the names of the examples.
Type study: Penaeus: External characters–Appendages–compound eye -Reproductive system and Life cycle.

General topics: (i) social life in insects – Honey Bees
(ii) Beneficial insects – Honey bee, Lac insects and silk moth
(iii) External Characters, economic importance and control measures of the pests of agricultural crops (Coconut – Paddy)

(a) Oryctes rhinoceros (b) Leptocorisa acuta
(12L)

UNIT V

Mollusca: General characters and classification up to classes with the names of the examples.
Type study: Pila globosa: External characters – shell – mantle cavity – Anatomy of Digestive system and reproductive system.
General topics: (i) Pearl culture and Pearl Industry in India.
(ii) Cephalopods as advanced Molluscs.
Echinodermata: General characters and classification up to classes with the names of the example.
Type study : Star fish: External Characters – Water vascular system.
General topic:- Larval forms of Echinodermata and their Phylogenetic significance.
(12L)

(TOTAL : 60L)

REFERENCE BOOKS:

Animal Diversity – I : Invertebrata

1. Arora, M.P.Non – Chordates ,Himalaya Publishing House, Ramdoot, Dr.Bhalero Marg (Kelewadi) Gurgan, Mumbai-400004.
2. Barrington, E.J.W.,Invertebrate structure and function.Boston – Houghton. Miffin and ELBS, London.
3. Bhamrah,H.S.et.al. A text book of Invertebrates. Alilnol Publications Private Limited,4374/4B.Ansari Road, Dayaganj,New Delhi – 110002.
4. Brusca, Invertebrates, ANE Books, Avantika,Niwas,19 Doraiswamy Road, T.Nagar,Chennai-600 017.
5. Ekambaranatha Iyer,M.: A Manual of Zoology Part I. Invertebrata, S. Viswanathan (printers and Publishers)Pvt.Ltd,Chennai.
6. Jan,A. Pechenik, Biology of the Invertebrates, Tata McGraw-Hill Publishing Company Limited,No.444/1 Sri Ekambara Naicker Industrial state,Alalpakkam, Porur,Chennai-600 016.
7. Jordan,E.L.and P.S. Verma. Invertebrate Zoology (Edition).S. Chand and Company Limited,7361 Ram Nagar,Qutab Road,New Delhi-110055.
8. Kotpal R.L. Modern Text Book of Zoology, INVERTEBRATES (Edition). Rastogi Publications, Gangotri, Shivaji Road, Meerut-250 002.
9. Mahanta Rita and I.K. Bhattacharyya. Invertebrate Zoology. Kalyani Publishers, B1/1299, Rajaendar Nagpur, Ludhiana-141008.
10. Parker and Haswell. A text Book of Zoology, Invertebrates Volume I. AITBS Publishers and Distributors,J5/6 Krishna Nagar, Delhi-110051
11. Verma, A. Invertebrates: Protozoa to Echinodermata. Naros Publishing House Private Limited.35-36 Greams Road, Thousand Lights, Chennai - 600006

SEMESTER –I
Course 1.2 ANIMAL DIVERSITY –II: CHORDATA
4 Hrs/week 4 Credits

OBJECTIVE: To exemplify the intermediary position of Prochordates between invertebrates and vertebrates, and to study the structure, functional organization, adaptations and the economic importance of lower and higher chordates

OUTCOME: To understand the knowledge of habits and habitats of vertebrates

UNIT I:**Introduction to chordata**: General characters(Diagnostic characters and additional characters)and Classification up to classes with the name of the examples.

Prochordata: General characters and classification up to orders with the name of the examples.

Type study: Amphioxus-External features-Digestive and Excretory system

External features and biological significance of the following

(a) Ascidian (b) Balanoglossuss

Agnatha: Petromyzon- External morphology; Ammocoetes Larva

(12L)

UNIT II:Pisces: General characters and classification up to sub-classes with the names of the examples

Type study: scoliodon (shark) -External characters- Placoid scales-Digestive system-Respiratory system-Receptor Organs- Urinogenital system.

General topics: (i) Accessory respiratory organs in fishes (ii) Migration of fishes
(iii) Parental care in fishes

(12L)

UNIT III: Amphibia: General characters and classification up to orders with the name of the example.

External features and biological significance of the following Examples:

(a) Rhachophorus (b) Ambystoma (c) Axolotl Larva.

General topic: Parental care in Amphibia

Reptilia: General characters and classification up to orders with the name of the examples

External features and Biological significance of the following Examples:

(a) Chelone mydas (b) Chamaeleon (c) Draco (d) Cobra

General Topics:

(i) Identification of poisonous and non-poisonous snakes of South India

(ii) Poison apparatus- Biting mechanism- venom- First aid for snake bite-Antivenom.

(12L)

UNIT IV:Aves:- General characters and classification up to subclasses with the names of the examples.

Type study: Columba livia (Pigeon)-External characters-Flight muscles-Digestive system-Respiratory system-Urinogenital system
General topics: (i) Migration of Birds (ii) Flight adaptations in Birds
(12L)
UNIT V:Mammalia: General characters and classification up to subclasses with the names of the examples.
Type study: Rabbit –External morphology – Digestive system – Respiratory system- Heart-Structure of Brain- Reproductive system.
General topics:(i) Egg laying mammals (ii) Adaptations of aquatic mammals
(iii) Dentition in mammals

(12L)

(TOTAL: 60L)

REFERENCE BOOKS: Animal Diversity II – Chordata

1.Alexander, R.M. The Chordates Cambridge University Press.

2.Bhamrah, H.S. et al. A text book of chordates.Anmol publication Limited, 4374/4B Ansari Road,Daryaganj, New Delhi 110002.
3.Ekambaranatha Ayyar,M. and T.N.Ananthakrishnan. A Manual of Zoology Vol.II(chordate).S.Viswanathan (Printers and Publishers)Pvt.Ltd.,Chennai.
4.Jordan E.L. and P.S Verma.Chordata Zoology (11th Edition).S.Chand and Company Limited, 7361 Ram Nager,Qutab Road,New Delhi-110 055.
5.Kardong, K. Vertebrates:Comparative Anatomy,Function,Evolution.Tata Mc Graw Hill publishing Company Limited,444/1.Sri Ekambara Naicker Industial estate,Alapakkam,Porur,Chennai-600 116.
6.Kotpal.R.L.Modem Text Book of Zoology-vertebrates.Rastogi Publications, Gangotri,Shivaji Road,Meerut-250 002.
7.Kulshrestha,S.K.Comparative Anatomy of Vertebrates,Anmol Publishers a.Private limited,4374/14B,Ansari Road,Daryaganj.New Delhi-110 002.
8.Mahanta Rita and I,K.Bhattacharyya.Vertebrate Zoology,Kalyani publishers,B-1/1299,Rajinder Nagar,Ludhiana-141008.
9.Nigam,H.C.Biology of Chrodates.Vishal Publishing Company,Books Market,Old Railway Road,Jalandhar-144008.
10.Pough,R.H., C.M.Janis and J.B. Heiser. Vertebrate life.Pearson Education (Singapore) Pvt.Limited;Indian Branch-482 FIE Patpaganj,Delhi-110092.
11.Prasad, S.N.and Kashyap Vasantika,P.Text Book of Vertebrate Zoology,New Age International publishers,4835/24 Ansari Road,Daryaganj,New Delhi-110002.
12.Young,J.L.Life of Vertebrates.Oxford at the clarendon press,London.

SEMESTER II
COURSE 2.1 DEVELOPMENTAL ZOOLOGY
(4 Hrs /Week) Credits 4

OBJECTIVE:

To understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms.

OUTCOME:

To know the developmental processes of animals particularly man

UNIT I

Definition and Scope of Developmental Zoology – Gametogenesis – Spermatogenesis – Oogenesis – Vitellogenesis – Structure of Sperm and Egg in Chick. Fertilization: Pre and Post fertilization events – significance; Parthenogenesis.
(12L)

UNIT II

Cleavage in chick – Fate map of Chick – Gastrulation in Chick – Chick Embryo 48, 72 Hrs. Manipulations of reproduction in Human: Infertility (male and female) – IUI - Invitro fertilization –Artificial insemination - Test tube babies – Amniocentosis.
(12L)

UNIT III

Organogenesis : Development of brain and heart in chick.
Organizer : Primary and secondary organizers.
Morphogentic fields and gradient hypothesis.

(12L)

UNIT IV

Hormonal control of Amphibian metamorphosis.

Extra-embryonic membranes in chick – Development, Types and Physiology.

Placenta in Mammals – Types and Physiology.

(12L)

UNIT V

Nuclear Transplantation in Acetabularia - Regeneration – Types – Regeneration in Amphibians – Regeneration in Planaria. Birth control : Contraceptive devices: Surgical method – Hormonal methods – Physical barriers – IUCD.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS: Developmental Zoology

1. Arora, M.P. Embryology. Himalayan Publishing House, Ramdoot, Dr. Bhalero Marg (Kelewadi) Girgaon, Mumbai – 400004.
2. Arumugam, N.Developmental Biology. Saras Publications, 114/35G, A.R.P camp Road, Nagercoil.
3. Balinsky, B.J.Introduction to Embryology, W.B.Saunders, Philadelphia,USA.
4. Berry,A.K. An Introduction to Embryology,EMKAY Publications,Post Box No.9410, B – 19 East Krishna Nagar,Swami Payanand Marg,Delhi – 110 051.
5. Beryl, N.J. Developmental Biology,Tata McGraw Hill Publishing Company Limited, 444/1 Sri Ekambara Naicker Industrial Estate, Alapakkam, Porur, Chennai -600 116.
6. Developmental Biology: R.M.Twyman.Bios scientific publishers, Ltd. New Delhi (2001).
7. Diwan, A.P. Mammalian Embryology, Anmol Publications Private Limited,4374/4B Ansari Road , Daryaganj, New Delhi-110 002.
8. Diwan,A.P.Avian Embryology, Anmol Publications Private Limited,4374/4B Ansari Road , Daryaganj, New Delhi-110 002.
9. Gilbert,Developmental Biology,ANE Books India, Avantika Niwas, 19,Doraiswamy Road,T.nager,Chennai-600 017.
10. Goel,S.C.Principles of Animal Developmental Biology,Himalaya Publishing House,Ramdoot,Dr.Bhalerao Marg (Kelewadi)Girgaon,Mumbai – 400 004.
11. Jain,P.C. Elements of Developmental Biology (Chordate Embryology).vishal Publishing Company,Books Market,Old Railway Road,Jalandhar – 144 008.
12. Jangir, O.P.Developmental Biology – A Manual.Agrobios (India),Behind Nasrani Cinema,Chopasani Road,Jodhpur – 342 002.
13. Nelson, E.Comparative Embryology of Vertebrates.Tata McGraw Hill Publishing Company Limited,No. 444/1 Sri Ekambara Naicker Industrial Estate, Alapakkam,Porur, Chennai – 600 116.

14. Ramesh Mathur and Meenakshi Metha. Embryology.Anmol Publications Private Limited,4374/4B,ansari road,Daryaganj,New Delhi – 110 002.
15. Rao, K.V. Developmental Biology. A Modern Synthesis.Oxford & IBH Publishing company Private Limited, S-155 Panchshila Park, New Delhi 110017.
16. Sastry.K.V. and Vineeta Shukal, Developmental Biology Rastogi Publications Gangotri, Shivaji Road, Meerut-250 002.
17. Slack,Essential Developmental biology. ANE Books India. Avantika Niwas, 19,Doraiswamy Road,T.Nager,Chennai-600 017.
18. Subramomam, T.Developmental Biology. Narosa Publishing House Private Limited, 35 – 36 Grams Road, Thousand Lights, Chennai – 600 006.
19. Verma.P.S. and V.K. Agarwal. Chordate Embryology (Edition).S. Chand & Company Ltd.7361 Ram Nagar,Qutab Road,New Delhi – 110055.

SEMESTER II

COURSE 2.2 ECOLOGY & TOXICOLOGY

(4 Hrs. / Week) Credits 4

OBJECTIVE:

To study the interaction and interdependence among environmental factors and living organisms – To enumerate the ill-effects and the health hazards of toxic agents released to the environment – To discern the evolutionary significance of animals, theories origin of species and significance.

OUTCOME: To understand the ecosystems such as marine, freshwater and terrestrial.

UNIT I

- **Abiotic factors :** Biological Effect of temperature and light.
- **Biotic factors:** Producer, Consumers and Decomposers.
- **Ecosystem:** Pond,Forest

(12L)

UNIT II

Food chain, Food web, Trophic levels, Energy flow, Ecological Pyramids

Animal Relationships: Mutualism, Commensalism, Antagonism (Antibiosis, Parasitism, Predation and Competition)

(12L)

UNIT III

Population Ecology: Definition – Density – Natality – Mortality – Age – Distribution – Age pyramids –Population growth – Population fluctuations – Regulation of Population density - Animal Dispersion.

Community Ecology: Definition - Community stratification-Periodicity – Community interdependence – Ecotone - Edge effect- Ecological niche- Concept of community –Ecological Succession.

Adaptation:

- Desert Adaptation
- Cave Adaptation

(12L)

UNIT IV

Wild life Conservation: Definition- Endangered Species – Causes for Depletion, Necessity for conservation – Methods of conservation – Sanctuaries – National Parks.

Remote sensing: Its application in agriculture, Fisheries, Forest management and Flood Management.

Urbanization: Reasons for urbanization, Urban problems, Methods to control urban growth.

