MOTHER TERESA WOMEN'S UNIVERSITY COLLEGE, KODAIKANAL

Common Course structure for UG programmes under CBCS

B. Sc. ZOOLOGY

Course Structure for the Major Zoology under CBCS: 2018 – 19 onwards

P. No.	Paper Code	Course Title	Hours	Credits	Continuous Internal Assessment (CIS)	End Semester Exam (ESE)	Total
		Semester I					
1.	ULTA11	Part I - Tamil	6	3	25	75	100
2.	ULEN11	Part II – English	6	3	25	75	100
3.	UZOT11	Core –I (Theory)- Invertebrata I	5	4	25	75	100
4.	UZOT12	Core-II (Theory) Invertebrata II	5	4	25	75	100
5.	UZOA11	Allied (Theory) I - Botany paper-I	5	4	25	75	100
6.	UVAE11	Value Education	3	3	25	75	100
Total			**30**	**21**			**600**
		Semester II					
7.	ULTA22	Part I – Tamil	6	3	25	75	100
8.	ULEN22	Part II – English	6	3	25	75	100
9.	UZOT21	Core III (Theory) - Chordata	6	4	25	75	100
10.	UZOP21	Core I (Practical) - Invertebrata and Chordata	5	4	25	75	100
11.	UZOA21	Allied –I (Practical) - Botany I	5	4	25	75	100
12.	UEVS21	Environmental studies	2	2	25	75	100
Total			**30**	**20**			**600**
		Semester III					
13.	ULTA33	Part I – Tamil	6	3	25	75	100
14.	ULEN33	Part II – English	6	3	25	75	100
15.	UZOT31	Core-IV (Theory) - Anatomy	5	4	25	75	100
16.	UZOA32	Allied -II (Theory) - Chemistry Paper-I	5	4	25	75	100
17.	UZOE31	Elective- I (Theory) Entomology / Biophysics	4	3	25	75	100
18.	UZON31	NME I- Sericulture	2	2	25	75	100

19.	UZOS31	SBE I-Economic Zoology	2	2	25	75	100
Total			**30**	**21**			**700**
		Semester IV					
20.	ULTA44	Part I-Tamil	6	3	25	75	100
21.	ULEN44	Part II-English	6	3	25	75	100
22.	UZOT41	Core V (Theory)-Microbiology	4	4	25	75	100
23.	UZOP42	Core II **(**Practical**)** sericulture, microbiology & clinical biology	4	4	25	75	100
24.	UZOA42	Allied Practical II-Chemistry	3	4	25	75	100
25.	UZOE42	Elective II (Theory) - Medical Laboratory Technology/Animal Behaviour & Chronobiology	3	3	25	75	100
26.	UZON42	Non Major Elective course II- Apiculture	2	2	25	75	100
27.	UZOS42	Skill Based Studies II Vermiculture	2	2	25	75	100
Total			**30**	**25**			**800**
		Semester V					
28.	UZOT51	Core VI(Theory) Immunology	5	4	25	75	100
29.	UZOT52	Core VII (Theory) Developmental Biology	5	4	25	75	100
30.	UZOT53	Core VIII (Theory) Animal Physiology	5	4	25	75	100
31.	UZOT54	Core IX (Theory) Genetics	5	4	25	75	100
32.	UZOT55	Core X (Theory) Environmental Biology and Evolution	5	4	25	75	100
33.	UZOE53	Elective III (Theory) Biostatistics / cancer biology	3	3	25	75	100
34.	UZOS53	Skill Based Studies III Ornamental fish culture	2	2	25	75	100
Total			**30**	**25**			**700**
		Semester VI					
35.	UZOT61	Core XI (Theory) Molecular Biology	5	4	25	75	100
36.	UZOT62	Core XII (Theory) Biotechnology and Genetic Engineering	5	4	25	75	100
37.	UZOT63	Core XIII (Theory) Cell	5	4	25	75	100

		biology					
38.	UZOP63	Core III (Practical) Cell biology, Developmental biology, Immunology, Animal physiology, Genetics & Biostatistics	5	4	25	75	100
39.	UZOP64	Core IV (Practical) Environmental Biology, Evolution, Biotechnology & Genetic Engineering, Biochemistry	5	4	25	75	100
40.	UZOE64	Elective IV Biochemistry / Bioinformatics	3	3	25	75	100
41.	UZOS64	Skill Based Studies IV Poultry science	2	2	25	75	100
42.	UEAS61	Extension Activity	-	3	25	75	100
Total			**30**	**28**			**800**
Grand Total				**140**		**Total**	**4200**

SEMESTER – I

CORE I (THEORY) - INVERTEBRATA – I

UZOT11 **5 hrs/4 credits**

Objectives

- ✓ To study the various forms of invertebrate animals present in the world.
- ✓ To help our students to distinguish various animals of invertebrates
- ✓ To discuss the classification, structural and functional aspects of invertebrates
- ✓ Students can able to understand the origin of life, diverse forms of invertebrate which belongs to which phyla

UNIT I

Introduction to principles of Taxonomy:

Protozoa, Metazoa, Radiata, Bilateria, Acoelomata, Pseudocoelomata and coelomata. General characters and classification upto class level with Few examples.

Protozoa:

Type study: Paramecium – General organization, Cyclosis, contractile vacuoles and reproduction.

General Topic: Life history, Pathogenicity and control Measures of Entamoeba and Plasmodium.

UNIT II

Porifera:

Type Study: Sycon – Histology, Spicules, Gemmules, Parenchymula larva. General Topic: Canal system in sponges.

UNIT III

Colenterata

Type Study: Obelia – general organization and Metagenesis.

General Topic: Corals and Coral Reef

UNIT IV

Platyhelminthes

Type Study: Fasciola hepatica – external morphology, digestive, Excretory and reproductive systems and Life history

General Topic: Parasitic adaptation – Platyhelminth Worms

UNIT V

Aschelminthes

Type Study: Ascaris – Sexual dimormphism – reproductive systems and Life cycle.

General Topic: Human nematode parasites – Ancylostoma, Enterobius, Wuchereria

REFERENCES

1. A Text Book of Invertebrates- N.C.Nair, S. Leelavathy, N.Soundara pandian, T.Murgan, Dr. N. Arumugam, Saras Publication, 2010

2. Invertebrate Zoology, Jordan, E.K. and P.S.Verma. 1993. 12th Edition.S.Chand & Co.Ltd., Ram Nagar, New Delhi.
3. Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca, Echinodermata, Kotpal, R.I., 1988-1992, Rastogi Publications, Meerut – 250 002
4. Manual of Zoology Vol. I (Invertebrates). Parts I & II.Ayyar, E.K. and T.N. Ananthakrishnan, 1992. S. Viswanathan (Printers and Publishers) Pvt Ltd. Madras.

CORE II (THEORY) INVERTEBRATA – II

UZOT12 **5 hrs/4 credits**

Objectives

- ✓ To understand the systemic and morphological features of invertebrates animals
- ✓ Student can be able to identify simple features of invertebrates
- ✓ To understand the evolutionary sequence of invertebrates
- ✓ Student can acquire knowledge regarding the economic value, affinities of invertebrates

UNIT I

Annelida

Type Study: Nereis – External morphology, digestive system, Nephridia, Nervous and reproductive system.

General topic: Metamerism in Annelids

UNIT II

Arthropoda

Type Study: Prawn – Penaeus – External Morphology, appendages, digestive system, Excretory system, reproductive system and Development

UNIT III

General Topic: Social life of beneficial insects

Peripatus and its affinities

UNIT IV

Mollusca

Type Study: Pila – External morphology, Digestive System, Respiratory system, Osphradium and Reproductive system.

General Topic: Torsion in Gastropoda, Economic importance of Mollusca

UNIT V

Echinodermata

Type Study: Starfish – External morphology, Digestive System, nervous system and Reproductive system and development. Pedicellaria, Water vascular system

General Topic: Larval forms in Echinodermata

REFERENCE

1. A Text Book of Invertebrates- N.C.Nair, S. Leelavathy, N.Soundara pandian, T.Murgan, Dr. N. Arumugam, Saras Publication, 2010
2. Invertebrate Zoology, Jordan, E.K. and P.S.Verma. 1993. 12th Edition.S.Chand & Co.Ltd., Ram Nagar, New Delhi.
3. (All Series) Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca, Echinodermata, Kotpal, R.I., 1988-1992. – Rastogi Publications, Meerut – 250 002.
4. Manual of Zoology Vol. I (Invertibrata). Parts I & II. Ayyar, E.K. and T.N. Ananthakrishnan, 1992. S. Viswanathan (Printers and Publishers) Pvt Ltd. Madras.

ALLIED I (THEORY) - BOTANY PAPER

UZOA11 **5hrs/4 credits**

Objectives

- ✓ To understand the taxonomy aspects of plants
- ✓ To discuss the structure, reproduction & classification of lower plants
- ✓ To identify the plants as either monocotyledons or dicotyledons
- ✓ After studying this, students can apply the knowledge to better understand and manage the plant based system.