(12L)

UNIT V

Introduction to Toxicology, Definition, Outline classification of Toxicant.
Toxic agents and mode of action of Pesticides, metals, solvents, carcinogens, poisons
Environmental toxicology and public health.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS: ECOLOGY

1. Agarwal, A.K. Ecology and Environmental Biology. Student Edition, Agrobios (India) Behind Nasrani Conema, Chopasani Road, Jodhpur -342 002.
2. Arora, M.P. Ecology. Himalaya Publishing House, Ramdoot, Dr.Bhalerao Marg, Girgaon, Mumbai- 400 004.
3. Clarke, G.L. Elements of Ecology, John Wiley & sons Inc. New York.
4. Junega, Kavita. Ecology. Anmol Publications Private Limited, 4371/4B Ansari Road, Daryagani, New Delhi – 110002.
5. Kotpal, R.L and N.P. Bali. Concepts of Ecology Vishal Publishing Company,Books Market, Old railway road, Jalandhar – 144 008.
6. Madhab, C.Dash. Fundamentals of Ecology. Tata McGraw Hill Publishing Company Limited,No.444/1.Sri Ekambara Naicker Industrial Estate, Alapakkam, Porur, Chennai – 600 116.
7. Odum , E.P. Fundamentals of Ecology. International Student Edition, W.B. Saunders Company, Philadelphia, USA.
8. Purohit, S.S. A Text book of Environmental Science, Student Edition, Agrobios (India), Behind Nasrani Cinema, Chopasani Road, Jodhpur – 342 002.
9. Singh, H.R. and Neeraj Kumar. Ecology and Environmental Science, Vishal Publishing Company, Books Market, Old Railway Road,Jalandhar – 140 008.

10. Singh, S.P.Animal Ecology,6th Edition, Rastogi Publications, Gangotri, Shivaji Road, Meerut – 250 002.
11. Verma, P.S. and Agawal 1986, Environmental Biology, S. Chand & Co Ltd.,

TOXICOLOGY:

1. Omkar. Concepts of Toxicology, Vishal Publishing Company, Books market, Old Railway Road,Jalandhur-144 008
2. Sharma, P.D.Toxicology .Rastogi Publications, Shivaji Road,Meerut-250 002.
3. Subramanian, M.A.Toxicology, Principles and Methods.MJP Publishers, Tamil Nadu Book House,47 Nallathambi Street,Triplicane,Chennai-600005.
4. Shukla, J.P. and S.P.Trivedi, Fundamentals of Toxicology, New Central Book Agency(P)Limited, 8/1 Chintamoni Das Lane,Kolkata-700 009.

MANONMANIAM SUNDARANAR UNIVERSITY
B.Sc ZOOLOGY (CHOICE BASED CREDIT SYSTEM – CBCS)
MAJOR PRACTICAL SYLLABUS
(FOR THOSE WHO JOINED THE COURSE IN THE YEAR 2017-2018 ONWARDS)
PRACTICAL - I
SEMESTER I
(2HRS / WEEK) Credits 1

Paper 1.1. Animal diversity I- Invertebrata

1. **Dissection and mountings:**
   Cockroach- Nervous system, Digestive System, Trachea, Salivary apparatus.
2. **Museum specimens, slides , models and charts:**
   Paramecium entire, Obelia colony, Ascaris male and female, Earthworm, Honey Bee, Leptocorisa, Nauplius, larva, Sepia, Pinctada, Star fish.

Paper 1.2. Animal Diversity II – Chordata

1 Dissection and Mountings :

- Shark – Placoid Scales.
- Frog – Arterial system (Demonstration only) – model / chart / CD – students have to draw the diagram and write detailed account of the arterial system in the observation note book.
- Frog – Brain (demonstration only) – model / chart / CD – students have to draw the diagram of dorsal and ventral view and write detailed account of the brain in the observation note book.

2. Museum Specimens, slides, models and charts

Amphioxus, Balanoglossus, Ascidian, Petromyzon,Narcine,Hippocampus,Rhacophorus, Ambystoma, Chameleon, Cobra, Kingfisher, Bat.

SEMESTER II

2HRS / WEEK Credits 1

PAPER 2.1. DEVELOPMENTAL ZOOLOGY

- Mounting and observation of live sperms of a vertebrate
- Mounting and observation of egg of a frog.
- Temporary mounting and observation of chick embryo – 24,48,72,96 Hrs.
- Museum specimens, slides, models and charts

  Sperm of a vertebrate, chick embryo – 24,48,72,96 Hrs.

  Condom, Mala – D, Placenta in mammals, Discoidal, Cotyledonary, Zonary placenta, Diffuse placenta.

PAPER 2.2 ECOLOGY AND TOXICOLOGY

Ecology

I. Plankton mounting-any two fresh water/marine

II. Museum specimens, slides, models and charts

Secchi disc, Mutualism (Hermit crab and sea anemone),commensalism (Echeneis and shark), Parasitism (Sacculina on crab),Cyclomolphosis (Daphnia)

Predation (Snake and Rat)

Effect of light Protective Colouration(Leaf insect)

Effect of light Colour changes (chamaeleon)

Pond Ecosystem (Chart)

Food Chain – Forest Ecosystem

Food Web – Grass land.

III Compulsory Study Tour

- A one day study tour is compulsory to visit an ecologically important place such as sea shore, sanctuary, forest area etc., to observe and study the animals in their natural habitat.
- The students should write an illustrated, study tour report and the same is to be submitted for evaluation at the time of practical examination (5 marks).

SYLLABUS FOR B.SC ZOOLOGY

Under Choice Based Credit system (CBCS)
(For the candidates admitted to the course in the academic year 2017 – 2018 and afterwards)
SEMESTER – I
I B.Sc. – ALLIED SUBJECT I – ZOOLOGY THEORY SYLLABUS
Course – 1.1 Cell Biology, Genetics and Biotechnology
4 Hrs/Week Credits – 3

OBJECTIVE:

To elucidate the structure and functions of the cell organelles; to exemplify the concept of genetics, the principles of imheritance and the role of genes in determining characters; to understand the application of the innovative technology to manipulate living organisms or parts of organisms to make products useful to human.

CELL BIOLOGY

UNIT I Ultra structure and functions of (a) Plasma membrane (b) Mitochondria (c) Nucleus,Chromosomes – Structure, types and functions; Giant Chromosomes (Polytene and Lampbrush Chromosomes)

(12L)

UNIT II DNA: Structure (Watson and Crick Model), Replication.

RNA: Different types – r RNA – mRNA – tRNA; Protein synthesis.

Cancer cells and carcinogenesis – Definition, Types, Causes, Properties, Diagnosis and Treatment.

(12L)

GENETICS

UNIT III Simple Mendelian traits in man; Multiple alleles – ABO blood groups in man – problems.

Rh-factor in human – Erythroblastosis foetalis. Multiple gene inheritance.

(12L)

UNIT IV Sex determination in man; Sex linked inheritance in man – Haemophilia, Colour blindness and Hypertrichosis.

Non disjunction and Syndromes in man – Klinefelter's syndrome, Turner's syndrome and Down's syndrome.

Inborn errors of metabolism in man – Phenylketonuria, Alkaptanuria and Albinism.

(12L)

BIOTECHNOLOGY

UNIT V Definition, scope and importance of Biotechnology, Basic concepts of genetic engineering.

Restriction and modification system – Cloning vectors – (Plasmids, pBR 322, Lambda phage)

Introduction of cloned genes into host cells – Transgenesis – Transgenic animals and its application.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS:

CELL BIOLOGY

- Ambrose, E.J & Dorothy, M.E: Cell Biology (ELBS CAMLOTPRESS)
- De Robertis & De Robertis: Cell & Molecular Biology. (W.B. Saunders &co, Philadelphia).
- De Robertis, E.D.P, Nowinski, W.N & Saez, F.A : Cell Biology (W.B. Saunders &co, Philadelphia).
- Dupraw, EJ : Cell & Molecular Biology (Academic Press, NewYork)
- Dyson, R.D :Essentials of Cell Biology (Allyn & BaconInc. Boston). Giese.A.C: Cell Physiology (W.B. Saunders & co,Philadelphia).

GENETICS

1. Strickberger : Genetics(MacMillan).
2. Farnsworth : Genetics (harper andRow).
3. P.K.Gupta: Genetics (RastogiPublications)
4. P.S. Verma and Agarwal: Genetics (S.Chand &Co.Ltd.)
5. Altonburg,E: Genetics (Oxford & IBH publishing company)
6. Burns G.W.: The Science of Genetics (MacMillan)
7. A.C.Pai: Foundations of Genetics (Mc Gaw –Hill)

BIO-TECHNOLOGY

- Prof.V. Kumaresan,"Animal Biotechnology", Saras Publication, A.R.P. Camp Road, Periavilai, Kottar P.O.,Nagercoil, K.K.Dist., - 629002.
- Kumar H.D." A text book of Biotechnology,Affiliated East – West Press(P) Ltd., NewDelhi.
- Animal Biotechnology,2006,R.Sasidhara,MJPPublishers,Chennai.
- Dubey R.C "A text book of Biotechnology"S.Chand & Co.,Ltd.,NewDelhi.

ALLIED PRACTICALS

2 Hrs/week **Credits 1**

FOR 1.1.CELL BIOLOGY, GENETICS AND BIOTECHNOLOGY

- Mounting of Giant Chromosome in Chironomous larva / onion root tip
- Observation of simple mendelian triats among the students

Study of the following through Charts, Slides and Figures:
Mitochondria, Interphase Nucleus, DNA, tRNA, ABO Blood group.
Colour Blindness, Haemophilia, Klinefelter's syndrome, Down's syndrome.
pBR 322, Lanmbda Phage, Recombinant DNA.
Allied practical examination at the end of each semester

SEMESTER II

I B.Sc., - ALLIED SUBJECT I – ZOOLOGY

COURSE 2.1. DEVELOPMENTAL ZOOLOGY, ECOLOGY, ANIMAL PHYSIOLOGY AND EVOLUTION

4 Hrs/Week Credits-3

OBJECTIVES:

To understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms. To study the interaction and the interdependence among environmental factors and living organisms; To understand the functional significance of various organs and organ systems of animals. To discern the evolutionary significance of the animals, origin of species, effects of mutation.

OUTCOME: To understand the behaviour and physiology of organisms

UNIT I

Early development in Man: Structure of sperm and ovum; Fertilization – Cleavage, Morula, Blastocyst, Implantation and gastrulation – Fate map. Placenta in mammals – types and functions. Test tube babies – Twins – Amniocentosis.

Nuclear Transplantation in Acetabularia.

(12L)

UNIT II

Abiotic factors: Biological effects of Temperature and Light; Biotic factors: Symbiosis, Commensalism, Mutualism, Parasitism, Prey-predator

Relationship; Adaptations: Desert adaptations.

Community: Ecosystem – Structure and dynamics of a pond.

(12L)

UNIT III

Nutrition: Food constituents – Carbohydrates, Proteins and Fats.

Digestion: Role of enzymes in carbohydrate, protein and fat digestion.

Absorption: Absorption of digested food.

Metabolism: Carbohydrate metabolism: Glycogenesis, Glycogenolysis, Glycolysis. Respiration: Transport and exchange of oxygen and carbon dioxide. Haemoglobin.

(12L)

UNIT IV

Excretion: Structure of Nephron – Urine formation – Dialysis Nervous Co-ordination: Structure and types of neurons – Nerve impulse, conduction of nerve impulse through neuron and synapse.

Reproduction: Structure of human testis and ovary, Graafian follicle, Menstrual cycle and its hormonal control.

(12L)

UNIT V

Theories of Evolution: Darwinism, Mutation theory of De Vries.
Adaptive radiation in birds.
Mimicry and Colouration.
(12L)

(TOTAL: 60L)

REFERENCE BOOK:

DEVELOPMENTAL ZOOLOGY

1.Arora,M.P.Embryology.HimalayaPublishing House,Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai- 400 004.
2. Arumugom, N. Developmental Biology, Saras Publication, 114/35G,A.R.P camp Road, Nagercoil.

Ecology:

1. Agrawal. A.k. ecology and environmental biology, student edition agrobios (india), behind nasrani cinema. Chopasani road. Jodhpur-342 002
2. Odum, E.P. Fundementals of Ecology International Student Edition W.B. Sounders Company, Philadelphia, London.

Animal Physiology:

1. Agarwal, R.A., A.K. Srivastava and Kaushal Kumar. Animal Physiology and Biochemistry (3rd Edition). S. Chand & Company Limited, 7361 Ram Nagar, New Delhi-110 055.
2. Arora,M.P Animal Physiology (6th Edition). Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai 400 004.

Evolution:

1.Arora, M.P. Evolutionary Biology. Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai 400 004.
2. Tomar, B.S. and S.P. Singh. Evolutionary Biology. Rastogi Publications, Gangotri, Shivaji Road, Meerut-250 002.

ALLIED PRACTICALS

2 Hrs/Week **Credits 1**

FOR 2.1.DEVELOPMENTAL ZOOLOGY, ECOLOGY, ANIMAL PHYSIOLOGY AND EVOLUTION.

1. Mounting and observation of live sperms of a vertebrate.
2. Estimation of dissolved oxygen in two water sample and discuss the result
3. Qualitative test for glucose, protein and lipid.
4. Effect of temperature on the opercular movement of fish; Calculation of Q_{10}.
5. Museum specimens, slides, models and charts:

Developmental Zoology: Human sperm, Human ovum, Cleavage, Diffuse Placenta,Zonary Placenta,Discoidal placenta,Cotyledonary Placenta (any two)

Ecology: Identification of any two plankton either Fresh water OR marine samples.

Echeneis and Shark, Hermit crab and Sea anemone, Sacculina, Secchi disc.

Animal Physiology: Intestinal villi, Nephron, Heart of mammal.

Evolution: Ancon sheep.

Allied Practical Examination at the end of each Semester.

ALLIED SUBJECT FOR I YEAR B.SC ZOOLOGY MAJOR STUDENTS FROM THE YEAR 2017 – 2018 ONWARDS

INDUSTRIAL FISH AND FISHERIES – ALLIED

SEMESTER I

PAPER I BIOLOGY OF FISH

4 Hrs/Week Credits-3

OBJECTIVE:

To help the students taking Industrial Fish and Fisheries as a subject to have a through knowledge of the various aspects of the Biology of Fish

OUTCOME:

To understand the marketing of fishes and fishery products.