UNIT 1

Structure, Reproduction & Classification of Algae- Sargassum Economic importance of Algae
Fungi- General characters of fungi, life cycle Puccinia,Economic importance of Fungi

UNIT II

Structure of life cycle of Bryophyte - Funaria
Structure of life cycle of Pteridophyte -Lycopodium
Structure of life cycle of Gymnosperm- Gnetum

UNIT III

Brief Account of Meristerms – Types Primary & structure of Dicot stem, structure of Monocot stem.

UNIT IV

Outline of Benthem &Hooker classification,Merits & Demerits
Characteristic features of the Following families: Rubiaceae, Caesalpinaceae, Asclepidaceae & Poaceae

UNIT V

Structure of Anther, Malegametophyte, Ovule, Femalegametophyte, Double Fertilization, dicot embryo, Endosperm & its types.

REFERENCE

1.K.N.Rao& K.V.Krishna moorthi
2.Pteridophytes- Rashid, Vashista
3.Gymnosperm- Sponse ,Vashista
4.Plant Anatomy -Pandey,Annie,Regland
5.Embryology of Angiosprem-S.S.Bhojwani& Bhatnagar
6. An Itroduction to Embryology –P.Maheswari

VALUE EDUCATION

UVAE11 **3hrs/3 credits**

UNIT I

Values – definition – value crisis – need for practicing positive values for good life – values erosion – its impact on individual, societal – cultural level – way out.

UNIT II

Family, material, human values – good health – individual and intellectual freedom – human progress – production and distribution – prosperity and peace – Aesthetic values – sense of beauty – moral ethical value – conscience – integrity – fairness.

UNIT III

Societal values – cooperative living – healthy behaviors – justice – social responsibility – free from bribery and corruption – good citizen – good society – pursuit of excellence – Psychological values - self-esteem and acceptance – emotional intelligence – spiritual values – devotion and self-fulfillment

UNIT IV

Bioethics – definition – goals and objectives – love of life – animal use and ethics – medical ethics – negligence and wrong judgments – issues genomes on organ transplantation – donors – drugs – mortality – social ethics – child labour and bonded labor

UNIT V

Women – and development – sex versus gender – women's rights – factors affecting development – violence against women – right to privacy – abortion and reproductive rights – social stigma – women empowerment – social, economic and political – government program and policies.

SEMESTER II

CORE III (THOERY) - CHORDATA

UZOT21 **6hrs/4 credits**

Objectives

- ✓ To understand the systemic and functional morphology of various forms of vertebrates

- ✓ To discuss the affinities and adaptations of chordates to different modes of life.
- ✓ To understand the origin and evolutionary relationship in different subphylum of chordates
- ✓ Make the student to enlighten the concept of diversity, adaptations, organisation and taxonomic status of Chordates.

UNIT I

General characters and Classification of Chordata: up to orders with a few examples
Affinities and systematic position of cephalochordate, Hemichordates and Urochordata.

UNIT II

Pisces:
Type Study: Shark -External morphology, Digestive System, Respiratory system, nervous,excretory and Reproductive system.
General Topic: Accessory respiratory organs in Fishes

UNIT III

Amphibia
Type Study: Frog- External morphology, Digestive System, Respiratory system,circulatory, nervous, excretory, Reproductive system and metamorphosis.
General Topic: Parental care in Amphibia

UNIT IV

Reptilia
Type Study: Calotes vesicolor – External morphology, Digestive System, Respiratory, circulatory, nervous, excretory, pectoral and pelvic Girdle only
General Topic: South Indian Poisonous and non- Poisonous snakes.
Identification – Poison apparatus, biting mechanism, Nature of venom, first aid and treatment.

UNIT V

Aves
Type study – Pigeon External morphology, Digestive System, Respiratory system, circulatory, nervous, excretory, exoskeleton and flight mechanism
General Topic: Migration of birds
Mammalia: 15
Type Study – Rabbit External morphology, Digestive System, Respiratory system, circulatory, nervous, excretory, Reproductive system.
General Topic: Dentition in Mammals, Adaptation of Aquatic mammals

REFERENCE

1. A Text Book of chordates – A. Thangamani, S. Prasanna kumar, L.N.Narayanan, Dr.N.Arumugam, Saras Publication, 2010.
2. A Manual of Zoology, volume II – Chordata. Parts I & II. M.Ekambatanatha Ayyar, T.N. Anantha Krishnan, 1992. S.Viswanathan (Printers and Publishers) Pvt.Ltd, Madras.
3. Chordate Zoology, Jordan E. L & Verma P. S., S. Chand & Company Ltd. 1998

CORE I (PRACTICAL) - INVERTEBRATA AND CHORDATA

UZOP21 **5hrs/4 credits**

Objectives

- ✓ To impart training on the techniques of mounting and identification of different cells and feathers
- ✓ To provide the knowledge to identify the poisonous animals like snake
- ✓ To train the students about the various types of animal cells and molecular structures with their characteristic features and detailed functions
- ✓ Acquire the knowledge of the technique of various systems present in the invertebrate and chordates.

I. Mounting & identification

Paramecium

Earthworm - Body and Penial setae

Honey bee / mosquito mouth parts

Appendages of prawn

Placoid scales of shark

Feathers identification

Two parasites identification in any fish digestive tract.

II. Diagram and description of

Earthworm -Nervous System.

Salivary apparatus and trachea of cockroach.

Cockroach -Digestive system, Nervous System, Reproductive system

Pila - Digestive system, Radula

Frog -Arterial System, Brain

III Spotters: Invertebrata:

1. Paramecium -entire, binary fission, conjugation.
2. Simple sponge – Gemmule, Spicules
3. Obelia -Colony.
4. Obelia -Medusa.
5. Physalia
7. Fasciola -Entire.
8. Ascaris - -Male & Female
9. Ancylostoma duodenal.
10. *Wuchereria Bancroft.*
11. Nereis.
12. Heteronereis.

13. Prawn - Entire, Nauplius
15. Honey Bee.
16. Silkworm.
17. Headlouse
18. Starfish - oral and aboral view

Chordata Spotters:

1. Amphioxus,
2. Balanoglossus
3. Shark.
4. Hippocampus.
5. Narcine.
6. Anabas
7. Clarius
8. Echeneis,
9. Rhacophorus
10. Bufo
11. Chamaeleon
12. 2 poisonous snakes
13. 2 Non – Poisonous Snakes.
14. Birds – Beak & Feet of any two birds.
15. Bat.
16. Rabbit – Pectoral & Pelvic girdle
    -- Limb Skeleton.

A record of lab work should be maintained and submitted at the time of the practical examination

Study tour to the minimum of 1 day for specimen collection is compulsory. Exposing the students to different habitats, ecosystem and animal farm.

ALLIED PRACTICAL I –BOTANY

UZOA21 **5hrs/4 credits**

Objectives

- ✓ To train the techniques of permanent slide preparation
- ✓ To make the student able to identify the plant

- ✓ To understand the anatomical structure of plants and salient features of the families and construction of floral diagram.
- ✓ Make the student to understand the plant physiology

Plant Diversity

1. Study of Permanent slides of the following

Algae	- Oscillatoria(Harmonica)
	- Oedogonium(Nannandrium & Capcells)
	- Sargassum(Morphology)
Fungi	- Puccinia(T.S of Wheat leaf uredospore Teleutospore)
Bryophytes	- Funnaria (Habit)
Pteridophyte	- Lycopodium(Morphology,T.s of Stem, L.S. of cone)
Gymnosperm	- Gentum (morphology, T.S. of Stem showing secondary growth, Gentum ula, male cone, Female cone

Taxonomy

2. Technical description and identification of the families those are included in the theory
   1. Rubiaceae,
   2. Caesalpinaceae,
   3. Asclepidaceae &
   4. Poaceae

Anotomy

3. Study of Apical meristem (shoot apex)
   Tissues - Parenchyma, Collenchymas, Sclerenchyma, T.S of Dicot stem
   Embryology
4. T.S of mature Anther, structure of Dicot Embryo, Structure of Ovule
5. Plant physiology

Experiments to demonstrate

i Osmusis - thistle fumel experiment
ii Evolution of oxygen during photosynthesis
iii Evalution of Co_2 during Respiration (Ganongs's respirascope).

ENVIRONMENTAL STUDIES

UEVS21 **2 hrs/2 credits**

UNIT – I

The multidisciplinary nature of environmental studies
Definition, Scope and importance.
Need for public awareness

UNIT – II

Natural resources:
Renewable and non – renewable resources

Natural resources and associated problems

a) Forest resources: Use and over – exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b) Water resources: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non – renewable energy sources, use of alternate energy sources, case studies.
f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable of resources for sustainable lifestyles.

UNIT – III

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers.
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:
    - Forest ecosystem
    - Grassland ecosystem
    - Desert ecosystem
    - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT – IV

Biodiversity and its conservation

- Introduction – definition: generic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega – diversity nation.
- Hot – spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wild life, man – wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity: In – situ and Ex-situ conservation of biodiversity.