UNIT I

Introduction: Fish Biology – Definition and basic concepts of biosystematics. Importance of classification – Theories of biological classification. Variations in structure, Form, Skin, Coloration, Scales, Mouth, Jaws, Teeth, Fins, Spines and other structures used in taxonomic studies. Induced breeding techniques – Hatching methods – Seed and Brood transport.

(12L)

UNIT II

Study of external morphology and internal organization of a typical elasmobranch and teleost. Alimentary Canal and Associated Structures – Gills – Swim Bladder – Accessory Respiratory organs – Lateral line system – Sound and Light producing organs. Morphological and anatomical characters of Prawn, Crab, Lobster, Bivalve, Gastropod and Cephalopod (one example each)

(12L)

UNIT III

Natural food of fishes – Feeding habits in various groups of fresh water and marine fishes, Prawns, Crabs, Lobsters and Cephalopods. Qualitative and Quantitative estimation of food consumption based on experimental studies and stomach content analysis – Seasonal changes in food availability and food preference – Food and Feeding in relation to age – Food selectively – Feeding intensity. Nutrition of fishes and utilization of food, Feeding strategies and energies. Artificial feeding – Nutritional requirement.

(12L)

UNIT IV

Growth of fish – Absolute, Relative, Isometric and Allometric growth. The Cube Law – Methods for determination of growth – Length frequency analysis – Analysis of growth checks on hard parts like Scales, Otolith and Vertebrae – Estimation of growth by direct methods – Marking and tagging of fish for growth studies – Aging of fish and shell-fish based on length data and growth checks – Length weight relationships, Ponderal index, Relative condition factor and Gonado – Stomach index.

(12L)

UNIT V

Types of reproduction, Sex differences – Sexual maturity, Classification of maturity stages, Size at first maturity. Estimation of fecundity – Ova diameter frequency – Fecundity in relation to length, Weight, Age and food supply. Spawning habits – Factors affecting Spawning, Spawning seasons and frequency. Embryonic and early development – Types of egg and Larvae – Metamorphosis of larva – Larval life and feeding habits. Reproductive behaviour and parental care – Social behaviour – Aggregation and Shoaling. Migrations – Anadromous and Catadromous. **(12L)**

(TOTAL: 60L)

PRACTICALS

1. Methods for Collection, Handling, Identification and Preservation of fish for taxonomic purposes.
2. Study of external morphology of fish. Specific identification of important fresh water and marine fishes, prawns, crabs, Bivalves and Cephalopods of India.
3. Identification of scales of fishes – Placoid, Cycloid and Ctenoid scales.
4. Study of food and feeding habits of fishes – Plankton feeder, Herbivore feeder, Carnivore feeder, Omnivore feeder, Detritus feeder. Study of Structural Adaptations for Diet.
5. Qualitative and Quantitative methods for Stomach content analysis.
6. Estimation of Oxygen, Carbon dioxide, Salinity content in water samples.
7. Plankton analysis in the water samples – any two.
8. Identification of Anadromous and Catadromous fishes.

REFERENCES

1. The Biology of Fishes, Kyle, H. M., T.F.H. Publication, Hong kong 366 P.
2. The Life of Fishes, Marshell,N.B.1965,Weidenfeld & Nicolson, London 402 P.
3. The Marine and Freshwater Fishes of Ceylon,Munro I.S.R,1982.Soni Reprints Agency, New Delhi 351 P.
4. Inland Fishes of India and Adjacent Countries., Vol I & Vol II,Talwar, P.K. and A.G.Jhingran,1991,Oxford & IBH Publishing Co Pvt Ltd.,New Delhi 1958 P.
5. Fisheries Ecology, Pitcher, T.J. & P.J.E. Hart,1992,Room Helm,London 414 P.
6. Introduction to the Practice of Fisheries Science.Royce,W.F.1984,Academic Press 438 P.
7. Fisheries Science its methods and application,1993,Rounsfell,G.A. and W.H.Everheart, John William & Sons New York,444

ALLIED SUBJECTS FOR I YEAR B.SC ZOOLOGY MAJOR STUDENTS FROM THE YEAR 2017 - 2018 ONWARDS

INDUSTRIAL FISH AND FISHERIES – ALLIED

SEMESTER II

PAPER 2 CAPTURE FISHERIES

4 Hrs/Week **Credits-3**

OBJECTIVE:

To highlight the recent trends and types of capture fisheries to students studying industrial fish and fisheries.

OUTCOME: To understand the knowledge of techniques about fish capture and culture.

UNIT I

Capture Fisheries – Inland Capture Fisheries – Scope and importance of Capture Fisheries in India and World. Present yield and Estimates of Potential. Inland capture fishery resources of Indian Fisheries of major and minor carps. Cat fishes and other groups. Problems and management.
(12L)

UNIT II

Cold water fishery resources – Fisheries of trout, Mahaseer and other Cold water Species. Lacustrine fisheries – Species, Catch, Fishing gears, Potential and Problems of Development and management. Estuarine fisheries. Fisheries of Brackish water lakes and back waters – Problems and Management.
(12L)

UNIT III

Salient features of cultivable species of fishes and shell fishes.Marine fishery resources of India – Fisheries of Sardine, Lesser Sardine, Anchovies, Other Clupeoids, Mackerel, Ribbon fishes, Tunnies, Carangids and Cephalopods.
(12L)

UNIT IV

Mid water and Demersal fisheries – Fisheries of Elasmobranches, Bombay duck, Cat fishes, Silver Bellies, Sciaenids, Pomfrets,Thread fins,Thread fin breams and Perches,Flat fishes,Prawns lobsters,Crabs,Mussels Oysters and Clams,Culture of edible Oyster.
(12L)

UNIT V

Biological aspect of fishery managements,Principles of Conservation,Development and Management Concept and practice.Population dynamics – Concept of recruitment and yield,problems of over fishing,MSY,MEY and OSY
(12L)

(TOTAL: 60L)

PRACTICALS

1. Identification of commercial fresh water and marine prawns.
2. Visit to a Prawn farm.
3. Visit to a fish processing industry.
4. Visit to a Landing centers.
5. Raceway culture system.
6. Field visit to observe fishing and to collect field data regarding species composition,Craft, Gear and Field problems regarding riverine, esturine,reservoir and cold water fisheries.
7. Study of fishery development programmes.
8. Study of fishery management problem – Laws,Acts and Field problems.

REFERENCE BOOKS

1. Fish and Fisheries of India Jhingran V.G. 1982 Hindustan Publishing Corporation India Delhi Rev.Ed.
2. Prawns and Prawn fisheries of India Kurian C.V and V.C Sebastian 1982.Hindustan Publishing corporation (India) Delhi Rev.Ed.
3. Marine Fisheries.Bal D.V and K.V Rao 1990.Narendra Publishing House Delhi Rev.Ed.
4. Cold water fisheriesof India.Jhingran V.G and K.L Sehgal 1979.Barrackpore Inland fisheries soceity of India.
5. Fisheries Development in India.Srivastava U.K and Dharma Reddy 1983.Concept publishing co.,New Delhi.
6. Introduction to the practice of fishery science,Royce 1984 Academic press,London.
7. Fishery Science its methods and Applications,Rounsefell,G.A and W.H Everhart 1953 John.Wiley, New York.

SYLLABUS FOR B.SC ZOOLOGY
(For the candidates admitted to the course in the academic year 2017 – 2018 and afterwards)
SEMESTER III
PAPER3.1 CELL AND MOLECULAR BIOLOGY
(4 Hrs /Week) Credits-4

OBJEVTIVES:
To understand the ultrastructure and functions of various cell organells..
OUTCOME:
To inculcate the techniques of cell and molecular biology.

UNIT I

Cell types – prokaryotic & Eukaryotic, Microscopy – detailed study of compound microscope, phase contrast & electron microscopes, Cytological techniques – Fixation & Fixatives – types of stains.
(13L)

UNIT II

Ultrastructure & functions of the following cell organelles: Plasma membrane, mitochondria. Golgi apparatus, endoplasmic reticulum, ribosomes, lysosomes, centriole.
(12L)

UNIT III

Nuclear components: Ultrastructure & functions of nucleus, nuclear membrane, nucleolus, chromosomes&theirtypesLampbrushchromosomeandPolyteneChromosome,Cancercells& Carcinogenesis: Definition, types, causes, properties, treatment, Oncogenesis. CellSignaling.
(14L)

UNIT IV

Nucleic acids – DNA: Components of DNA, DNA structure & Replication, Hybridization, DNA finger print, DNA as genetic material. RNA - Types, Protein Synthesis – Lac Operon
(11L)

UNIT V

Cell Division – Mitosis, Meiosis, & synaptonemal complex, functional unit of gene, Genetic code – codon, anticodon & control of gene expression.
(10L)

(TOTAL: 60L)

PRACTICALS

- Mitosis in Onion root tip cells./ Garlic rootcells.
- Meiosis in Grasshopper testis – Demonstrationonly.
- Giant chromosome in Chironomouslarva.
- Preparation of a) Squamousepithelium
- Preparation of human bloodsmear
- Preparation of frog bloodsmear
- **Spotters:**Models & charts: DNA, t-RNA, Ribosomes, Nucleus, Mitochondria,Golgi apparatus, Endoplasmic reticulum, Proteinsynthesis.

REFERENCE BOOKS:

- Ambrose, E.J & Dorothy, M.E: Cell Biology (ELBS CAMLOTPRESS)
- De Robertis & De Robertis: Cell & Molecular Biology. (W.B. Saunders &co, Philadelphia).
- De Robertis, E.D.P, Nowinski, W.N & Saez, F.A : Cell Biology (W.B. Saunders &co, Philadelphia).
- Dupraw, EJ : Cell & Molecular Biology (Academic Press, NewYork)
- Dyson, R.D :Essentials of Cell Biology (Allyn & BaconInc. Boston). Giese.A.C: Cell Physiology (W.B. Saunders & co,Philadelphia).
- Gupta P.K. – Cell and Molecular Biology, Rastogi Publication,Meerut.
- Norman.S. Cohn : Elements of Cytology (Freeman Book co, Kamia Nager, NewDelhi).
- Swanson, C.P & Webster. B : The Cell (Prentice Hall Inc., Engle Wook Cliffs, New Jersey)
- Verma, P.S. and Agarwal, V.K. Cytology eighth edition S. Chand andCo.

SEMESTER III
SKILL- BASEDSUBJECTS
Paper 3.2A HOME AQUARIUM
(4 Hrs / Week) Credits-4

OBJECTIVESTo understand the construction and maintenance of aquarium, selection , culture and breeding techniques**.**

OUTCOMETo gain knowledge about the culture practices of aquarium fishes**.**

UNIT I
Construction of Home Aquarium.
Materials needed – Wooden and metal frames – Frameless tanks – Sealants and Gums. Design and Construction of Public Freshwater and Marine Aquaria.
Aerators and Filters – Hand net and other equipment.
Water quality requirements – Temperature control and Lighting.
(13L)

UNIT II
Setting up aquarium – gravel/pebbles – Plants – Ornamental objects and fishes – Selection. of species – Introducing fishes to the aquarium. Nutritional requirements of aquarium fishes. Different kinds of feeds. Culture of food organisms. Preparation of dry feeds. Feeding methods
(11L)

UNIT III
Species of ornamental fishes – Taxonomy and biology of Gold fish, Guppies, Swordtails, Marine fishes – Angels and Butterfly fishes.
Fresh water species – live bearers and egg layers, one example each – Common Community fishes – Freshwater and marine, any two examples each.
(12L)

UNIT IV
Reproductive biology of gold fish and angel fish – Maturation, Secondary sexual characters, Breeding habits, Spawning, Parental care, Fertilization and Development of eggs.
Common diseases of freshwater and marine aquarium fishes – Parasites, Fungal, Bacterial-symptoms – Treatment – Prevention and control.
(13L)

UNIT V
Fresh water plants – their taxonomy and morphology, any three of aquarium plants – provision of nutrient and optimum environmental condition for their growth.
Other Ornamental organisms – Anemones, Lobsters, Shrimps, Octopus, Star fish etc
(11L)

(TOTAL: 60L)

REFERENCE BOOKS:

1. Guide to tropical fish keeping, 1967, Braymer, J.H.P.ILiffe.
2. Tropical Marine aquaria, 1974. Cox, J.F.Hamlyn.
3. Tropical Fish: Setting up and maintaining fresh water and Marine aquaria,1972. Dussa Octopus BookLtd.
4. Aquarium systems, 1981. Hawkins, A.S.(Ed.) Academicpress.
5. Living Aquarium, 1981. Hunnam, P. WardLock.
6. Aquarium Fishes and Plants, 1971, Rataj, K. and R. Zukal –Hamlyn.
7. Ornamental Fish for Garden and Home Aquariums, 1956, R and C.P Home Aquariums.
8. Sea Water Aquariums, 1979.Spotte, S. JohnWiley.
9. Collins Guide to Aquarium Fishes and Plants, 1969.Schiotz, A.Collins.
10. Complete Aquarium, 1963.Vogt,D. and H. WermuthThames.

SEMESTER III

PAPER 3.2B NUTRITION AND DIETETICS

(4Hrs./WEEK) Credits-4

OBJECTIVE:

To understand the importance of the various food stuff on one side and to study malnutrition, nutrition related diseases and special diets for persons suffering from diseases on the other.

OUTCOME: To understand the food we have to take and to maintenance of health practices.

UNIT I

Macronutrients and their function – Carbohydrates – Fats – Proteins -Water.

Micronutrients and their function - Vitamins andMinerals.

Nutritive value of the foodstuff – Cereals – Pulses – Vegetables – Fruits – Milk – Egg – Meat – Fish.

(11L)

UNIT II

Parboiling of rice – process of parboiling and uses of parboiledrice.

Germination of cereals – process of germination and uses of sprouts & its nutritivevalue.

Metabolism of foodstuffs – protein, carbohydrate and lipid.

Food choice and preparation methods.

Effect of cooking on protein, carbohydrate and fatcontent.

Menu planning and meal pattern – vegetarian and non – vegetarian.