UNIT – V

Environmental Pollution

- Causes, effects and control measures of:
  - Air pollution
  - Water pollution
  - Soil pollution
  - Marine pollution
  - Noise pollution
  - Thermal pollution
  - Nuclear hazards
- Solid waste Management: causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquakes, cyclone and landslides.

UNIT – VI

Social issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation. Rainwater harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

UNIT - VII

Human population and the Environment

- Population growth, variation among nations.
- Population explosion – family Welfare Programme.
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS.
- Women and child welfare
- Role of Information Technology in Environment and human health.
- Case studies.

UNIT - VIII

Field work

- Visit to a local area to document environment assets – river / forest/ grassland/ hill/ mountain.
- Visit to a local polluted site – Urban/ Rural/ Industrial/ Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems – pond, river, hill slopes, etc.

REFERENCE

1. Agarwal, K.C 2001 Environmental Biology, Nidi Publ Ltd, Bikaner
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt Ltd. (R)
3. Brunner R.C 1989, Hazardous Waste Incineration, McGraw Hill Inc 480p
4. Clark R.S Marine Pollution, Claderson Press, Oxford (TB)
5. Cunningham, W.P Cooper, T.H Gorhani, E & Hepworth, M.T 2001, Environmental Encylopedia, Jaico Publ House, Mumbai 1196p.
6. De A.K Environmental Chemistry, Wiley Eastern Ltd.,
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P 1993 Water in crisis, Pacific Institute for Studies in Dev., Environmental & Security. Stockholm Env. Institute. Oxford Univ Press 473p.
9. Hawkins R.E Encylopedia of Indian Natural History, Bombay Natural History Society, Bombay (R).
10. Heywood, VH & Watson R.T 1995 Global Biodiversity Assessment. Cambridge Univ Press 1140p.
11. Jadhav, H 7 Bhosale, V.M 1995 Environmental Protection and Laws. Himalaya Pub House, Delhi 248p.
12. McKinney M.L & Schoch R.M 1996 Environmental Science systems & Solutions, Web enhanced edition 639p.
13. Mhaskar A.K Matter Hazardous, Techno Science publications (TB)
14. Miller T.G Jr Environmental Science, Wadsworth Publishing Co (TB).
15. Odum, E.P 1971 Fundamentals of Ecology, W.B Saunders Co USA, 574p.
16. Rao MN & Datta A.K 1987. Waste Water treatment. Oxford & IBH Publ Co Pvt Ltd. 345p.
17. Sharma B.K 2001 Environmental Chemistry Goel Publ House, Meerut.
18. Survey of the Environment, The Hindu (M)
19. Townseed C. Harper J and Michael Begon, Essentials of Ecology, Blackwell Science (TB).
20. Trivedi R.K Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II, Enciro Media (R).
21. Trivedi R.K and P.K Goel, introduction to air pollution, Techno Science Publications (TB).
22. Wagner K.D 1998 Environmental Management W.B Saunders Co Philadelphia, USA 499p.(M) Magazine, (TB) Textbook, (R) Reference.

CORE-IV (THEORY) – ANATOMY

UZOT31 **5 hrs/4 credits**

Objectives:

- ✓ To explain the level of structural organization in the body
- ✓ To understand the structure and functions of various organs of the body
- ✓ To encourage the anatomy as a subject through research in solving problems in the students
- ✓ The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.

UNIT I

Introduction to Anatomical terms organization of human body , Cell & Cell structure division Tissues definition, types, characteristics, classification, location, functions, and formations. Radiological anatomy.

UNIT II

Anatomy of Eye, image formation, defects of eye, photo pigments, visual cycle. Ear {auditory apparatus}, Nose {olfactory apparatus}, Tongue. Structure of liver and its secretion, function of liver.

UNIT III

Skin structure. Membrane glands - classification and structure, alteration in disease Regions, cavities Membranes. Muscular tissue review • Muscle groups Alteration in Disease. Structure of hair, hair loss.

UNIT IV

Bone structre and function of bones. Classification of bone , Bone- formation growth, healing, Skeleton Axial, Appendicular , Bones Joints – Classification and structure. Structure and function of spinal cord. Importance of bone marrow.

UNIT V

Lymphoid glands – Primary and secondary structure and function. Cells of the immune system & their functions - maturation and Differentiation of B cells and t cells. Lymphatic tissue - ThymusLymph node -Spleen -Lymph nodules , Alteration in disease .Body buffer system.

ALLIED II (THEORY) - CHEMISTRY

UZOA32 **5 hrs/4 credits**

Objectives:

- ✓ To understand the basic concepts of chemistry.
- ✓ To study the importance of pH and buffer action.
- ✓ To provide the knowledge about rusting and kinetics.
- ✓ Students can acquire the knowledge of all basics of chemistry.

UNIT 1

Arrhenius theory of electrolytes strong electrolytes – weak electrolytes – ostwald's dilution of law and its applications – Ionic product of water and its applications – solubility product and its determination.

UNIT II

pH – definition simple calculation of pH form molarity of acids and bases – comon ion effect and its application in analytical chemistry buffer solution- definition – theory of buffer action – application. Acid – base indicators – working range of indicators – choice of indicators – commercial cells – primary and secondary cells- Weston – cadmium cell lead storage cell.

UNIT III

Theory – Applications to the formation of simple molecules like H_2 and O_2. Overlap of atomic orbitals – S-S, S-P and P-P overlap principles of hybridisation.

UNIT IV

Corrosion – principle and methods – corrosion and passivity rusting of ion preventive methods from rusting – Electroplating.

UNIT V

Derivation of first order – rate constant – half life period – examples of second order and third order reaction – enzyme kinetics.

REFERENCES

1. S.P.Banerjee, Advanced inorganic chemistry, Published by Books & Allied (p) Ltd
2. Ghosh, (2008), Advanced general organic chemistry, New Age Publishers Pvt Ltd
3. Roy, (2013), Mukherjee and Das, General and inorganic chemistry, New Central Book Agency (P) Limited
4. A.Ghoshal,(2013) A general and physical chemistry, Books & Allied Ltd; 2nd Revised edition

5. Mukherjee, (2011), Textbook of organic chemistry, Wisdom Press

6. Sarkar, (2007), General and inorganic chemistry, Vol I and Vol II., New Central Press

7. Pahari, (2007), Physical chemistry, Vol. I and Vol. II, New Central Book Agency; 2nd Revised edition edition

ELECTIVE- I (THEORY)

UZOE31 **4 hrs/3 credits**

OPTION 1: ENTOMOLOGY

Objectives

- ✓ To learn how to classify the insects by use of standard taxonomic keys.
- ✓ To learn the basic external morphology and the basic internal anatomy of insects
- ✓ To identify several beneficial insects and understand the economic importance of insects, interrelation of crops and insect pests.
- ✓ Students can able to identify the insects and can use these knowledge for pest control

UNIT I

Basics of Entomology Definition, scope and importance of Entomology.
Insect classification and their distinctive characters.
Insect External morphology- Head, Thorax, and Abdomen. 20
Insect Internal Morphology – Digestive, Respiratory, Circulatory, Excretory, Nervous, and Reproductive systems.
Insect growth and development.

UNIT II

Insect vectors and pests. 20
Introduction and history of medical entomology
Vectors of public health importance – Mosquitoes, Housefly, Sand fly, Lice & Bedbugs
Vector-borne diseases- (Malaria, Dengue, Filaria) and their control measures.
Role of pests in Agriculture.
Crop Pests and their control measures

UNIT III

Beneficial Insects and Harmful Insects 20
Honey Bee.
Lac Insects
Silk worm
Social life of Insects.
Venomous Insects.

REFERENCES

1. Text Book of Applied Entomology Vol. I & II by K. P. Srivastava
2. General Applied Entomology by B V David and T N Anathakrishnan
3. Destructive and Useful Insects by C. L. Metcalf
4. A text book of Entomology by Mathur and Upadhay

ELECTIVE- I (THEORY)

UZOE31 **4 hrs/3 credits**

OPTION 1: BIOPHYSICS

Objectives

- To understand the basic principles and applications of thermodynamics law for biological system
- To learn the physics behind the function of sensory organ in biological systems.
- To learn the biophysics techniques for the study of structural biology
- Students can able to increase their knowledge of standard molecular and biophysical techniques and capable to select the methods and techniques to design experiments in a specific research area.

UNIT I

Introduction to biophysics: Application of physics in biological sciences, Biophysics of water – Molecular structure of water, hydrogen bonds – Physical Properties of water.

UNIT II

Laws of thermodynamics and its applications to biology
States of matter Colloidal state – Size of colloidal particles, Different types of colloidal dispersion (sol, aerosol, emulsion, foam, gel) Preparation of lyophilic and lyophobic sols – Protective colloids, Colloidal particles of milk and blood with their functions – Properties of colloides (surface tension, viscosity, surface absorption, Kinetic properties

UNIT III

Determination of molecular weight of macro molecules by chemical composition, Sedimentation – Molecular sieving – Light scattering – Osmotic pressure methods Units of measurement of solutes in solution – normal, molar, molal, milli equirvalents, And milli osmol, ionic strength.

UNIT IV

Molecular organization protein – primary, secondary, tertiary and quaternary structure. Physics behind vision, hearing and impulse conduction. Bioenergetics, ATP – Energy and its forms – Enthalpy and entropy – Redox potential, redox coupling And ATP bioenergetics

REFERENCE

1. Biophysics – Principles And Techniques – M.A.Subramanian,Mjp Publishers,Chennai 5.
2. Aspects Of Biophysics – William Hughes, John Willy And Sons, N.Y., 1979.
3. Biophysical Science – L.E. Ackermann, L.B.E. Ellis And Williams, 1979.
4. Biophysics – Concepts And Mechanisms-E.J. Casey , Von Nostrand Reinhold Co., N.Y.,

NON MAJOR ELECTIVE-I (THEORY) - SERICULTURE

UZON31 **2hrs/2credits**

Objectives:

- ✓ To enlighten the students about sericulture a profitable culture practice.
- ✓ To enhance the skills, competitiveness and employability of the students
- ✓ To gain the knowledge of silk production, disease management, quality of silk and marketability.
- ✓ Non major elective student can become entrepreneur.

UNIT I

Introduction to sericulture, moriculture, classification of Mulbery, Methods of cultivation.

UNIT II

Biology and diseases of Silkworms
Life cycle, External morphology and biology of mulberry silkworm.
Internal morphology of Silkworm – Digestive, Respiratory,
Nervous, Excretory, and Reproductive systems.
Diseases of *Bombyx mor*i -Viral, bacterial protozoan and fungal
Preventive and control measures. Insect and vertebrate
Pests of silkworm and their management.

UNIT III

Seed /silkworm eggs. Structure – Commercial and reproductive, Seeds, Voltinism, Hiber nating and non hiber nating eggs.

UNIT IV

Rearing: Rearing house and appliances, Rearing processes. Chawkiworm rearing – optimum feeding, optimum Environmental conditions, care during rearing and cleaning. Selection of ripeworm, spinning, mounting, Harvesting, storage and transport.

UNIT V

Reeling – Stifling, reeling appliances – types of croissures, Country charka, cottage basin, filature units, Applications of silk.

REFERENCE

1. Applied Zoology- Dr.N.Arumugam, T.Murugan, J.Johnson Rajeshwar, R. Ram Prabhu, Saras Publication, 2010.
2. G. Ganga & J. Sulochana Chetty, 1997. An introduction to sericulture (Oxford & IBH bubl.Co.Pvt. Ltd.)
3. Hand Book of Practical Sericulture by Ullal and Narsimhanna. CSB. Bangalore

SKILL BASED ELECTIVE-I ECONOMIC ZOOLOGY

UZOS31 **2hrs/2 credits**

Objectives:

- ✓ To gain the knowledge in the field of animal culture and its product marketing.
- ✓ To learn the process of honey bee culture, honey production and pearl culture.
- ✓ To gain the knowledge of poultry science, edible fishes and milk pasteurization.
- ✓ Student can get self employment programme.

UNIT I

Honey Bee-Types of honey bee-Culture techniques- Diseases of honeybee.

UNIT II

Poultry Industry-Any three indigenous and exotic breeds Diseases of poultry- Any three poultry products.

UNIT III

Pearl Industry-Types of Pearls-Pearl formation-Culture of pearls-Pearl producing sites in India.

UNIT IV

Fishery Industry-Common Edible fishes-Economic Importance of fishes.

UNIT V

Dairy Science-Different Breeds- milk and milk products - Pasteurization.

REFERENCE

1. Applied Zoology by Dr. N. Arumugam, T. Murugan, J, Johnson Rajeshwari, R. Ram Prabhu, Saras Publication, 2010.
2. Economic zoology by Jawaid Ashan, Subhas Prasad Sinha (1995), S.Chand & Company Ltd, Ram nagar, New Delhi - 110055

SEMESTER IV

CORE V (THEORY) – MICROBIOLOGY

UZOT41 **4hrs/4 credits**

Objectives:

- To provide the knowledge with the latest information in scientific microbiological methods.
- To learn the microbial culture and maintenance techniques
- To gain the knowledge of economical importance of microbes
- The students can get skills of microbial culture and application of this knowledge to well being of human health and environmental health.

UNIT I

Introduction:

Definition & Scope of microbiology – Contributions of early microbiologists- General classification (Whittaker) of microorganisms.

UNIT II

Bacterial Culture Techniques.

Salient features, classification, structure and reproduction of bacteria.

Sterilization – Culture media – Culture methods & techniques – Methods of isolation – Staining – Microbial growth & growth curve.

UNIT III

Applied microbiology:

Salient features and economic relevance of fungi and actinomycetes.

Food microbiology – Food spoilage – Food poisoning – Food preservation.

Industrial Microbiology – Alcohol production – Production of Antibiotics – Penicillin and Streptomycin.

UNIT IV

Environmental microbiology:-

Soil microbes – N_2 fixation – Biodegradation of pollutants – Xenobiotics – Heavy metal

UNIT V

Medical microbiology:-

Bacterial diseases – Tuberculosis – Streptococcal pneumonia – Cholera , leprosy, tetanus Gonorrhea – Syphilis.

Viral diseases – Influenza – Polio – Hepatitis B – AIDS.

REFERENCE

1.Microbiology P. D. Sharma, Rastogi Publ. Meerut, India, 1998.

2.General Microbiology , Sullia, S. B & Santharam. S, Oxford IBH, India, 2004.

3.Microbiology, Purushotam Kaushik. S . Chand & Co, New Delhi, India, 2005.

4.Microbiology & Immunology, N. Arumugam, Saras Publications,

CORE PRACTICAL II
SERICULTURE, MICROBIOLOGY & CLINICAL BIOLOGY

UZOP42 **4hrs/4credits**

Objectives

- To obtain the basic laboratory skills such as microscopy, spectrophotometery, measuring, etc
- To train the students about the sericulture and bacterial cells and culture techniques
- To learn the important clinical techniques
- Student can classify the microorganism and can do better sericulture as entrepreneur.

Sericulture

Identification of cocoons
Observation and study of
i. Silk worm – life cycle, egg, larva, pupa and moth, Silk gland
ii. Mountage of Netrika
iii. Silkworm disease and pest – pebrine and uzifly

Microbiology

1. Preparation of media – Natural Broth solid media (Agar)
2. Plating techniques – streak plate, pour plate and spread plate
3. Serial dilution techniques
4. Gram's staining
5. Hanging drop experiment
6. Screening of antimicrobial agent (Krby Bauer Method)
7. Observation of Instruments: Water bath, laminar air flow, autoclave, Incubator, Hot air oven, Colony counter.
8. Spotters: - Bacteria, Fungi, Algae, Spirogyra, Agaricus, Rhizopus, Bread mould, Protozoa – paramecium, Yeast.

Clinical Biology:

1. **Blood** Analysis – Hb Estimation
2. Urine Analysis – Detection of Albumin, Sugar and Deposits.
3. Observation & Study of Mantoux test, Widal test

A record of lab work should be maintained and submitted at the time of the practical examination

Study tour – visit to sanctuaries / parks / sericulture unit /Animal form / Microbiology and Immunology lab compul

ALLIED II (PRACTICAL) - LAB IN CHEMISTRY

UZOA42 **3hrs/4 credits**

Objectives

- To learn how to use of graduated cylinders, graduated pipettes and volumetric pipettes for measurements.
- To impart the training for the preparation of various strength solution for analysis
- To understand the concept of indicators and standardization

- Acids and bases indicators
- pH adjustments- Acid, Base, Neutral
- Buffer preparation
- Molarity and Normality
- Titration between a strong acid against NaOH
- Titration between sodium hydroxide against oxalic acid.
- Titration between KMnO4 against ferrous sulfate
- Titration between sodium thiosulfate and potassium dichromate

REFERENCES

1. Upathayah , (2006), Biophysical Chemistry –, 3rd edition, reprinted 2006.
2. Keith Wilson & John Walker, (2000), Practical Biochemistry – Principles and Techniques, Cambridge University Press; 5 edition
3. D. Friefelder, (1982), Physical Biochemistry, W.H.Freeman & Company, Newyork, USA.
4. K.E. van Holde, W.C. Johnson, P.S. Ho, (2006), Principles of Physical Biochemistry, Prentice Hall, 2nd Edition.

ELECTIVE II (THEORY)

UZOE42 **3 hrs/3 credits**

Option 1: MEDICAL LABORATORY TECHNOLOGY

Objectives

- To learn the proper procedure for the collection, safe handling and analysis of biological specimens.
- To discuss about the medical diagnostics methods used for analysis of Blood.
- To know the urine test, blood test and important human diseases.
- By this paper student can enlighten the skills of basic medical techniques.

UNIT I

Introduction to Medical Diagnostics and its Importance Diagnostics Methods Used for Analysis of Blood- Blood composition, Preparation of blood smear and Differential Leucocyte Count (D.L.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)

UNIT II

Urine analysis – Physical characteristics; Abnormal constituents, Detection of sugar, albumin, deposits and pregnancy test, (b) Blood analysis – Blood grouping, Haemoglobin estimation, Cell counts DC/TC.