(13L)

UNIT III

Role of fibres innutrition.

Determination of energy content of food – Bombcalorimeter.

BMR – Determination of BMR – using direct caloriemeter and Benedict Methods, Roth basal metabolic apparatus – Factors affecting BMR.

(11L)

UNIT IV

Balanced diet – Nutritional requirements of different age groups – Pre schoolers- schoolers – Adolescents – Pregnant, lactating women and Agedpeople.

Nutritional diseases – causes and prevention and dietary management of malnutrition, under nutrition and obesity.

Common nutritional deficiency diseases in India – Kwashiorkor – Marasmas –Anaemia – Goitre.

(15L)

UNIT V

Therapeutic diet and its importance, dietplanning.

Symptoms, causes, prevention and dietary management for diabetes mellitus, ulcer, renal diseases, hepatitis, hypertension, atherosclerosis, gastro-intestinal disorders,constipation.

(10L)

(TOTAL: 60L)

REFERENCE BOOKS:

- Ann Louise Gittleman. The Fat Flush Plan. Tata Mc Graw Hill Publishing Company Limited,444/1,Sri Embara Naicker Industrial Estate, Alapakkam, Porur,Chennai
- Hellen Kowtaluk. Food for Today, Tata Mc Graw Hill Publishing Company Limited, 444/1,Sri Embara Naicker Industrial Estate, Alapakkam, Porur,Chennai
- Shubhangini A. Joshi, Nutrition and Dietetics.T Tata Mc Graw Hill Publishing Company Limited, 444/1,Sri Embara Naicker Industrial Estate, Alapakkam, Porur,Chennai.
- Swaminathan, M. Food Science, Chemistry andExperiment.
- Swaminathan, M. Principles of Nutrition andDietetics.
- You and Your food and its utilization, Manuscript.IGNOU.
- Rajalakshmi, R. AppliedNutrition.
- Sumathi, R. Mudambi and M.V. Rajagopal. Fundamentals of Food andNutrition.
- Stanley Davidson, Passmore, R. Nutrition andDietetics
- Poggy, S., Stanfield. Nutrition and Diettherapy.
- Fergos Clydesdate, M. Food Nutrition AndHealth.

SEMESTER III

PAPER 3.3A BEE KEEPING (NON MAJORELECTIVE)

(2 Hrs/week) Credits-2

OBJECTIVE:

To know the knowledge of rearing of honey bees and extraction of honey.

OUTCOME:

To encourage the students to develop self employment.

UNIT I

Comparative study of Rock bee, Indian bee, Little bee and Dammer bee – Life history of Apis indica. Queen, Drones and Workers – Identification, Salient features and Functions.

(6L)

UNIT II

Food of the bee – honey and pollen. Relationship of plants and Bees. Arranging an apiary position – space – direction.

(6L)

UNIT III

Acquiring bees – Care of newly captured colonies. Different kinds of cells. Swarming.

(6L)

UNIT IV

Primitive hives – Different types. Advantages and Disadvantages of primitive hives. Newton's bee hive and its architecture. Appliances used in Apiaries.

(6L)

UNIT V

Honey – Collection and Extraction of honey , preservation, storage, Physical properties, chemical composition, Nutritive value, medicinal values, Honey as Daily Food.

(6L)

(TOTAL: 30L)

REFERENCES:

1. Bee Keeping in India – Sardar Singh- KAR,Delhi.
2. Bee keeping in South India – Cherian M.C. & Ramachandran, Govt.Press,Chennai.
3. Handbook of bee keeping – Sharma P.L. & Singh S.,Chandigarh.
4. Apiculture – J. Johnson and Jeyachandra, Marthandam, TamilNadu.

SEMESTER III

CLINICAL BIOLOGY

(2HRS. /WEEK) Credits-2

OBJECTIVE:

To understand the methodology of collection, analysis and preservation of samples related to various diseases.

OUTCOME:

To understand various preventive measures

UNIT I

Introduction- Normal and Abnormal conditions of body – Symptoms – Samples to be collected for analysis – diagnosis – Instruments used in the analysis - Sterilization .

(6L)

UNIT-II

Urine Analysis –Collection and preservation of sample and chemical estimation. Protein, Urea, Glycemia sediments and casts, impaired renal function and clearance test.

(6L)

UNIT-III

Estimation of Gastro intestinal contents –Saliva constituents, Collection and estimation of Gastric juice, Secretion of liver, Duodenal contents and Pancreatic function tests.

(6L)

UNIT-IV

Clinical Haematology – Ways of obtaining blood, Haemoglobin estimation. Cell counting (DC/ TC), Estimation of Erythrocytesedimentation test (ESR) ,pathological ,physiological and hereditary disorders, Blood banking ,Blood grouping ,and typing ,Glucose ToleranceTest (GTT), Impaired Glucose Tolerance Test , Elisa test.

(7L)

UNIT-V

Fertility test-semen analysis and pregnancy test, RIA test- Agglutination test- Morphological variations – Types- Count and Abnormalities.

(5L)

(TOTAL: 30L)

REFERENCE BOOKS:-

1. Medical laboratory techniques-R.Sood
2. Text book of preventive medicine-J.E Park, BenansidarBhalot
3. Introduction of medical laboratory technology-Baker, F.J.Silverton
4. Medical laboratorytechnology-Lynch.

SEMESTER IV
PAPER 4.1 – GENETICS
(4 Hrs. /WEEK) Credits-4

OBJECTIVE
ToUnderstand the inheritance of parental characters and hereditary diseases
OUTCOME
To gain knowledge of Mendelian traits of human traits

UNIT I
Introduction to Genetics. Mendel- Reason for Mendel's experiment, Alleles, Backcross, testcross- Mendellian laws of heredity. Monohybrid cross and Dihybrid cross.

Interaction of genes – complementary, supplementary, Duplicate genes, lethal genes in man, epistasis, complete and incomplete dominance, co-dominance.

Multiple alleles – A,B,O blood groups- Rh factors in man Problems related to blood groups - Erythroblastosis foetalis. Multiple genes (polygenic inheritance) skin colour in man.
(12L)

UNIT II
Linkage – complete, incomplete, crossing over – coupling and repulsion – Mechanism of Meiotic crossing over – chromosomes map; Sex determination in man, Drosophila. Genic Balance Theory. Sex linked Inheritance in man – Haemophilia, colour Blindness, Holandric genes - hypertrichosis- sex limited genes. Non disjunction inman
Extra chromosomal inheritance in paramecium, maternal predetermination in coiling of shell. Animal breeding: – Inbreeding and out breeding, heterosis.
(12L)

UNIT III
Mutation – types of mutation- gene mutation – genome mutation – mutagens – mode of action of chemical mutagens and ionizing mutagens – detection of mutation by ClB method.
Chromosomal abnormalities – autosomal and sex chromosomes – klinefelters syndrome, Turner's syndrome and Down's syndrome.
(12L)

UNIT IV
Human genetics – twins. Human chromosome, karyotypes, idiogram, Simple Mendelian traits in man.Inborn errors of metabolism – phenylketonuria, Alkaptonuria, Albinism, Sickle – Cell anaemia. Improvement of human race – Eugenics, Euthenics, Pedigree Analysis. Genetics Prognosis – genetic counselling – family history – preventive measures.
(13L)

UNIT V
Bacterial genetics – structure of E-coli, bacterial recombination – transformation conjugation, transduction and sexduction. Genetic application of bacteria, structure and life history of T_4phage. Genetic application of virus.
(11L)

(TOTAL: 60L)

PRACTICALS

- Breeding Experiment: Chi Square test to be illustrated with beads

a) Monohybridand

b) Dihybrid.

- Observation of simple Mendelian traits in man – to berecorded.
- Observation and study of polygenic inheritance of quantitative traits to be interpreted in graphs:-a)height of student b) weight of students / length of shells / length ofpods.
- Blood group to be analyzed in a population with a minimum of 30students.
- Spotters: models of genetic significance to be studied E-coli, T_4phage. Down's syndrome, Klinefelters syndrome, Turner's syndrome, sex linked inheritance (colour blindness, hemophila, hypertrichosis, and webbedtoes).
- Culture and Observation of Drosophila lifecycle.

REFERENCE BOOKS:

1. Strickberger : Genetics(MacMillan).
2. Farnsworth : Genetics (harper andRow).
3. P.K.Gupta: Genetics (RastogiPublications)
4. P.S. Verma and Agarwal: Genetics (S.Chand &Co.Ltd.)
5. Altonburg,E: Genetics (Oxford & IBH publishing company)
6. Burns G.W.: The Science of Genetics (MacMillan)
7. A.C.Pai: Foundations of Genetics (Mc Gaw –Hill)
8. J.A.Serra: Modern Genetics (3 volumes)
9. Sinnot,Dunn and Dobzhansky: Principles of Genetics (McGrawHill)
10. Gardener: Principles of Genetics.

SEMESTER IV
PAPER 4.2A BIOPHYSICS AND BIOINSTRUMENTATION
SKILL BASED SUBJECTS(Any One)
(4Hrs / Week) Credits-4

OBJECTIVES
To know the methods of various instrumentations related to biological systems.
OUTCOME
To gain knowledge about the establishment of clinical laboratory and also useful for research purposes

UNIT I
Biophysics – Scope and Method – Atoms – Molecules – Molecular Interactions – Chemical bonds – Primary chemical bonds – Secondary chemical bonds. Principles of Thermodynamics – Laws of Thermodynamics – Enthalpy – Entropy – Living systems and energy changes.
(12L)
UNIT II
Bioenergetics – Energy and Work – Energy Transformation – ATP – Bioenergetics – Structure of ATP – Formation of ATP – NADP – Structure – NADP / NADPH Redox couple – Mitochondrial bioenergetics – Chloroplast bioenergetics. Membrane Conductivity – Diffusion – Active transport – Osmosis – Electric conductivity.
(12L)
UNIT III
Photobiology – Nature of light and its properties – Absorption and Emission Spectra – action spectrum, Refractive index – Huygen's Principle – Polarized light – Solar radiation – UV – Infrared – De- excitation- Bioluminescence – Fluorescence – Phosphorescence.
(11L)
UNIT IV
Instrumentation – Microscopy – Principle and application of Electron Microscope. Basic Instruments – Principle and applications of pH meter and Colorimeter Centrifugation – Principle and Types – Chromatography – Principle – Types – Paper, Ion exchange, HPLC and applications
(11L)
UNIT V
Labeling Techniques: Isotopes, Radioactivity, Radioactive decay, half – life, autoradiography, biological use of radioactivity, radioactivity Counter – Principle – Types – Geiger Muller – Scintillation Counter.
Electrophoresis – Principle – Types – Agarose Gel electrophoresis, Polyacrylamide gel – Sodium Dodecyl Sulphate Polyacrylamide gel – Applications
PCR Technology: Working mechanism of PCR
Gel Doc. – Principle – Working mechanism – Lyophiliser – Pinciple – Working mechanism – applications.
(14L)

(TOTAL: 60L)

REFERENCE BOOKS:

1. Saleel Bose: Elements of Biophysics.
2. Casey: Biophysics – Concepts & Mechanism.
3. Vasantha pattabhi N. Gautham: (Narosa publishing House) – Biophysics.
4. Jeyaraman, K. : Laboratoy Manual in Biochemistry. New Age International publishers.
5. Kalaichelvan, P.T: A Laboratory Manual, MJP Publishers,47, Nallathambi Street, Triplicane,Chennai 600 005.
6. Gurumani, N: Research Methodology for Biological Sciences.MJP 47, Nallathambi Street, Triplicane, Chennai 600 005.
7. Palanivelu, P.Analytical Biochemistry and Separation Techniques.A Laboratory Manual for B.SC and M.SC Students.Department of Molecular Biology,M.K.University, Madurai-625 021.
8. L.Veerakumari,Bioinstrumentation MJP Publishers,47, Nallathambi Street, Triplicane,Chennai 600 005

SEMESTER IV PAPER
4.3B VERMITECHNOLOGY
SKILL BASED SUBJECT
(4Hrs / Week) Credits-4

OBJECTIVE

To get the thorough knowledge of making vermicompost and vermiculture

OUTCOME

To encourage the self employment practice and save the human being by the way of minimizing the use of chemical fertilizers.

UNIT I

Earthworm taxonomy – Morphological and anatomical – Classification of earthworms – Food habits – Digestive system – Excretion – Reproduction and Life cycle – Earthworm as farmer's friend.

(11L)

UNIT II

Types of earthworm – Exotic and native species – South Indian and North Indian species used in Vermicomposting – Collection and Preservation of earthworms for vermicomposting – Culture techniques of earthworms.

(11L)

UNIT III

Vermicompost production – Requirements – Different methods of Vermicomposting – Heap method – Pot method and Tray method – changes during Vemicomposting.

(11L)

UNIT IV

Role of Earthworms in soil fertility – Use of Vermicompost for crop production – Use of earthworms in land improvement and land reclamation – Economics of Vermicompost and vermiwash production. Earthworms as animal feed – Medicinal value of earthworm meal – Role of Earthworms in Solid Waste, Sewage and faecal waste management and Vermifilters. Earthworms as bioreactors.

(15L)

UNIT V

Interaction of earthworms with other organisms – Influence of chemical inputs on earthworm activities – Large scale manufacture of Vermicompost, packaging of vermicompost and its marketing – Financial supporting – Government and NGOs for vermiculture work.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS :

1. Invertebrate Zoology – Ekambaranatha Ayyar.
2. Earthworm in Agriculture – S.C. Talashikar and Dosani, Agrobios Publications, Near Nasarani Cinema, Jodhpur, 342 002.
3. Vermicompost for sustainable Agriculture – P.K. Gupta Agrobios 2nd Edition.
4. Organic Farming for sustainable Agriculture – A.K.Dahama,Agrobios.
5. A Hand book of Organic farming – A.K.Sharma.Agrobios publication.
6. Earthworm ecology – Clive A. Edwards St. Lucie press – CRC Press Washington DC.
7. Biology of Earthworm - Edward and Lofti – Chapman and Hall Publication.
8. Vermicology – Sultan A. Ismail – Orient Longman Press.
9. Vermiculture Biotechnology – U.S. Bhawalkar BERI, PUNE.