UNIT III

Diseases -Causes, types, symptoms, complications, diagnosis and prevention of Bacterial diseases – primary complex Helminthes diseases – round worm. Diabetes (Type I and Type II), Hypertension (Primary and secondary), diagnosis and prevention of Tuberculosis and Hepatitis Immunization schedule in India

UNIT IV

Aid for (a) Heart attack (b) Electric shock (c) Fire accident d) Burns (e) Snake bite and dog bite (f) Drowning bleeding and shocking (h) Road accident.

UNIT V

Tumours Types Benign/Malignant, Detection and metastasis; Medical imaging: X-Ray of Bone fracture, PET, MRI and CT Scan.

REFERENCE

1. Notes on Clinical Lab Techniques, Root & I. Samuel. M. K. G. Iyyer & Sons Publ. Co, Chennai, 1992.
2. Medical Laboratory Technology Vol. 1,2& 3, Mukherjee. Tata McGraw Hill publ. Co, Noida, India, 2006.
3. Medical Laboratory Science. Theory and practice, Ochei, Tata McGraw Hill publ. Co,

Noida, India, 2000.
4. A text book of Microbiology, Dubey R. C. and Maheshwari D. K. S. Chand & Co. Publ. New Delhi, India, 2007.

ELECTIVE II (THEORY)

UZOE42 **3 hrs/3 credits**

Option 2: ANIMAL BEHAVIOUR & CHRONOBIOLOGY

Objectives:

- To learn animal behaviour and understanding of insect reproduction and host plant protection, leading to the discovery of non-toxic pheromones for insect pest control.
- To know about the natural behaviour of various animals (foraging, reproductive, migratory, home range etc.)
- To understand the reproductive behaviour studies may lead to improved captive breeding methods of near-extinct species
- Student can acquire the knowledge about various animal behaviour and biological rhythms

UNIT I

Introduction to Animal Behaviour

Origin and history of Ethology; Brief profiles of Karl Von Frish, Ivan, Pavlov, Konrad Lorenz, Niko Tinbergen, Proximate and ultimate causes of behaviour, Methods and recording of a behavior

UNIT II

Patterns of Behaviour:

Stereotyped Behaviours (Orientation, Reflexes); Individual Behavioural patterns; Instinct vs. Learnt Behaviour; Associative learning, classical and operant conditioning, Habituation, Imprinting.

UNIT III

Social and Sexual Behaviour

Social Behaviour: Concept of Society; Communication and the senses; Altruism; Insects' society with Honey bee as example; Foraging in honey bee and advantages of the waggle dance. Sexual Behaviour: Asymmetry of sex, Sexual dimorphism, Mate choice, Intra-sexual selection (male rivalry), Inter-sexual selection (female choice), Sexual conflict in parental care.

UNIT IV

Biological Rhythm

Types and characteristics of biological rhythms: Short- and Long- term rhythms; Circadian rhythms; Tidal rhythms and Lunar rhythms; Concept of synchronization and masking; Photic and non-photic zeitgebers; Circannual rhythms; Photoperiod and regulation seasonal reproduction of vertebrates; Role of melatonin.

UNIT V

Biological Clocks
Relevance of biological clocks; Chronopharmacology, Chronomedicine, Chronotherapy.

REFERENCE

- David McFarland, Animal Behaviour, Pitman Publishing Limited, London, UK.
- Manning, A. and Dawkins, M. S, An Introduction to Animal Behaviour, Cambridge, University Press, UK.
- John Alcock, Animal Behaviour, Sinauer Associate Inc., USA.
- Paul W. Sherman and John Alcock, Exploring Animal Behaviour, Sinauer Associate Inc., Massachusetts, USA.
- Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey (ed). 2004, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
- Insect Clocks D.S. Saunders, C.G.H. Steel, X., Afopoulou (ed.)R.D. Lewis. (3rdEd) 2002 Barens and Noble Inc. New York, USA
- Biological Rhythms: Vinod Kumar (2002) Narosa Publishing House, Delhi/ Springer-Verlag, Germany.

NON MAJOR ELECTIVE II (THEORY) – APICULTURE

UZON42 **2 hrs/2 credits**

Objectives:

- To make clear to the students about the honey bees, its life style and social behaviour.
- To learn apiculture, and recognize the list of honey bees
- To provide the knowledge of economic importance of bee products
- Students will be able to understand biological features of honey bee and economic importance thereby they can get self employment.

UNIT I
Introduction to Apiculture – Scope of Apiculture. Honey bee – Classification, types of honey bees – *Apis dorsata, Apis florae, Apis indica* and Dammer bee

UNIT II
Bee colony- function of members – Different kinds of cells, Bee hive and its architechture, communication in bees.

UNIT III
Apis indica – social life in Indian honey bee. Morphology of Queen, Drones and Workers.

UNIT IV
Bee keeping – methods of bee keeping in India – Primitive hives – wall type, movable type, bamboo hive. Modern hives – longstroth ten frame hive, Newton's hive. Appliances use in bee keeping.

UNIT V

Economic importance of bee products – chemical composition, Nutritive value and medicinal uses of honey, bee wax, bee venom and disease of honey bees.

REFERENCE

1. Applied Zoology Dr. N. Arumugam, Dr. S. Murugan, Dr. J. Johnson Rajeshwar and Dr. R. Ram Prabhu, Saras Publication, Nagerkovil, (2005).
2. A text book of Economic Zoology Ravindranathan K. R, Dominent Publishers and distributors, New Delhi. (2005).
3. Entomology M. S. Nalina sundari M. J. P Publications, Chennai, 2006.
4. Hand book of Bee Keeping, Sharma P.L & Singh S. Agrobius Publ, India, 2001.
5. A text book of Economic Zoology. Ravindranathan K. R. Dominent Publishing & distributors, New Delhi, 2005.

SKILL BASED STUDIES II - VERMICULTURE

UZOS42 **2 hrs/2 credits**

Objectives

- To learn the skill to produce vermicompost
- Student can obtain the skills for the production of organic manure for sustainable agriculture.

UNIT I

Earthworms-Taxonomic position and diversity; types – Epigeic species, Endogeic species and Anecics.

UNIT II

Vermiculture-definition, scope and importance, common species for culture, Environmental requirements; culture methods-wormery-breeding techniques; Indore and outdoor cultures.

UNIT III

Applications of vermiculture-Vermiculture Biotechnology-vermicomposting, use of vermicastings in organic farming/horticulture-vermiwash.

UNIT IV

Earthworms for management of municipal/selected biomedical solid wastes, as feed/bait for capture/culture fisheries; forest regeneration.

UNIT V

Future perspectives-Potentials and constraints for vermiculture in India.

REFERENCE BOOK

1. Sultan Ahmed Ismail, 2005.The Earthworm Book, 2nd revised edn, Other India press, Goa, India.

SEMESTER V

CORE VI (THEORY) - IMMUNOLOGY

UZOT51 **5 hrs/4 credits**

Objectives:

- To learn about function of immune system and lymphoid organs
- To enlighten the structure and function of immunoglobulin
- To provide the knowledge of auto immune diseases
- Acquire the knowledge to understand the science of immunology for the new invention of vaccine for some deadly diseases.

UNIT I

History and scope of Immunology
Immunity – Types of Immunity, Introduction to Vaccines and types of Vaccines and their role.
Lymphoid organs – structure and functions of primary and secondary lymphoid organs.

UNIT II

Cells of the Immune system – their role in immune response. Antigen and antibody interaction. Basic properties and functions of Cytokines, Interferons and complement proteins Complement activation Immunoglobulin – Structure, types and functions.

UNIT III

Humoral Immune Response – Primary and Secondary immune response. Cell mediated Immune response.

UNIT IV

Major Histocompatibility Complex (MHC), Human Leucocyte Antigen (HLA)
Hyper Sensitivity Types I, II, III, IV and V.

UNIT V

Immunology
Auto Immune diseases – Myasthenia gravis, Lupus erythematosus, Haemolytic anaemia, AIDS. Antibodies and Immunotherapy. Monoclonal antibodies and their production

REFERENCE

1.Immunology & Microbiology, Dulsy Fatima, A. Mani, L.M. Narayanan, A.M.Selvaraj, Dr. N. Arumugam, Saras Publication, 2010
2.Immunology & Immunotechnology, Ashim K. Chakravarth, Published in India by oxford university press, 2006 / Jai Singh Road, New Delhi.
3.Immunology, I. Kannan, 2007, MJP Publishers, Chennai- 600005.

CORE VII (THEORY) - DEVELOPMENTAL BIOLOGY

5hrs/4credits

UZOT52

Objectives

- To know the various stages involved in the embryo development
- To learn the gametogenesis process and understand the importance of meiosis cell division
- To study the process of fertilization and its development like organogenesis
- Student can enlighten about the embryo formation and development

UNIT I

Definition: History of Developmental Biology - Theories of Preformation – epigenesis – Von Baer's law and biogenetic theory. Gametogenesis – Spermatogenesis and Oogenesis.