SEMESTER IV

PAPER 4.3A PUBLIC HEALTH AND HYGIENE

(Non Major Elective)

(2 Hrs / Week) Credits-2

OBJECTIVES

To understand the physical, mental and social health and also know the safer disposal of various wastes

OUTCOME

To gain the knowledge about the preventive measures

UNIT I

Physical, Mental,Social – Positive health – Quality of life Index. Nutrition and Health – Food hygiene – Food toxicants.

Population explosion in India – Birth control measures.

(6L)

UNIT II

Environment and health – Water – Sources of water – Uses of water. Water borne diseases – Cholera – Ascariasis.

Standards of Housing – Ventilation.

(6L)

UNIT III

Excreta disposal – Importance – Methods of excreta disposal. Sanitary health measures during fares and festivals.

First aid with reference to accident.

(6L)

UNIT IV

Communicable disease – Viral diseases – AIDS, Rabies. Bacterial diseases – Tuberculosis, Typhoid.

Protozoan diseases – Amoebiasis. Helminth diseases – Filariasis.

(6L)

UNIT V

Health situation in India – Health problems – Primary health care in India – PHC – National Programmes – National AIDS control – National Malaria Eradication Programme – National Tuberculosis.

(6L)

(TOTAL: 30L)

REFERENCE BOOKS:

1. Anderson R.Cliford. Your Guide toHealth.
2. Basu, S.C. Preventive and SocialMedicine.
3. Goel, S.O.L. Public HealthAdministration.
4. Harold Shoryock and Hubert O. Swartout. You and Your Health illustratedDealing with Diseases.
5. Park, K.Park's Text Book of Preventive and Social Medicine.BanarsidasBhanot Publishers,1167 Prem Nager,Jabalpur – 482001.
6. Ramarao, V.First Aid in accidents. Sri Krishna brothers, Thambu Chetty Street,Chennai.
7. Sanitarians Hand Book. Theory and Administrative Practice.PearlesPublications, New Orleans, USA.

SEMESTER IV PAPER

4.3B COMMUNITYAND SOCIAL PREVENTIVEMEDICINE

(Non Major Elective)

(2hrs/week) Credits-2

OBJECTIVES

To understand the knowledge of epidemic and endemic diseases

OUTCOME

To gain the knowledge about the maintenance of hygienic conditions, various diseases and their preventive measures

UNIT-I

Community and Health

Meaning and concept- Biomedical, Ecological, Psychological, Social and holistic. Determinants of health & Indicators of health. Concept of community health, Role of primary health centers.

(6L)

UNIT-II

Drug Addiction:

In India today –incidence among college students-common drugs in vogue-their side effects, control and management of drug addiction.

Alcoholism:

Its effect on various organs like heart, lungs, liver, pancreas, brain and intestine-chronic alcoholism – alcoholic withdrawal syndrome - its control and treatment.

(6L)

UNIT-III

Sexually transmitted diseases:

Gonorrhoea- Syphilils – AIDS - Causative agent, causes - symptoms-diagnosis - treatment and controlmeasures.

(6L)

UNIT-IV

Child abuse:

Definition-causes-effects-Legal measures for eradication.

(6L)

UNIT-V

Problems of old age:

Concept of ageing. H**o**using and health care of the aged. Problems – Cardiovascular - alimentary –Locomotion and joints-welfare service provided to the aged by the Government.

(6L)

(TOTAL: 30L)

PRACTICALS:

- Simple staining of bacteria.
- Gram staining of bacteria.
- Visit to primary health centres.
- Health survey report of a rural community.
- Museum specimens, slides, models and charts- Treponema pallidum, Neisseria gonorrhoeae, AIDS virus , Liver cirrhosis and illustrations related to theory syllabus.

REFERENCE BOOKS:

1. Social Problems in India – Ram Akuja.
2. Social Preventive Medicine – Park & Park.
3. Ageing and Aged – Paul Chowthry.
4. Indian Social Problem –G.R. Madan.

SEMESTER V

PAPER 5.1 – ANIMAL PHYSIOLOGY

5 Hrs. /Week Credits-4

OBJECTIVE

Carving an integrated approach to chemistry related to the functional significance of the various organs and organ systems of animals.

OUTCOME

Students learned about various physiological systems and their activates

UNIT I

- Introduction – Animal physiology and Biochemistry
- Carbohydrates – Classification – Structure and functions of glucose, fructose, sucrose and glycogen
- Proteins – classification – structure and function of albumin and glycoproteins.
- General structure of amino acids – essential, non essential aminoacids.
- Lipids – classification – structure and functions of lecithin, Cephalin, glycol lipids and cholesterol
- Prostaglandins – Introduction – Structure – Classification –Functions.

(16L)

UNIT II

- Enzymes – classification – Nomenclature and properties – Mechanism of enzymeaction.
- Digestion – Role of enzymes in carbohydrate, Protein and Fat Digestion in man absorption of digested food materials inman.
- Metabolism – Carbohydrates – Glycogenesis, glycogenolysis, glycolysis – Krebs's cycle.
- Protein's – Deamination – Transamination – Urea cycle.
- Lipids –β-Oxidation.

(15L)

UNIT III

- Respiration – respiratory pigments – Distribution – composition – properties –Functions -Transport and exchange of oxygen and carbon-di-oxide - Anaerobiosis - Respiratory Quotient.
- Circulation – Origin and conduction of heat beat – cardiac cycle – ECG – Blood pressure -Heart diseases – Artherosclerosis, Angiogram.
- Excretion – kinds of excretory products – structure of kidney – Nephron – Mechanism of urine formation in man – composition of urine – Nephritis –Dialysis.

(16L)

UNIT IV

- Muscle Physiology – types of muscles - Ultra structure of skeletal muscle – properties – mechanism of muscle contraction – Tetanus – Muscle fatigue
- Nerve Physiology – structure, types and functions of neuron.
- Nerve impulse – Definition – Conduction of nerve impulse through nerve – Saltatory conduction – Synapse – Synaptic transmission of impulses – Neurotransmitters – Neuromuscular junction.

(15L)

UNIT V

- Endocrine system – Fine structure and functions of Pituitary, thyroid, Parathyroid, Adrenal, Islets of Langerhans – Testis,Ovary.
- Reproductive Physiology - Ovary, Graafian follicles, menstrual cycle, pregnancy, lactation, menopause - the role of hormones.

(13L)

(TOTAL: 75L)

PRACTICALS

- Rate of Oxygen consumption in a fish.
- Effect of temperature on the opercular movement of fish – Calculation ofQ10.
- Action of salivary amylase in relation to enzyme concentration.
- Qualitative test for carbohydrate (glucose), protein and lipid.
- Demonstration of blood pressure using sphygmomanometer.
- Estimation of Haemoglobin – demonstration only.
- Counting of different kinds of blood cells using haemocytometer – demonstration only.
- Qualitative test for ammonia, Urea and Uric acid.

Spotters
Slides, models and charts – glucose, fructose, glycogen, sucrose, Amino acid, Cholesterol, Intestinal Villi, Haemoglobin, myoglobin, ECG, Sphygmomanometer, Haemometer, Haemocytometer, Kymograph, Cardiac Muscle, Striated and Non – Striated Muscle, Simple MuscleTwitch.

REFERENCE BOOKS: ANIMAL PHYSIOLOGY

1. Agarwal, R.A, A.K. Srivastava and Kaushal Kumar. Animal Physiologyand Biochemistry (third edition).S.Chand & Company Limited, NewDelhi.
2. Arora, M.P. Animal Physiology (sixth edition) Himalaya Publishing house, Ramdoot,Dr. Bhalerao Marg, Girgaon,Mumbai.
3. Berry, A.K. A Text Book of Animal Physiology with related Biochemistry(6th
4. Edition). EMKAY Publications, Post box No.9410. B – 19 East Krishna Nayar, Swami Dayanad Marg, Delhi.
5. Das, A.K. Medical Physiology, Vol. I and Vol. II Books and allied (P) Limited, No.1 E/2 Shubam Plaza (1st Floor), 83/1 Beliaghata Main Road,Kolkata.
6. Goyal, K.A and K.V. Sastry, Animal Physiology,6th Revised Edition, Rastogi Publication, Gangotri, Shivaji Road,Meerut.
7. Guyton, A.C. (1981).Text Book of Medical Physiology, W.B. Saunders co.
8. Hill. Animal Physiology, ANE Books India, Anantika Niwas,19 Doraiswamy Road, T-Nagar,Chennai.
9. Hoar, W.S.(1975). Text Book Of Medical Physiology, W.B.SaundersCo.
10. Juneja, Kavita, Animal physiology. Anmol Publications Pvt. Ltd, 4374/4B AnsariRoad, Daryaganj. NewDelhi
11. Nagabhushanam, R.M.S. Kodarkar and R. Sarogini. Text Book of Animal Physiology2nd Edition. Oxford & IBH Publishing Company Private Limited, S – 155, Panchshila Park, New Delhi.
12. Nigam, H.C. Animal Physiology. Vishal Publishing Company, Books Market Old Railway Road,Jalandhaar.
13. Prosser, L. and A. Brown Comparative Animal Physiology. Saunders & Co.Philadelphia.
14. Prosser,C.L.(1978). Comparative Animal Physiology. W.B. Saundersco.
15. William, S. Hoar, General and Comparative Physiology. Prentice – Hall of India,M-97 Connaught Circus, NewDelhi.

SEMESTER V
PAPER 5.2 ANIMAL BIOTECHNOLOGY
(5 Hrs/Week) Credits-4

OBJECTIVES

- ✓ To introduced various concepts, principles of biotechnology
- ✓ To introduced the concepts of isolation, cloning and insertion of various genes into a prokaryotes
- ✓ To describe the utilization of biotechnology in various biological fields

OUTCOME

- ✓ Students learned about the advancement in biological techniques and their utilization in biological fields

UNIT: I

Definition, History old and new Biotechnology, Scope and importance of biotechnology. Biotechnology in India. Research promotions and priorities in India, Restriction enzymes; enzymes useful for genetic engineering.

Steps in Gene cloning – preparation of desired DNA, Isolation of Plasmid vector, Insertion of desired gene into vector DNA, Introduction of recombinant DNA into host cells - prokaryotic and Eukaryotic animal cells. (Transformation, Transfection, Transduction, Microinjection, Biolistics, Electroporation, Liposome fusion). Screening and selection of recombinants. (Insertional inactivation, blue-white selection, Direct selection), Hybridization techniques (Colony hybridization), Blotting techniques (Southern, Northern and Western).

(15L)

UNIT: II

Genomic library, DNA probe, cloning vectors: Plasmids – types, characteristic features, properties of an ideal gene cloning vector. Plasmid vector ($_{p}$BR 322,$_{p}$UC8, Ti plasmid), Bacteriophage vector (Lambda phage and M13), cosmid, phagemid, plant viral vector (CaMV), Animal Viral Vector (SV40); Yeast artificial chromosome, Transposons as vectors. Gene Amplification through PCR.

(15L)

UNIT: III

Animal cell and Tissue culture: Requirements for animal cell culture laboratory, substrate, liquid media and gases; Maintenance of aseptic condition, Explant, Isolation of Explant, culture of Explant, disaggregation of Explants; Primary culture, secondary culture, subculture, prevention of contamination storage of animal cells (cryopreservation) Large scale culture – (Mono layer culture), Bioreactors – (CSTB and Air lift Bioreactor), Organ Culture: Techniques, advantages, applications Artificial skin & Cartilage. Stem cell culture. Hybridoma technology / Monoclonal antibody production.

(16L)

UNIT: IV

Transgenic animal technology – Introduction, Methods of trans genesis (Any 3 methods), Dolly, applications.

Gene therapy – Definition, classification, Bone marrow and Liver transplantation. Enzyme technology: Definition, Production of β Galactosidase enzyme, Enzyme immobilization and their application.

Bioethics: Intellectual property right, patenting of Biotech products. Bio safety – definition, Biosafety guidelines in India.

(14L)

UNIT: V

Applied Biotechnology:-

Biotechnological methods of sewage water treatment – primary, secondary and tertiary treatment.
Bioremediation: Definition, types, Role of genetically engineered organisms in bioremediation (Super bug, phyto remediation)
Biofuel: - Ethanol, Biogas.
Aqua culture technology: - DOT-ELISA, Gene probe PCR.
Human genome project; DNA finger printing techniques and its application in forensic medicine, Microarrays, Biochip, Bioweapons.
(15L)

(TOTAL: 75L)

PRACTICALS

- Isolation of genomic DNA –Demonstration.
- Isolation of plasmid –Demonstration
- Protoplast preparation and fusion –Demonstration
- Estimation of Co_2in any three effluent / sewage water samples –(Individual)
- Isolation of Protein by PAGE –Demonstration.
- **Models / charts / photos:** PBR 322, PUC 8, Ti plasmid, Lambda Phage, M13 Phage, SV40, CaMv, Restriction enzyme, recombinant DNA, Gene cloning, Electroporation, Microinjection, Lipofection, Southern blotting, Monoclonal antibody, stem cells, Dolly, Trans genesis, Animal cloning, organ culture, Anaerobic digester,Fermentor.

REFERENCE BOOKS:

- Prof.V. Kumaresan,"Animal Biotechnology", Saras Publication, A.R.P. Camp Road, Periavilai, Kottar P.O., Nagercoil, K.K.Dist., - 629002.
- Kumar H.D." A text book of Biotechnology, Affiliated East – West Press(P) Ltd., NewDelhi.
- Animal Biotechnology,2006,R.Sasidhara, MJP Publishers, Chennai.
- Dubey R.C "A text book of Biotechnology" S.Chand & Co., Ltd., NewDelhi.