UNIT II

Structure of egg and sperm of Amphioxus, frog, Chick and rabbit.
Fertilization, Early development, Physicochemical, Cytological and Biochemical aspects of fertilization, Cleavage and its pattern in Vertebrates; Morula – Types of blastula. Gastrulation – Fate maps – morphogenetic, Movements – neurula.

UNIT III

Organogenesis – Development of heart, brain, and eye in chick. Embryonic adaptation: Foetal membranes in Chick – placenta in mammals.

UNIT IV

Experimental embryology: Organizer Concept – field and gradients - amphibian metamorphosis and its hormonal. Control. Regeneration in planarians and Amphibian.

UNIT V

Applied embryology: Test tube babies –Birth control – Artificial insemination –IVF- Techniques in embryo culture.

REFERENCE

1. A Text Book of Embryology. Dr. N. Arumugam.Saras Publication, 2010.
2. Chordate Embryology -P.S .Verma & V.K.Agarwal---S. Chand & Co.1975.
3. Developmental Biology - Arumugam N. Saras Publicaion – kottar. 2007.
4. An introduction to embryology, – Balinsky B.I- W.B.Saunders Co.., Philadelphia, 3rd edt.., 1965

CORE VIII (THEORY) - ANIMAL PHYSIOLOGY

UZOT53 **5hrs/4 credits**

Objectives

- To learn the digestion and circulation system
- To study the structure and function of internal organs
- To know the excretion system and its significance
- Student can get thorough knowledge about the physiology of human body

UNIT I

Physiology of Digestion
Structural organization and functions of gastrointestinal tract
Mechanical and chemical digestion of food; Absorptions of food Hormonal control of secretion of enzymes in Gastrointestinal tract.

UNIT II

Respiration Circulation
Respiration – Types of respiratory organs – Respiratory pigments – transport and exchange of gases control of respiration – biological oxidation anaerobiosis respiratory quotient. Structure and function of human Heart, haemodynamics, ECG, Blood pressure

UNIT III

Excretion: Structure of kidney and its functional unit; Mechanism of urine formation; 10 Regulation of water balance; Regulation of acid-base balance. Origin and Types of Nitrogenous wastes – Ammonotelism, Ureotelism and uricotelism

UNIT IV

Receptors and effectors: Structure of neuron, resting membrane potential, conduction of action potential across the myelinated and unmyelinated nerve fibers; Types of synapse, Synaptic transmission and, Neuromuscular junction; Reflex action and its types - reflex arc. Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus

UNIT V

Endocrine System and Reproductive Physiology: Types of endocrine glands – pituitary, thyroid, parathyroid, adrenal and sex glands – their secretions and physiological role, Human reproductive cycle and the role of hormones, Birth control measures.

REFERENCE

1. Animal Physiology- A. Maria Kuttikan, Dr.N. Arumugam, Saras Publication, 2010.

2. Animal Physiology- P.S Verma, B.S.Tyagi, V.K. Agarwal, II edt, 1978, S.Chand & Company Ltd. Ram Nagar, New Delhi – 110 055.
3. General comparative physiology by Hoar, S. William, 3rd edt, 1987, Prentice Hall of India Pvt. Ltd. New Delhi, 18 BN-0-87692-337-6.

CORE IX (THEORY) - GENETICS-

UZOT54 **5hrs/4credits**

- To study the basic concept of gene interaction
- To know the chromosomal maps
- To learn sex chromosome, syndromes and gene transformation
- Student can acquire the thorough knowledge of genetics and gene trasformation

UNIT I

Mendel's Experiments. Interaction of genes -- Epistasis, Complementary and supplementary. Multiple alleles – Blood groups - inheritance. Polygenic inheritance – Inheritance of skin colour.

UNIT II

Linkage & Crossing over in Drosophila. Chromosomal maps

UNIT III

Sex chromosomes and sex chromatins, Sex determination in Man, Sex linked inheritance, sex influenced genes and sex limited genes. Extra chromosomal inheritance.

UNIT IV

Bacterial transformation – Conjugation -- Transduction – Gene regulation – Genetic Code – Bacteriophages - Structure and Replication.

UNIT V

Syndromes: Down, Klinefelter, Turner. Inbreeding, Out breeding and Heterosis. Eugenics, Euthenics and Genetic counselling.

REFERENCE

1. Genetics, P. K. Gupta Rastogi Publications, Meerut, 2001.
2. Genetics, Verma P. S and Agarwal V. K, S. Chand & Co, New Delhi, 1995.
3. Principles of Genetics 8th edition. Gardener. John Wiley & Sons In, Newyork. Chichester, Brisbane, Toronto, Singapore, 1991.

4. Genetics, Monroe W. Strick Berger, Prentice Hall of India, New Delhi, 2004.
5. Genetics. A. M. Winchester, Oxford & IBH Publication Co. New Delhi, 1976.

CORE X (THEORY) - ENVIRONMENTAL BIOLOGY AND EVOLUTION – UZOT55 5hrs/4credits

Objectives

- To study the factors involved in the environment
- To understand the relationship occurs between the organism
- To know the population,community ecology and function of ecosystems
- Student can able to get the knowledge about ecology and can understand the evolution of organisms

UNIT I

Physico-chemical factors: Light: Spectra (composition of light), Light on land, light in water. Biological effects of light. Temperature: thermal Stratification, Classification of Organisms. Adaptation of extreme temperature, Biological effects of temperature.. Habitats: Fresh water, Marine and Terrestrial

.

UNIT II

Inter specific relationships and intra specific relationships - Types and example. Mutalism , commensalism and parasitism

Population Ecology: Types, density, and estimation, natality, mortality, age, distribution, growth curve - fluctuation and equilibrium biotic potential. Dispersal and distribution. Biodiversity conservation.

UNIT III

Community, characteristics, diversity dominance, structure, Stratification, periodicity, fluctuation, Ecotone and edge effect, Ecological niche, equivalence, ecotypes, ecological succession, Ecosystem: Components, food chain and its types- food web, Ecological pyramids. Biogeochemical cycles- carbon, N & P cycle.

UNIT IV

Evidences for evolution-Theories of Evolution – Lamarckism, Darwinism, Neo – Lamarckism, Neo – Darwinism, Mutation theory of Devries modern synthesis.

UNIT V

Variation – Sources of Variability – Gene mutation, Chromosomal mutation, recombination and variation, Hybridization, Isolating mechanism. Micro, Macro and Mega evolution (Allopatric & sympatric).

REFERENCE

1. Concepts of Ecology (Environmental Biology) - Dr. N. Arumugam., Saras Publication, 2010.
2. Environmental Biology (Principles of ecology) by P.S. Verma & V.K.Agarwal, 2009, ISBN-81-219-0859-0S. Chand &Co. Ram nagar, New Delhi- 110 055
3. Elements of Ecology by Sharma P.D, 7th edt,(2005), Rastogi Publication, Meerut – 2500002 Mimicry and adaptive colouration. Co – evolution.Human evolution

ELECTIVE III (THEORY)
Option I: BIOSTATISTICS

UZOE53 **3hrs/3credits**

Objectives

- To know the biological data collection, tabulation and sampling methods
- To know the statistical tool for biological data presentation
- To study the Hardy –weinberg law
- Student can acquire the knowledge of biological data collection and can use suitable statistical tool for excellent presentation
-

UNIT I

Introduction to Biostatistics, Collection of data, classification, tabulation, Sampling methods, Graphical representation. Frequency distribution, frequency polygon curve, Diagrammatic representation.

UNIT II

Measures of central tendency – Mean, Median and Mode. Measures of Dispersion: Standard deviation, Standard error, Coefficient of Variation.

UNIT III

Probability - Addition theorem and Multiplication theorem, Binomial distribution, Normal distribution and Poison distribution.

UNIT IV

Population genetics – Hardy Weinberg law. Chi – square test and student 't' test.

UNIT V

Correlation – Definition, Types of correlation, Estimation of unknown value from known value.

REFERENCE

1. Statistics, S. P. Gupta, S. Chand & Co, New Delhi, 1996.
2. Bio statistics, M. Manohoraa, Palani Paramount Publication, 1992.
3. Introduction to Biostatistics, Pranab kumar Banarjee. S. Chand Company, New Delhi, 2009.
4. Elements of Biostatistics, Satguru Prasad, Rastogi Publication, Meerut, 2012.

Option 2: CANCER BIOLOGY

3hrs/3credits

Objectives

- To study the normal cell and cancer cells properties
- To learn the available cancer diagnosis techniques
- To learn the cancer diagnosis teat
- Student can get clearcut idea about cancer cells and this knowledge can use to discover new drug

UNIT I

Cancer cell: Universal properties of normal cell, properties of cancer cell,definition of cancer, clonal expansion, normal cells vs Benign tumor vs Malignant tumor, Types of Cancer, Common Symptoms, Causative factors, definition of primary cancer and second primary cancer with examples, sporadic cancers, hereditary cancers, examples of cancer susceptibility syndromes, immune suppression related malingnancies, transplantation related malignancies.