SEMESTER V
ELECTIVE: (Any One)
PAPER:5.4A SERICULTURE
(5Hrs/Week) Credits-4

OBJECTIVE

To explore the scope for students adopting sericulture as a vocation after their graduation as it is rural based and welfare oriented agro based industry.

OUTCOME

Students learned how to rear, maintain and uses of silk

UNIT I

Importance of sericulture, sericulture industry in India, sericulture as cottage industry, role of Central Silk Board, Moriculture, Mulberry varieties – High yielding varieties – Varieties for rainfed conditions. Morphology of mulberry plant, methods of propagation, irrigation, manuring – Biofertilizers – Green manuring – Triacontanol for increased mulberry productivity – Seriboost, pruning, harvesting and storing of mulberry leaves, package of practices for mulberry cultivation.
(15L)

UNIT II

Diseases of mulberry – fungal diseases – fungal root diseases, fungal shoot diseases, Bacterial diseases – leaf blight disease, rot disease, Viral disease – mulberry leaf mosaic disease, dawn disease, Neamatode disease - root knot disease, Deficiency diseases – nitrogen deficiency, phosphorus deficiency, potassium deficiency, magnesium deficiency and calcium deficiency. Pests of mulberry – leaf eating insect pests and borer pests one example each.
(15L)

UNIT III

Classification of mulberry silkworm, habit and habitats of silkworm, voltinism, races of silkworms, life cycle of mulberry silkworms, structure of egg, larva, pupa and adult, sexual dimorphism digestive system, circulatory system, excretory system, respiratory system, nervous system and reproductive system, endocrine glands, glands of silkworm.
(15L)

UNIT IV

Rearing of silkworm: Rearing house – Rearing appliances – Rearing operation – Disinfection – Brushing – Maintenance of optimum conditions, Feeding – bed cleaning – spacing. Rearing of young ages – Chawki rearing - Rearing of late age larva: Shelf rearing. Floor rearing, shoot rearing. Application of sampoorna. Mounting: Methods – precautions, Cocoon marketing: Characteristics of cocoon – defective cocoons – methods of harvesting.
(15L)

UNIT V

Diseases of silkworms; Protozoan – pebrine, Viral – Flacherie, gattine, grasserie Bacterial – Flacherie, septicemia, sotto, court, Fungal – Muscardine, Pests – Uzy fly, dermestid beetle of silkworm. Silk reeling: cocoon stifling – types, storage of stifled cocoons, sorting, cocoon, boiling and deflossing – brushing, Process of reeling: Different methods, silk waste and byproducts of silk reeling. Raw silk and marketing.
(15L)

(TOTAL: 75L)

PRACTICALS:

1. Dissection of silk glands, digestive and nervoussystems.
2. Dissection of male and female reproductivesystem.
3. Selection of mulberry leaves according to differentstages.
4. Life history – egg, larva, pupa andadult.
5. Sexual dimorphism in larva, pupa andadult.
6. Mulberry varieties such as MR2, S30, S36,V2.
7. Chandrike.
8. Rearing tray and rearingstand.
9. Raw silk.
10. Report on field visit to sericulturefarm.

REFERENCE BOOKS:

1. Ganga, G. and I. Sulochana Chetty, An introduction to Sericulture.Oxford & IBH Publishing Company Private Limited,S -155,Panchshila Park,NewDelhi.
2. Ganga,G. Comprehensive Sericulture,Volume – 2 Silkworm Rearing and Silk Realing. Oxford & IBH Publishing Company Private Limited, S -155,Panchshila Park,New Delhi.
3. Dandin, S.B, Jayant Jayaswal and K. Giridhas, Hand Book of Sericultural Technologies, Central Silk Board, Madivala, Bangalore –68.
4. Kamile Afifa. S and Masoodi M. Amin, Principles of Temperate Sericulture,Kalyani Publishers, B – 1/1292,Rajinder Nagar,Ludhians.
5. Kesary, M and M.Johnson, Sericulture, Department of Zoology,N.M.Christian College, Marthandam.

SEMESTER V
PAPER 5.4B ECONOMIC ENTOMOLOGY
(5Hrs/Week) Credits-4

OBJECTIVES

- ✓ To introduced various breeds of chicks, layers and broilers
- ✓ To describe construction, maintenance of poultry keeping and also introduce the rearing and maintenance of poultry
- ✓ To describe how to prevent and manage various diseases of poultry

OUTCOME

- ✓ Students learned about selection, culturing and maintenance of poultry

UNIT I

Structure and salient features

Brief account of external morphology of head, thorax and abdomen; Classification and development (metamorphosis) of insects; Salient features (up to order) and economic important of Thysanura, Orthoptera, Odonata, Thysanoptera, Isoptera, Coleoptera, Lepidoptera, Hemiptera, Diptera, Hymenoptera, Dermaptera

(15L)

UNIT II

Productive insects

Sericulture- Types of Silkworm, Life cycle and rearing of mulberry silkworm, *Bombyx mori*; Economic importance of silkworms

Apiculture – Types of honey bees, Life cycle and culture methods, bee product and its economic importance

Lac culture – Lac insect, *Laccifer lacca* - Life cycle, Lac processing, Lac products and Economic Importance.

(15L)

UNIT III

Beneficial insects

Biological control agents – Characters and different between parasitoids and predators (common Indian insects); General characters and beneficial role of scavengers, pollinators, weed killers; Medicinal and Aesthetic value of insects; Insect as human food (general account only)

(15L)

UNIT IV

Insects of medical importance

General account on Personal Pests (Lice, Fleas, Bedbugs, Ticks, Scabies mites), Housefly, Cockroach, Biting insects (Mosquitoes, Biting Midges, Sandflies, Black flies, Horse Flies, Stable flies), Major insect-born disease and their management; Recent development in Forensic entomology.

(15L)

UNIT V

Pest management

Components of pest control – physical, mechanical, cultural, chemical and biological control; Pesticide applicators; Pesticide poisoning and first aids; Banned pesticides; General Principles, advantages and disadvantages of Integrated Pest Management; Recent advances in pest control – sterilization techniques, liquid vaporizers, pheromones, RNA interferences, kairomones.

(15L)

(TOTAL: 75L)

PRACTICALS:

1. Head sclerites, thoracic segments, abdominal segments of cockroach
2. Types of antennae. Filiform, Moniliform, Aristate, Capitate, Clavate, Clubbed, Plumose, Pilose, Pectinate, Bipectinate, Setaceous and Geniculate, Lamellate, Serrate. (Any two mountings and rest for study with photo/permanent slides) (Preferablypests)
3. Halter and wing of housefly
4. Types of legs- Typical, Cursorial, Fossorial, Saltatory, Natatorial and Scansorial (Mountings of any two and rest for study with photo/permanentslides).
5. Abdominal appendages- Styles, cerci of cockroach.
6. Mouthparts of Cockroach
7. Malpighian tubules(cockroach)
8. Collection, preservationanddisplayof5insecttypes(Collection and preservation of insects other than pests be discouraged)
9. Common Insecticide formulations (display of samples)
10. Field visit / Assignment / Play and ponder. Give actual handling of bees/ silk moth / lac insect or visit to any one of these units.

REFERENCES BOOKS

1. Abhishek Shkula, 2009. A Handbook on Economic Entomology, Daya Publishing House, India
2. Ganga, G. & Sulochana Chetty, J. 1997. An introduction to Sericulture. Oxford & IBH Publ. Co. pvt. Ltd., India.
3. David, B.V.& Ramamurthy, V.V. 2016. Elements of Economic Entomology, 8th Edition, Brillion Publishing, India.

SEMESTER V

PAPER5.4C DAIRY FARMING

(5 Hrs/Week) Credits-4

OBJECTIVES

- ✓ To introduced various breeds of Indian cows
- ✓ To describe construction, maintenance of sheds and also introduce the growing and maintenance of diary animals
- ✓ To describe how to prevent and manage various diseases of diary animals

OUTCOME

- ✓ Students learned about selection, growing and maintenance of diary animals

UNIT I

Importance of the study – Live stock in India – Live stock reproduction – Organs – Fertilization – Artificial Insemination – Inheritance – Hybrids – Hybrid Vigor – Grading – Pure breeds – Inbreeding.

(15L)

UNIT II

Nutrition – Nutritive values of common feeds – Commercial and mixed feeds – Balance ration.

(15L)

UNIT III

Dairy animals – Cattle – Cow – Buffaloes – Goat – Their economic importance – Productivity.

(15L)

UNIT IV

Live stock diseases – Common parasites in India – Treatment.

(15L)

UNIT V

Marketing the diary products – Milk and other dairy products – Nutritive values of fresh and preserved products – Combating spoilage of milk – Souring – Gassy Curdling – Robiness – Sweet curdling – Pasteurization.

(15L)

(TOTAL:75L)

PRACTICALS:

1. Visit to pasteurization plant andreporting.
2. On the spot tests of pure milk – Specific gravity,total soilds and adulteration ofmilk.
3. Demonstration of Dairy products – Cream,Butter,Ghee,Khoa, and Icecream.
4. Identification of cattle diseases – Prevention and Cure-Method of taking temperature incows.
5. Preparation of Cattle Feed-Balanced food – Identification of different feedplants.
6. Artificial insemination – Common Surgical Instruments and theiruses.
7. Periodical visit to a Good Dairy Farm andReporting.

REFERENCE BOOKS:

1. Principles of Dairy Chemistry. Janness, Robert and Sturte Patton; WielyEastern.
2. Artificial Insemination in Farm animals: Perry Enos (Eds.) Oxford &IBH.
3. Breeding and Improvement of Farm animals: Rice, Victor, Arthur; Tata MCGraw Hill.
4. Livestock and Poultry Production: Singh, Herbans and Earl Moore; Prentice Hallin India.

SEMESTER V

ELECTIVE: (ANY ONE) PAPER 5.5A APICULTURE

(5 Hrs. / Week) Credits-4

OBJECTIVE

To examine the scope for self employment opportunities after their graduation account of the rural based and welfare oriented nature of this vocation.

OUTCOME

Students learned about selection, rearing and maintenance of apiary

UNIT I

Definition, Scope, Classification of bees, Rock bee, Indian bee, Little bee and Dammer bee- their identification and habits, choice of species in Apiculture.

Bee colony-Distinctive features, Identification and Functions of queen, drones and workers, Structure and functions of Legs, mouth parts and sting of worker bee.

Development of Honey bee-egg, larva and pupa-time taken for the development of queen, drone and worker. Food of the bee- honey and pollen-royal jelly.

Artificial feeding. Behaviour of bees-dances.

(17L)

UNIT II

Principles of apiculture, Arranging an apiary, position-space-direction,acquiring bees-care of newly captured colonies-handling the bees.

Bee keeping-Primitive methods and their Advantages and Disadvantages. The bee comb and its architecture-Different kinds of cells-Burr comb.

Different types of Modern hives – Architecture - Parts of artificial hive and its advantages - other appliances used in apiaries.

(15L)

UNIT III

Honey bee products.

Honey- Collection and Extraction, Preservation and storage –Physical properties,Chemical composition,nutritive value, medicinal values-honey as daliy food.

Bee wax-Production , method of extraction-characteristics and uses. Bee venom-method of collection - composition of venom- its uses.

(15L)

UNIT IV

Enemies of bees-Greater wax moth, lesser wax moth, ants, wasps, lice, beetles, birds and their management.

Diseases of bees-adult and brood diseases- Bacterial, Fungal, Viral & Protozoan; Prevention and Control measures.

(14L)

UNIT V

Swarming-Prevention and control.

Robbing and Fighting-Prevention and control. Uniting stocks-Different methods.

Queen rearing.

Supersedure.

Foraging, inter-relationships of plants and bees.

(14L)

(TOTAL: 75L)

PRACTICALS

1. Mountings of Legs, mouth parts and sting.
2. Spotters:
   Queen, worker, Drone, Artificial hive, Queen excluder, smoker, honey extractor, honey, Bee comb and Comb foundation sheet.
3. Report on field visit to apiary.

REFERENCE BOOKS:

1. Mishra,R.C. and R. Garg. Perspectives in Indian Apiculture. Agrobios (India)behind Nasrani Cinema, Chopasani Road, Jodhpur-342002.
2. Abrol,D.P. Bee Keeping in India. Kalyani Publishers, B-1/1292, Rajinder Nagar,Ludhiana-141 008.
3. Cherian, M.C. and Ramachandran. Bee Keeping in SouthIndia.
4. Philips, E.F. Bee Keeping,Agrobios (India) behind Nasrani Cinema,Chopasani Road,Jodhpur-342 002.
5. Sadar Singh, Bee Keeping in India KarDelhi.
6. Sharma P.L and Singh, S.(controller) Hand Book of bee Keeping, printingand Stationery,Chandigarh.
7. Webb,A. Bee Keeping for profit and Pleasure, Agrobios (India), Behind Nasrani Cinema, Chopasani Road, Jodhpur-342002

SEMESTER V

PAPER 5.5B FOOD AND FOOD PROCESSINGTECHNOLOGY

(5Hrs/ week) Credits-4

OBJECTIVE:

To understand the physical and chemical properties of food stuff, the methods of preparation of palatable diets and the techniques employed to increase their shelf – life.

OUTCOME

Understood various value added food products and their marketing strategies

UNIT I: FOOD CHEMISTRY

Food chemistry: Definition and importance, water in food, water activity and shelf life of food. Carbohydrates: Chemical reactions, functional properties of sugars and polysaccharides in foods. Lipids: Classification and use of lipids in foods, physical and chemical properties, effects of processing on functional properties and nutritive value. Protein and amino acids: physical and chemical properties, distribution, amount and functions of proteins in foods, functional properties. Effects of processing- Losses of vitamins and minerals due to processing. Pigments in food, food flavours, browning reaction in foods. Enzymes in foods and food industry, Bio-deterioration of foods, food contaminants, additives and toxicants.

(15L)

UNIT II: PRINCIPLES OF FOODPROCESSING

Scope and importance food processing – National and International perspectives.