UNIT II

Cancer Diagnosis and treatment: Clinical examination, Radiological examination, BIospsy and its types, Treatment- surgery and its type, Radiation, Chemotheraphy, Biological theraphy, Hormone theraphy, Transplantation, Targeted Therapies, Gene therapies, other treatment methods (Cryosurgery, laser theraphy, Photodynamic theraphy, Hyperthermia)

UNIT III

Classification of cancer by tissue type: Solid tumors, Histopathological diagnosis, Immunohistochemistry in differential diagnosis, Hematological malignancies, morphological diagnosis, Flowcytometric Diagnosis, Molecular classification of cancer.

UNIT IV

Cancer classification: TNM classification- Purpose, Types of staging, TNM system, Stage Grouping, Other Factors that can affect the stage, Other staging system

REFERENCES

1. Principles of Cancer Biology, 1e First Edition (English, Paperback, Lewis J. Kleinsmith).
2. The Biological Basis Of Cancer Second edition Edition (English, Soft Cover, Robert G. McKinnell Ralph E. Parchment Alan O. Perantoni).
3. Introduction to Cancer Biology (English, Paperback, Hesketh Dr Robin Hesketh).
4. The Biology of Cancer, 2nd Edition 2nd Edition by Robert A. Weinberg (Author), Robert A Weinberg (Author)

SKILL BASED STUDIES III - ORNAMENTAL FISH CULTURE-

UZOS53 **2hrs/2credits**

Objective

- To know about the design, construction and maintenance of home aquaria.
- To study the taxonomy of fishes, identification of freshwater and marine aquarium fishes suitable for home aquarium.
- To understand the nutritional requirement of fishes
- Student can able to become entrepreneur

UNIT I

Construction of home aquarium: materials used wooden and metal frames, frameless tanks. Sealants and gums. Design and Construction of aquarium tank.

UNIT II

Taxonomy and biology of popular ornamental fishes: Live-bearers (Ovo-viviparous)-red swordtail, platy, guppy and molly. Egg layers (oviparous)-gold fish, Siamese fighting fish, gourami, angel fish, Oscar, Koi corp, Neon tetra, discus and red tail shark.

UNIT III

Nutritional requirements of Ornamental fishes- different kinds of feeds-larval feeds and feeding.

UNIT IV

Cleaning the aquarium, maintenance of water quality (temperature, heating, waterchange, ammonia, O_2/Co_2, pH, water hardness) - Control of snail and algal growth.

UNIT V

Commercially important marine ornamental fishes, Entrepreneurships development in ornamental fish culture.

REFERENCE

1. Home Aquarium, Dr. C.S. Tharadevei, Dr. K.V. Jayashree, Saras Publication, 2010
2. Manual of ornamental fishes and farming technology, J.D.Jameson and R.Santhanam 1996. Fisheries College and Research institute. TANVASU. Tuticorin.
3. Manual on freshwater ornamental fish culture, R.Santhakumar *et al;* 2007. Dept of fisheries extension. Fisheries College and Research institute. TANVASU. Tuticorin.
4. Biodiversity and stock assessment of marine ornamental fishes, V.K.Venkataramani *et al;* 2004. Dept of Fisheries. Biology and Capture fisheries .Fisheries College and Research institute. TANVASU. Tuticorin-628008.

SEMESTER VI

CORE XI (THEORY) - MOLECULAR BIOLOGY – UZOT61 5hrs/4credits

Objective

- To understand the basic structure and functioning of the genetic materials - DNA.
- To learn about molecular mechanism of DNA replication, repair, transcription, protein synthesis and gene regulation in various organisms.
- To recognize the students cancer cells to mutational changes in gene function
- Enlighten the student about the deep knowledge of molecular techniques

UNIT I

DNA – as the genetic material, DNA structure, properties and functions. Types of DNA, Base pairs, constancy of DNA, replication, Different types of mutation and DNA repair mechanism – direct reversal, Excision repair, SOS repair, recombination.

UNIT II

RNA, Different types of RNA – mRNA, tRNA, rRNA, Processing of the precursor of mRNA

UNIT III

Genetic code, Protein synthesis - Transcription in prokaryotes, Translation, Ribosome, Polyribosome, Steps in protein synthesis. The lac operon; positive and negative control.

UNIT IV

Post Transcriptional Modifications and Processing of Eukaryotic RNA, Structure of globin mRNA; Split genes: concept of introns and exons, splicing, mechanism, alternative splicing, exon shuffling, and RNA editing, Processing of tRNA.

UNIT V

Gene Regulation: Transcription regulation in prokaryotes: Principles of transcriptional. Regulation with examples from *lac* operon and *trp* operon; Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencer elements; Gene silencing, Genetic imprinting

REFERENCE

1. Molecular Biology & Genetic Engineering, L.M. Narayanan, Dr.N. Arumugam, A. Mani, Padmalatha Singh, A.M. Selvaraj, Saras Publication, 2010.
2. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper G. M. and Robert E. Hausman R. E. *The Cell: A Molecular Approach,* V Edition, ASM Press and Sinauer Associates.
4. Karp, G. (2010) *Cell and Molecular Biology: Concepts and Experiments*. VI Edition. John Wiley and Sons. Inc.

CORE XII (THEORY)
BIOTECHNOLOGY AND GENETIC ENGINEERING

UZOT62 **5hrs/4credits**

Objectives

- To understand the basic concept in genetic engineering and rDNA technology
- To get basic knowledge about generating transgenic plants, animals and microbes for solving the problems
- To know the current application of genetic engineering
- After this course student can enable to make new traits organism for societal needs.

UNIT I

Introduction, History and scope of Genetic Engineering. Basic steps in Gene cloning, Restriction enzymes. Cloning Vectors -Bacterial plasmids (p BR 322). Bacteriophage Vector – (Lambda). Animal vector – (SV 40)

UNIT II

Importance of biotechnology in India. Animal cell and Tissue culture: Animal cell culture media. physical, chemical functions of different constituents of culture medium,

UNIT III

Types of cell culture; Primary and established culture, Organ culture Disaggregation of tissue cell separation, Cryopreservation.

UNIT IV

Introduction of DNA into cells. Bacteria – Transformation, Animals – shot gun method, Liposome mediated fusion. Identification of recombinant hosts – Bacteria ,Application of Recombinant DNA in medicine and industry, Biohazards of recombinant DNA.

UNIT V

Transgenic animals: production and application. Advantages of Transgenic animals. Transgenic animals in livestock improvement, Ethical issues in animal Biotechnology. PCR, DNA finger printing, Stem cell culture - production and application.

REFERENCE

1. Animal Biotechnology by Prof. V. Kumaresan, Saras Publication, 2010.
2. Elements of Biotechnology. P. K. Gupta Rastogi and Co, Meerut. 1998.
3. Environmental Biotechnology. S. K. Agarwal, APH Publication Co, New Delhi – 1998.
4. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M.(2009)
5. *An Introduction to Genetic Analysis*. IX Edition. Freeman and Co., N.Y., USA.

CORE XIII (THEORY) - CELL BIOLOGY-

UZOT63 **5hrs/4credits**

Objectives

- To understand the structure of prokaryotic and eukaryotic cells, macromolecules, and membranes
- To know how these cellular components are used to generate and utilize energy in cells and cell division
- To study the structure and function of cell organelles

- Students can able to know the structure and function of cell organelles, changes of cell function and physiological changes and alterations of cell function brought about by mutation.

UNIT I

Introduction: Cell type – prokaryotic and eukaryotic
Microscopy: Detailed study of Compound, Electron microscopes, TEM, SEM, X – ray diffraction and Phase contrast microscope.

UNIT II

Cytological Techniques: Detailed study: Fixation- processing- staining. Methods of DNA, RNA, Protein, Lipids and Polysaccharides- Ultracentrifugation.

UNIT III

Ultra structure and functions of plasma membrane. Mitochondria, Glogi apparatus, Endoplasmic reticulum And Ribosomes. Ultra structure and functions of Lysosomes, Centrioles, Nucleus and Nucleolus, Chromosomes – Structure and types.

UNIT IV

Cell Division – Mitosis and Mitotic apparatus, Meiosis and synaptonemal complex.

UNIT V

Cancer cells and Carcinogens: Definition – Types – causes – properties – Treatment Oncogenes.

REFERENCE

1. Cell Biology & Molecular Biology – Dr. N. Arumugam, Saras Publication, 2010.
2. Cell And Molecular Biology"(6^{th} Ed) DeRobertis and DeRobertis – W.B. Saunders Co. Philadelphia, 1990.
3. Verma and Agarwal: "Cytology" – S. Chand & Co.Ltd. Ramnagar, New Delhi. 1991.
4. Powar, C.B. (1983), Cell Biology, Himalaya Publishing House, Bombay.
5. Tomar & Singh.(1999). Cell Biology. Rastogi Publication, Meerut.