Principles and methods of food preservation – freezing, heating, dehydration, canning, additives, fermentation, irradiation, extrusion cooking, hydrostatic pressure-cooking, dielectric heating, microwave processing, aseptic processing, hurdle technology.

Storage of food, modified atmosphere packaging. Refrigeration , freezing and drying of food, Minimal processing, Radiation processing.

(14L)

UNIT III:

Definition of milk, composition, physical and chemical properties of milk Constituents and nutritive value of milk, Factors affecting composition of milk, Types of milk.Fluid Milk Processing. Receiving, Filtration Clarification, Straining, Standardization, Homogenization and its Effects, Pasteurization and various systems of pasteurization ; LTLT, HTST , UHT methods, Pasteurizes(Heating and Cooling systems ,Flow controller regenerator,Flow division valve) sterilization, packaging of fluid milk. Coagulated Milk Products.

Channa, Paneer, Classification and manufacturing process of cheese, butter and ghee and its storage.

Condensed Milk - Types and factors affecting the quality of Condensed Milk , Storage of condensed milk - Methods of drying milk.(Drum and Spray drying) factors affecting the quality of dry milk. Introduction to instant non-fat dry milk, packaging of dry milk products.

(16L)

UNIT IV : FRUITS AND VEGETABLESTECHNOLOGY

Cleaning, sorting, grading, peeling, and blanching methods and their Equipments, Ingredients and Processes for the manufactures of jam, jellies, marmalade, preserves, pickles and chutneys. Defects and factors affecting the quality of above. Thermal Processing of Fruits and Vegetables: History, definition, various techniques of thermal processing and their effects on the quality of fruits and vegetable products, thermal process time, introduction to concept of thermal process calculations, types of containers and their selection, spoilage of canned food. Dehydration of fruits and vegetables, equipment and process for dehydration of plums, apricot, apple, fig, grapes, peach, cauliflower, potato, mushroom, tomato. Freezing process of selected fruits and vegetables: Peas, beans, cauliflower, apricot and mushroom.

(14L)

UNIT V :TECHNOLOGY OF MEAT,FISH AND POULTRY PRODUCTS

Slaughter of meat animals, different cuts of lamb and their uses, post-mortem inspection – post mortem changes- Loss of homeostasis, post-mortem glycolysis and pH decline, Rigor mortis. Preparatory operations of meats and meat products: Abattior- definition and construction, Basic preparatory procedures (commintion, emulsification, preblending). Cured and smoked meats, sausage products- classifications, processing steps and canned meat, meat pickles. Handling and Dressing of poultry: Inspection of poultry birds, dressing and preparation of ready to cook poultry, factors affecting the quality- Egg and Egg products- structure, chemical composition and nutritive value, spoilage of eggs and preservation of whole eggs and egg products, preparation of egg powder. Fish and fish products: Types of fish, composition and nutritive value, judging and freshness of fish, fish grading and cooking of fish, smoking, pickling, salting and dehydration , preservation of fish and processed fish products. Frozen storage of fresh and processed meat, fish and poultry. Byproducts of fresh and processed meat, fish, poultry and egg industry.

(16L)

(TOTAL: 75L)

PRACTICALS:

1. Determination of Protein, Starch, Sugar, Amino acids, Crude fibers, Total minerals, Crude fat in food stuff.
2. Estimation of Vitamins – Ascorbic acid, Thiamine.
3. Browning reaction in food, Analysis of lipid-saponification value, acid value & Iodine Value.
4. Determination of Tannins-chemical residues and Aflatoxins, Estimation of Preservative and Antioxidants.
5. Platform test of Milk.
6. Determination of SNF, Specific gravity and total solids of milk.
7. Determination of moisture and fat content of milk powder.
8. Determination of adulterants in milk like Water, Urea, Neutralizes, Preservatives and Starch.
9. Preparation of Channa and Paneer.
10. Preparation of different types of milk products and their evaluations.
11. Preparation of fish, Meat, Egg and Vegetable pickles –Demonstration.
12. Estimation of iron sulphide formation in cooked egg.
13. Visit to a Dairy Unit, Different fruit and vegetables processing unit, Slaughter house and observation of different types of cuts made and demonstration of slaughtering, fish processing unit and submit are port.
14. Equipments and appliances used in various food processing industries-observation.

REFERENCE BOOKS:

1. Food processing and nutrition – Bender A.E. – 1978 Academic Press, London.
2. Food processing technology: Principles and Practices. Fellows, P. and Ellis, A.1990,New York.
3. Introduction to food processing – Jelen,P.-1985.Prentice Hall, Reston Virginia, USA.
4. Food Chemistry – Awrand. W andWoods, A.E.1973.AVI,Westport.
5. Food Chemistry – Meyer, L.H.-1973.East West Press Pvt. Ltd, New Delhi.
6. Outlines of Dietary technology –Woarnes.
7. Preservation of fruits and Vegetables – Vijayakhaderkalyani.
8. Preservation of fruits and Vegetables Srivastava, IBD Co. Lucknow.
9. Fish Preservation – S.K. Kulsherestha.
10. Fish Processing and Preservation –C.L.Cutting.
11. Processed Meat- Pearson and Glite – CBS publishes.
12. Poultry, Meat and Egg Products – Parkursht and Mountney.CBS Publishers

SEMESTER V
PAPER 5.5C POULTRYSCIENCE
(5HRS/WEEK) Credits-4

OBJECTIVE:

To know about poultry farming and to get deep knowledge about poultry manure, nutrition and various diseases

OUTCOME :

Students can get self employed after their graduation

UNIT I

Poultry industry in India – a brief introduction.
Choosing a commercial laying stock –sexing in one day old chicks. Poultry housing – General principles of building poultry house.
Deep litter system – Droppings pit – Feeders , Waters – Nest boxes. Laying cages – Californian cages – Management of cage birds.
(15L)

UNIT II

Poultry manure – Volume, Composition and values. Nutritional content of eggs.
Management of Chicks, Growers, Layers and Broilers. Lighting for Chicks, Growers, Layers and Broilers.
Summer and winter management. Debeaking –Forced moulting.
(14L)

Unit III

Poultry nutrition : Protein and Amino acid requirements for chicks , growers ,layers and broilers – Symptoms of excessive dietary levels and deficiency.
Carbohydrates and Fat requirements for Chicks, Growers, Layers and Broilers– Symptoms of excessive dietary levels and deficiency.
Fibre requirement for poultry feeds.
Requirements of vitamins and inorganic minerals for Chicks, Growers and Layers – Deficiency Symptoms.
(16L)

UNIT IV

Importance of feed additives in a poultry feed.
Preparation of supplementary feed for poultry- South Indian feed ingredients in relation to M.E level, Protein level, Amino acid, Minerals (ca & p) and Fiber content.
(14L)

UNIT V

Poultry diseases – Causes, Symptoms, Transmission, Treatment, Prevention and Control of the following diseases : Viral diseases - Ranikhit disease, Fowl pox, Infection and control bronchitis and Gumboro disease. Bacterial disease – Fowl typhoid, Paratyphoid, Pullorum, fowlcholera, Coryza and Mycoplasmosis. Fungal diseases – Aspergillosis and Aflatoxicosis. Parasitic disease- Coccidiosis. Nematode infections. Tape worm infections. External parasites of chicks – Ticks, mites and lice.
(16L)

(TOTAL: 75L)

PRACTICALS :

1. Identification of Ectoparasites of poultry studied in the theory.
2. Identification of Endoparasites.
3. Feeders – Different types.
4. Waterers – Different types.
5. Cage house –Model
6. New castel disease, Fowl pox, Coryza, Coccidiosis - Diagrams or models
7. Debeaking
8. Visit to a poultry farm and reporting.

REFERENCES :

- Poultry keeping – M.R. Gnanamani
- The Rearing of pullets – Bulletin No. 54, Her majesty's stationary office,London
- Intensive Poultry management for egg production. Bulleting No. 152. Her majesty 's stationary office ,London.
- Nutrition of Chicken - M.L Scott et al.,
- Disease of Poultry – Biester Oxford &IBH

SEMESTER VI
PAPER 6.1 EVOLUTION
(5Hrs/Week) Credits-4

OBJECTIVES
To know how the life originated in our planet and related theories
OUTCOME
Students learned relationships between abiotic and biotic factors

UNIT I ORIGIN OF LIFE
Chemical origin of life – Biological experimental evidences. Evidences in favour of evolution :
-Homologous organs and Analogous structures.
-Embryological evidences – palaeontology - geologicalscale – biochemistry and physiology.
(15L)

UNIT II
Lamarckism and Neo – Lamarckism Darwinism and Neo – darwinism.
Mutation theory of De vries
Modern concept of evolution : Natural selection – types and mechanism.
(15L)

UNIT III :
Variations and Sources of Variability. Isolation and Isolating mechanisms. Population genetics and evolution :
- Hardy – weinberg law
- Species concept and speciation – types and mechanism.

(15L)

UNITIV:
Mimicry and Protective Colouration .
Adaptations : Cursorial , Fossorial , Arboreal, Volant , Aquatic , Desert , Cave.
(15L)

UNIT V :
Evolution of Horse.
Evolution of man- Ancestry of man-Salient features of Apes and Man- Trends in Human Evolution – Causes for Human Evolution- Evolution of man as seen in the fossil record.
Cultural Evolution of Man.
Animal distribution (Geographical) – Patterns of Distribution - Zoogeography of Palaearctic , Nearctic , Neotropical , Ethiopian , Oriental and Australian region.
(15L)
(TOTAL: 75L)

PRACTICALS:

- Museum specimens, slides, models and charts.
- Animals of evolutionary significance: Peripatus, Archeopteryx, Limulus.
- Colouration: Mimicry- Lycodon and Krait; Mutation-Peppered Moth, Ancon sheep, Stick insect, Leaf insect
- Variations : variation and finger prints
- Gene Frequency : Hardy Weinberg law- probability Experiment.

REFERENCE BOOKS

- Organic Evolution- N. Arumugam
- Evolution- M. P. Arora
- Moody, Introduction To Evolution.
- Dobzhansky, Th.: Genetics And The Origin Of Species 1951,Columbia Uty. Press.
- Dodson, Evolution – Process and Product.

SEMESTER VI

PAPER 6.2- IMMUNOLOGY AND MICROBIOLOGY

(5 hours/ week) Credits-4

OBJECTIVES:

To study the immune system and their role of our body.

OUTCOME:

To know the life cycle of microbes and their control measures.

UNIT I

History and Scope of Immunology.
Immunity-Type of Immunity - Innate & acquired, passive & active.
Lymphoid organs –primary & secondary (Thymus, Bone marrow, Bursa of fabricius , Spleen, Tonsil, Lymph node, Peyer's patches) – Structure and Functions.
(15L)

UNIT II

Immunoglobulin-Structure, Function, Biological properties of Ig classes. Interaction of Antigen and antibody.
Salient features of antigen- antibody reaction.
Types of antigen-antibody reaction – Agglutination, Precipitation, Opsonization, Cytolysis.
(15L)

UNIT III

Immune response-Lymphocyte as unit of immune system, stem cells - Structure and lineage, T cells, B cells & Macrophages.
Humoral immune response - primary & secondary responses - B cell activation. Cell - Mediated immune response - Type of T cells & functions.
Tumour immunology.
(15L)

UNIT IV

Introduction : History & Scope of microbiology. General structure of microbes (Bacteria, virus).
Bacterial growth : Culture media & selective media; Continuous & batch culture techniques, growth curve.
(14L)

UNIT V

Food microbiology :Food poisoning ; Food spoilage & preservation.
Industrial microbiology : production of Antibiotic penicillin.
Soil microbiology : Role of soil microbes in N2 fixation.
Medical microbiology : Diseases caused by bacteria in different systems of man as given below**:**
Dermal – Streptococcal inflammation : - Tuberculosis;
Gastro-intestinal-dysentery**:**Reproductive – Gonorrhea.
Viral diseases with reference to causative organisms, symptoms, impact on the host & control measures, AIDS , Rabies, Chicken pox, Measles, Influenza & polio.
(16L)

(TOTAL: 75L)

PRACTICALS:

I .IMMUNOLOGY:

ABO blood grouping and Rh blood grouping. 2.Lymphoid organs in Rat(Demonstration only)

Spotters:

Charts, slides and figures: Stem cells, Phagocytes, Thymus, Bone marrow, Spleen, Lymph node, Immunoglobulin.

II.MICROBIOLOGY:

1. Simple staining ofbacteria.
2. Gram-Staining of bacteria.
3. Serial dilutiontechniques.
4. Microscopic examination of living bacteria - hanging dropmethod.
5. Microscopic counting of microbes using haemocytometer (Demonstration only)
6. Measurement of microbes using ocular & stage micrometers (Demonstrationonly)
7. Preparation of culture media formicrobes.
8. Distribution of microorganisms in nature-soil, water, &air.
9. Aseptic transfer of microbes & pure culture of bacteria and cultural characteristicsof Micro-organisms.

Spotters:

Charts, slides and figures-Autoclave, Hot air oven, Agar plate, Agar stab, Agar slant, Inoculation needle.

REFERENCE BOOKS:

IMMUNOLOGY

1. Roitt, I. : Essential Immunology(ELBS).
2. Kuby : Immunology(W.H.Freeman)

MICROBIOLOGY

1. Pelczar, Reid & Chan:Microbiology.
2. Philip, L. Carpenter :Microbiology.
3. Powar : GeneralMicrobiology.
4. Salle,A.J: Fundamental Principles ofBacteriology.
5. Alexander, M : Introduction to SoilMicrobiology.
6. Frazier,A.C. & Westhoff,D.C: FoodMicrobiology.
7. Burrows : Text Book ofMicrobiology.
8. Lakshmanan,M : Laboratory manual inMicrobiology.
9. Moat & Foster : MicrobialPhysiology.
10. Rangaswami,G : Diseases of crop plants inIndia.
11. Patel,A.H.:Industrial Microbiology (MC . MillanIndia).