CORE PRACTICAL III
CELL BIOLOGY, DEVELOPMENTAL BIOLOGY, IMMUNOLOGY, ANIMAL PHYSIOLOGY & GENETICS

UZOP63 **5hrs/4credits**

Objectives

- To understand the various stages involved in cell division
- To learn the immunological techniques and blood grouping, and antigen antibody reaction.
- To train the nucleic acid isolation
- Student can get training about the techniques of cell biology, embryo techniques, immunotechniques.
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Cell Biology:

1. Mitosis in onion root tip cells.
2. Polytene Chromosomes in Chironomous larva.
3. Preparation of squamous epithelium.
4. Preparations of human blood smear.
5. Model – Mitochondria.

Developmental Biology:

1. Chick blastoderm mounting
2. Observation of chick blastoderm
   i. 24 hrs ii. 48 hrs iii. 72 hrs iv. 96 hrs
3. Observation and study of different stages of frog embryo
   i. Early cleavage,ii. Late cleavage
   iii. Blastula iv. Gastrula of frog – yolk plug stage
   1. Placental types – diffuse, cotyledonary, discoidal and Zonary

Immunology

1. Blood grouping
2. Antigen antibody reaction- Any two
3. Observation and study of Lymphoid organs
   i. Bone Marrow, Bursa fabricious
   ii. Thymus, Lymph node, Spleen

4. Observation and study of IgG, IgA and IgM

Animal Physiology

1. O_2 consumption in a fish.
2. Examination of excretory products of fish, bird and mammal and detection of ammonia, urea and uric acid.
3. Counting of different types of blood cells using haemocytometer
   Demonstration only.
4. Demonstration of blood pressure in Sphygmomanometer.
5. Temperature variation with relation to Ovulation

Genetics

1. Observation and record of simple mendelian traits
2. Pedigree analysis – chart preparation
3. Immune surveillance – disease incidence data collection
4. Model - DNA & RNA.

A record of lab work should be maintained and submitted at the time of the practical examination

Study tour to the minimum of 1 day duration to be conducted compulsory.
Exposing the students to different habitats, ecosystem, pollution areas, thermal hydropower projects, wild life sanctuaries, bird sanctuaries, snake & crocodile parks and animal farm.

CORE IV (PRACTICAL)
ENVIRONMENTAL BIOLOGY, EVOLUTION, BIOTECHNOLOGY & GENETIC ENGINEERING, BIOCHEMISTRY-

UZOP64 **5hrs/4credits**

Objectives

- To understand the physical chemical parameter in water sample.
- To understand the adaptaion of animals by experiment
- To know the biochemical techniques
- After this, student can determine the water quality and biochemical test of macromolecules

Environmental Biology:

1. Estimation of dissolved oxygen in tap water and distilled water
2. Estimation of dissolved CO_2 in water samples.
3. Measurement of hardness of water by using detergent on distilled water and tap water
4. Estimation of salinity in water sample

5. sampling of animal population by using quadrate method
6. Detection of transparency of water by Secchi disc method
7. Animal association- symbiosis, parasitism, predation & commensalisms
8. Analysis and mounting of freshwater and marine planktons
9. adaptation of aquatic animals based on a study of museum specimen such as rocky, sandy, muddy and burrowing animals

Evolution

1. Finding out genetic drift in a small population using beads
2. Variation – Finger Prints.
3. Vestigial Organ.
4. Examples of evolutionary significance of peripatus, Limulus and Archaeopteryx. Animals with adaptive colouration. (Stick insect, & Chamaeleon).

Biotechnology & Genetic Engineering

Observation and study of

a. E. Coli, Bacteriophage , Plasmid

Biochemistry

1. Effect of temperature on salivary amylase activity
2. Measurement of P_H in various samples using P_H paper & P_H meter.
3. Beer's and Lambert's law verification using colorimeter
4. Aminoacid separation using chromatography method
5. Qualitative tests for Carbohydrates and Lipids

A record of lab work should be maintained and submitted at the time of the practical examination

ELECTIVE IV (THEORY) -Option 1: BIOCHEMISTRY

UZOE64 **3hrs/3credits**

Objectives

- To know the concept of pH and buffer solution
- To study the structure and function of macromolecules
- To study the enzyme chemistry and vitamins

- Student can able to understand the concept of buffer action and significance of macromolecules

UNIT I

Concepts of pH and buffer. Oxidation reduction reactions.

UNIT II

Carbohydrates: Structure, Classification and Biological importance.
Proteins – Structure, Classification and Biological importance. Amino acid – structure and Classifications. Biosynthesis of amino acids, Catabolism of amino acids. Lipids – Structure, Classification and Biological importance. Cholesterol: Types, Synthesis and Significance

UNIT III

Enzymes: Classification, physico – chemical nature and Mechanism of enzyme action. Factors affecting enzyme activity, Co-enzymes and isozymes.

UNIT IV

Vitamins: Classification, Structure & Mechanism only. Hormones : Chemistry of human hormones only

UNIT V

Biochemical Techniques.

-- P_H meter
-- Colorimeter
-- Chromatography
-- Electrophoresis.

REFERENCE

1. Biochemistry and Biotech. Dr. Annie Ragland, N. Arumugam., Saras Publication, 2010.
2. Principal of Biochemistry (2006) by Lehinger, Nelson & M.M. Cox, CBS publishers & Distributors, 485, Jain Bhawan, Bhala Nath Nagar, Shahdara, Delhi – 110032. CBS ISBN 81-239-0295-6.
3. Harper's illustrated Biochemistry (2006) – Robert. K. Murray Daryl. K.Granner. Peter Mayes & Victor W.Rodwell. Prentice – Hall International.ISBN 0-8385-361-3.The McGraw-Hill Companies, Inc.

Option 2: BIOINFORMATICS

3hrs/3credits

Objectives

- To gain the knowledge about the computer arithmetic and computer logic
- To learn the basic concept of bioinformatics and its application in various fields
- To understand the sequencing methods database searching tools and phylogenetic constructing tools
- Student can learn the bioinformatic tool for the application of biological research

UNIT I

History, development and types of computers. General awareness of computer systems – hardware and software (CPU and other peripheral devices, computer arithmetic, computer logic,

UNIT II

Programming languages – machine language, assembly language, higher level languages). Introduction – Email – World Wide Web – surfing.

UNIT III

Sequence analysis – need and importance – pair wise alignment – dynamic programming – Global (Needle man – Wunsch) and local (Smith Waterman) Alignment Concepts – Database searching tools – Entrez, BLAST, FASTA – Multiple alignment – clustal – construction of phylogentic trees.

UNIT IV

Use of nucleic acid and protein data banks – NCBI, EMBI, DDBJ, SWISSPORT. 3D structural analysis of biomolecules – molecular visualization tools Rasmol, chemsketch and SPDBV – Protein Docking.

UNIT V

Evolutionary analysis: Distance – clustering methods – Rooted and unrooted tree representation – Bootstrapping Strategies. Neutral Networks.

REFERENCE

1. Bioinformatics – Principles and potential of a new multidisciplinary tool, TIBITE, 1996.
2. Computer for biologists. – A. Fielding i985. Benjamin / cuming publ.co
3. Sequence Analysis in Molecular Biology – G. Von Heijine.
4. Sequence Analysis – A Pioneer - Devereux and Gtribskov.
5. Introduction of Bioinformatics – Attwood Tand Parry, D. 2002. Pearson Education Asia.

SKILL BASED STUDIES IV POULTRY SCIENCE

UZOS64 **2hrs/2credits**

Objectives

- To study the poultry nutrition and physiology
- To learn the nutritive value of egg
- To understand the poultry health and management
- Student can able to do the poultry culture thereby they can become entrepreneur

UNIT -I

Poultry Nutrition and Physiology

Essential amino acids, proteins, fatty acids, vitamins and minerals their inter-relationships.

Functional regulation of digestion, absorption and metabolism of nutrients.

Feed formulation for different species and groups

Different systems of feeding wet mash, dry mash, crumble and pellet feeding.

Feed Passage rate in G.I. tract in relation to digestion and absorption efficiency;

Characteristics features of endocrine glands.

Endocrine control and variable factors influencing growth process

UNIT II

Poultry Products technology

Structure, chemical composition and nutritive value of egg.

Various measures of egg quality. Shell, albumen and yolk quality assessment.

Factors influencing egg quality traits.

Mechanism of deterioration of egg quality.

Different methods of preservation of table eggs and their relative merits and demerits.

Physical, chemicals, microbial and organoleptic evaluation of meat quality

UNIT III

Poultry Health Management

Common diseases of poultry – bacterial, viral, fungal, protozoan, parasitic and other emerging diseases of poultry, their prevention control and treatment.

Metabolic and nutrient deficiency diseases and disorders.

Vaccination programmes and Deworming programmes.

Control of coccidiosis, worms, ectoparasites and flies. Medication procedures.

Cleaning and disinfection of poultry houses. Drinking water sanitation

REFERENCE

1. Text book of Poultry Science – P.V. Sreenivasaiah
2. Poultry Science and practice- A text book by Nilotpal Ghosh
3. Advances in Poultry science- Benjamin Mac clare
4. Poultry sciences- Breeding, Rearing and Management of animals by Carlos Hassey