SEMESTER VI

PAPER6.3 BIO STATISTICS, COMPUTER APPLICATIONSAND BIOINFORMATICS

(5 Hrs / Week) Credits-4

OBJECTIVES.

To study the descriptive and non descriptive methods of mathematics and their application in biology incorporating computer systems.

OUTCOME.

To understand the mathematical principles of biological systems. And bioinformatics

UNIT I

Definition and scope; Data – Types & collection; Sampling methods – Variables – Discrete and continuous; Presentation of Data , Classification and Tabulation ; Parts of table. Diagrams and Graphs: Line diagrams, Bar Diagram, Pie diagrams, Histogram, Frequency polygon, Frequency poly curve. Measures of Central Tendency – Calculation of Mean, Mode and Median (Grouped and Ungrouped Data)

(15L)

UNIT II

Measures of dispersion: Variance , Range , Standard Deviation and standard Error, Coefficient of variation. Chi – square test – Calculation and application, students't' Test. Correlation: Introduction , Types , Perfect positive and negative, Linear and Non-Linear methods Scatter diagram, Karl Pearson's correlation coefficient ; Interpretation of the Correlation coefficient.

(14L)

UNIT III

Introduction to computer, Generation of computer – Components of computer, Input devices and Output devices – CPU – Primary and Secondary Memory operating system. Introduction to M.S. Office software, covering, word processing, spread sheet and presentation software. MS Word basics : Creating word document – File, edit, Format, Save menus, adding bullets, numbering and symbols – printing. MS Excel – entering and editing cell entries – adjusting row and column height – Pie-bar-line chart preparation. Uses of Internet – Email, Internet Browsing, World Wide Web(WWW), M.S Power point.

(16L)

UNIT IV

Bioinformatics : Introduction – Definition of Bioinformatics – History – Importance of Bioinformatics – Scope and application of Bioinformatics – Components of Bioinformatics - Bioinformatics in life science. Biological sequence analysis – Sequence alignment – Pair wise sequence comparison – multiple sequence alignment.

(15L)

UNIT V

Major Data bases in Bioinformatics – Nucleic acid sequence databases – EMBL – Genbank – Protein sequence database – SWISS – PROT .

Databases similarity search Tools: BLAST FASTA – Application of bioinformatics tools. Database Retrieval Tools: ENTREZ – Locus link – Pub Med (Publishers on Medicine) SRS . Protein structure visualizing tools – RasMol, Swiss PDB viewer.

(15L)

(TOTAL: 75L)

PRACTICALS:

1. Find out Mean, Median, Mode, Standard deviation, Standard error and co-efficient of variance using Neemleaf.
2. Calculation ofcorrelation.
3. Bar diagram, Histogram, Pie diagram and frequencycurve.
4. Models, Chart and Photos: Computer Mouse, CPU, Keyboard,Monitor.
5. Visit to a Computer centre to learn internet browsing and email sending – Compulsory for eachstudent.
6. Take printout from NCBI, EMBL and PubMed and keep it forspotters.
7. Write some of the file commands and keep forspotters.

REFERENCE BOOKS:

BIO STATISTICS

1. Arora and Mathan. Bio Statistics (5th Edition). Himalaya Publishing House, Ramdoot, Dr.Bhalerao Marg,Girgaon,Mumbai – 400004.
2. Daha, T.K. Biostatitics in Theory and Practics. EMKAY Publications, Post Box No.9410, B-19, East Akrishna Nagar, Swami Dayanand Marg, Delhi-110051.
3. Gurumani. N, An Introduction to Biostatistics (computer Application included) 2nd Edition M.J.P. Publishers, Tamilnadu Book House, 47 Nallathambi street,Triplicane- 600 005.
4. Jasra, P.K. and Gurdeef Raj. Biostatistics, Krishna Prakashan Media(P) Limited, 11, Shivahi Road, Meerut – 250001
5. Parihar and Parihar. Biostatistics and biometry, Student Edition, Agrobios(India) Behind Nasrani Cinema,Chopasani Road,Hodhpur-342002.
6. Pranab Kumar Banergee. Introduction to Biostatistics (2nd Edition). S. chand & Company Limited, 7361, Ram nager,New Delhi-110055
7. Prasad, S. Elementa of Biostatistics. Rastogi Publications, Gangotri, ShivajiRoad, Meerut 250002.
8. Satguru Prasad – Fundamentals of Biostatistics (Biometry). EMKAY Publication,Post Box No.9410 B-19, East Akrishna Nagar, Swami Dayanand Marg, Delhi-110051.
9. Pagano, M. and K. Gauvreau. Principles of Biostatistics. Thomas Learning,Alps Building,1st floor,56,Janpath,NewDelhi.
10. Satgurau Prasad, Elements of Biostatistics, Rastogi Publications Gangotri,Shivaji Road, Meerut 250002.

COMPUTER APPLICATIONS:

- Krishnamoorthy, R. Computer Programming andapplications.
- Rajaram, V. Fundamentals of computers.

BIOINFORMATICS:

1. Bal, H.P. Bioinformatics principles and Applications, Tata Mc Graw Hill Publishing company Limited, No. 444/1 Sri Ekambara Naicker Industrial Estate, Alkapakkam, Porur, Chennai – 600116
2. Dan, E. Krane and Michael L. Raymer.Fundamental concepts of Bioinformatics. Pearson Education (Singapore) PTE Limited, Indian Branch, 482 FIE Patparganj,Delhi-110 092.
3. Ignacimuthu, S. Basic Bioinformatics. Narosa Publishing House Private Limited,35- 36 Greams Road, Thousand Lights, Chennai-600006
4. Ranga, M.M. Bioinformatics, Agrobios (India) Behind Nasrani cinema,Chopasani Road, Hodhpur – 342002.
5. C.S.V. Murthy Bioinformatics- Himalaya PublishingHouse.

ALLIED ZOOLOGY 2017 –2018 ONWARDS

SYLLABUS FOR B.SC ZOOLOGY
Under Choice Based Credit system (CBCS)
(For the candidates admitted to the course in the academic year 2017 – 2018 and afterwards)
SEMESTER – III
Cell Biology, Genetics and Biotechnology
4Hrs/Week Credits – 3

OBJECTIVE:

To elucidate the structure and functions of the cell organelles; to exemplify the concept of genetics, the principles of imheritance and the role of genes in determining characters; to understand the application of the innovative technology to manipulate living organisms or parts of organisms to make products useful to human.

CELL BIOLOGY

UNIT I

Ultra structure and functions of (a) Plasma membrane (b) Mitochondria (c) Nucleus. Chromosomes – Structure, types and functions; Giant Chromosomes (Polytene and Lampbrush Chromosomes)
(12L)

UNIT II

DNA: Structure (Watson and Crick Model), Replication.
RNA: Different types – r RNA – mRNA – tRNA; Protein synthesis.
Cancer cells and carcinogenesis – Definition, Types, Causes, Properties, Diagnosis and Treatment.
(12L)

GENETICS

UNIT III

Simple Mendelian traits in man; Multiple alleles – ABO blood groups in man – problems.
Rh-factor in human – Erythroblastosis foetalis. Multiple gene inheritance.
(12L)

UNIT IV

Sex determination in man; Sex linked inheritance in man – Haemophilia, Colour blindness and Hypertrichosis.
Non disjunction and Syndromes in man – Klinefelter's syndrome, Turner's syndrome and Down's syndrome.
Inborn errors of metabolism in man – Phenylketonuria, Alkaptanuria and Albinism.
(12L)

BIOTECHNOLOGY

UNIT V

Definition, scope and importance of Biotechnology, Basic concepts of genetic engineering.
Restriction and modification system – Cloning vectors – (Plasmids, pBR 322, Lambda phage)
Introduction of cloned genes into host cells – Transgenesis – Transgenic animals and its application.
(12L)

(TOTAL: 60L)

REFERENCE BOOKS:

CELL BIOLOGY

1. Ambrose, E.J & Dorothy, M.E: Cell Biology (ELBS CAMLOTPRESS)
2. De Robertis & De Robertis: Cell & Molecular Biology. (W.B. Saunders &co, Philadelphia).
3. De Robertis, E.D.P, Nowinski, W.N & Saez, F.A : Cell Biology (W.B. Saunders &co, Philadelphia).
4. Dupraw, EJ : Cell & Molecular Biology (Academic Press, NewYork)
5. Dyson, R.D :Essentials of Cell Biology (Allyn & BaconInc. Boston). Giese.A.C: Cell Physiology (W.B. Saunders & co,Philadelphia).

GENETICS

1. Strickberger : Genetics(MacMillan).
2. Farnsworth : Genetics (harper andRow).
3. P.K.Gupta: Genetics (RastogiPublications)
4. P.S. Verma and Agarwal: Genetics (S.Chand &Co.Ltd.)
5. Altonburg,E: Genetics (Oxford & IBH publishing company)
6. Burns G.W.: The Science of Genetics (MacMillan)
7. A.C.Pai: Foundations of Genetics (Mc Gaw –Hill)

BIOTECHNOLOGY

1. Prof.V. Kumaresan,"Animal Biotechnology", Saras Publication, A.R.P. Camp Road, Periavilai, Kottar P.O.,Nagercoil, K.K.Dist., - 629002.
2. Kumar H.D." A text book of Biotechnology,Affiliated East – West Press(P) Ltd., NewDelhi.

3.Animal Biotechnology,2006,R.Sasidhara,MJPPublishers,Chennai.

4. Dubey R.C "A text book of Biotechnology"S.Chand & Co.,Ltd.,NewDelhi.

ALLIED PRACTICALS

2Hrs/week **Credits 1**

CELL BIOLOGY, GENETICS AND BIOTECHNOLOGY

- Mounting of Giant Chromosome in Chironomous larva / onion root tip
- Observation of simple mendelian triats among the students
- **Study of the following through Charts, Slides and Figures:**
- Mitochondria, Interphase Nucleus, DNA, tRNA, ABO Blood group.
- Colour Blindness, Haemophilia, Klinefelter's syndrome, Down's syndrome.
- pBR 322, Lanmbda Phage, Recombinant DNA.

SEMESTER IV
DEVELOPMENTAL ZOOLOGY, ECOLOGY, ANIMAL PHYSIOLOGY AND EVOLUTION

4Hrs/Week **Credits-3**

OBJECTIVES:

To understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms. To study the interaction and the interdependence among environmental factors and living organisms; To understand the functional significance of various organs and organ systems of animals. To discern the evolutionary significance of the animals, origin of species, effects of mutation.

UNIT I

Early development in Man: Structure of sperm and ovum; Fertilization – Cleavage, Morula, Blastocyst, Implantation and gastrulation – Fate map. Placenta in mammals – types and functions. Test tube babies – Twins – Amniocentosis.
Nuclear Transplantation in Acetabularia.
(13L)

UNIT II

Abiotic factors: Biological effects of Temperature and Light; Biotic factors: Symbiosis, Commensalism, Mutualism, Parasitism, Prey- predatorRelationship; Adaptations: Desert adaptations.Community: Ecosystem – Structure and dynamics of a pond.
(13L)

UNIT III

Nutrition: Food constituents – Carbohydrates, Proteins and Fats. Digestion: Role of enzymes in carbohydrate, protein and fat digestion. Absorption: Absorption of digested food.
Metabolism: Carbohydrate metabolism: Glycogenesis, Glycogenolysis, Glycolysis. Respiration: Transport and exchange of oxygen and carbon dioxide.Haemoglobin.
(13L)

UNIT IV

Excretion: Structure of Nephron – Urine formation – Dialysis Nervous Co-ordination: Structure and types of neurons – Nerve impulse, conduction of nerve impulse through neuron and synapse.
Reproduction: Structure of human testis and ovary, Graafian follicle, Menstrual cycle and its hormonal control.
(13L)

UNIT V

Theories of Evolution: Darwinism, Mutation theory of De Vries. Adaptive radiation in birds. Mimicry and Colouration.
(8L)

(TOTAL: 60L)

REFERENCE BOOK:

DEVELOPMENTAL ZOOLOGY

1. Arora, M.P. Embryology. Himalaya Publishing House,Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai- 400 004.
2. Arumugom, N. Developmental Biology, Saras Publication, 114/35G,A.R.P camp Road, Nagercoil.

Ecology:

1. Agrawal. A.k. ecology and environmental biology, student edition agrobios (india), behind nasrani cinema. Chopasani road. Jodhpur-342 002
2. Odum, E.P. Fundementals of Ecology International Student Edition W.B. Sounders Company, Philadelphia, London.

Animal Physiology:

1. Agarwal, R.A., A.K. Srivastava and Kaushal Kumar. Animal Physiology and Biochemistry (3rd Edition). S. Chand & Company Limited, 7361 Ram Nagar, New Delhi-110 055.
2. Arora,M.P Animal Physiology (6th Edition). Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai 400 004.

Evolution:

1.Arora, M.P. Evolutionary Biology. Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai 400 004.
2. Tomar, B.S. and S.P. Singh. Evolutionary Biology. Rastogi Publications, Gangotri, Shivaji Road, Meerut-250 002.

ALLIED PRACTICALS

2Hrs/Week **Credits 1**

DEVELOPMENTAL ZOOLOGY, ECOLOGY, ANIMAL PHYSIOLOGY AND EVOLUTION.

1. Mounting and observation of live sperms of a vertebrate.
2. Estimation of dissolved oxygen in two water sample and discuss the result
3. Qualitative test for glucose, protein and lipid.
4. Effect of temperature on the opercular movement of fish; Calculation of Q_{10}.
5. Museum specimens, slides, models and charts:

Developmental Zoology: Human sperm, Human ovum, Cleavage, Diffuse Placenta,Zonary Placenta,Discoidal placenta,Cotyledonary Placenta (any two)
Ecology: Identification of any two plankton either Fresh water OR marine samples.
Echeneis and Shark, Hermit crab and Sea anemone, Sacculina, Secchi disc.
Animal Physiology: Intestinal villi, Nephron, Heart of mammal.
Evolution: Ancon sheep.

Allied Practical Examination at the end of each Semester