ANNAMALAI UNIVERSITY

208 - B.Sc. ZOOLOGY

Programme Structure and Scheme of Examination (under CBCS)
(Applicable to the candidates admitted in Affiliated Colleges from the academic year 2022 -2023 onwards)

Course Code	Part	Study Components & Course Title	Hours /Week	Credit	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – I					
22UTAML11	I	**Language Course - I : Tamil/Other Languages**	5	3	25	75	100
22UENGL12	II	**English Course - I : Communicative English I**	5	3	25	75	100
22UZOOC13	III	Core Course - I :Invertebrata I	4	4	25	75	100
22UZOOC14		Core Course - II : Invertebrata II	4	4	25	75	100
		Core Practical – I : Invertebrata & Chordata	3	-	-	-	-
		Allied - I : Paper – 1 :	4	4	25	75	100
		Allied Practical – I :	3	-	-	-	-
22UENVS18	IV	**Environmental Studies**	2	2	25	75	100
		Total	**30**	**20**			**600**
		SEMESTER – II					
22UTAML21	I	**Language Course - II : Tamil/Other Languages**	5	3	25	75	100
22UENGL22	II	**English Course - II : Communicative English II**	5	3	25	75	100
22UZOOC23	III	Core Course – III : Chordata	4	4	25	75	100
22UZOOP24		Core Practical – I : Invertebrata & Chordata	3	4	40	60	100
		Allied – I : Paper -2 :	3	4	25	75	100
		Allied Practical – I :	3	3	40	60	100
22UZOOE27		Internal Elective – I :	3	3	25	75	100
22UVALE27	IV	**Value Education**	2	1	25	75	100
22USOFS28		**Soft Skill**	2	1	25	75	100
		Total	**30**	**26**			**800**

Internal Elective Courses

22UZOOE27	Internal Elective-I	Biodiversity conservation
		Vector biology
		Aquaculture

Allied Courses offered by the Department of Zoology

22UZOOA01	Theory	Animal Diversity-I
22UZOOA02	Theory	Animal Diversity-II
22UZOOAP1	Practical	Allied Zoology Practical

SEMESTER: I PART:III	22UZOOC13 – INVERTEBRATA - I	CREDIT:4 HOURS :4

COURSE OBJECTIVES

1. To obtainbroad knowledge about different kinds of animal species of invertebrates.
2. To understand the systematic and functional morphology of various groups of invertebrates
3. To study their economic importance, affinities and adaptations.
4. To understand the role of invertebrates in biological communities, ecological interactions and conservation problems
5. To assess the diversity of animals in a phylogenetic conditions.

Unit I :

Principles of taxonomy - Binominal nomenclature and outline classification of Animal Kingdom.

Unit II:

Protozoa: General characters and classification up to classes with examples. **Type Study:Entamoeba-** General structure, Life cycle and Entamoeba **Gneneral Topic:** Locomotion,Nutrition,Reproduction and Osmoregulation in Protozoa-Parasitic Protozoa of Man

Unit III:

PORIFERA: General characters and classification up to classes with examples. **Type study** - **sycon, Gneneral Topic -C**anal system,Reproductio,Skeleton in sponges.

Unit IV:

COELENTERATA: General characters and classification up to classes with examples.

Type study – Obelia, Life history of Obelia.**Gneneral Topic:**Nematocysts,polymorphism in coelenterates – Corals and Coral reefs.

Unit V:

PLATYHELMINTHES: General characters and classification up to classes with examples.

Type study – Fasciola hepatica. Gneneral Topic: Parasitic adaptations of Platyhelminth parasites (Taenia solium, Sachistosoma).

COURSE OUTCOMES

1. To understand the principle of taxonomy animals
2. To identify the general characters, classification, phylum of Invertebrates
3. To understand the morphology and their systems of various groups of Invertebrates.
4. To study the economic importance of invertebrates and important parasites
5. To study the affinities and adaptations of Invertebrates

Text Books (In API Style)

1. Ekambaranatha Ayyar.M. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol.1
   [Invertebrata], Viswanathan [Printers and Publishers] Pvt. Ltd.; Madras
2. Ekambaranatha Ayyar.M. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol.1
   [Invertebrata], Viswanathan [Printers and Publishers] Pvt. Ltd.; Madras.
3. Kotpal, R.L. 1988-1992 Protozoa, Porifera, Coelenterata, Helminthes, Annelida, Arthropoda,Mollusca, Echinodermata. Rastogi Publications, Meerut.
4. Parker and Haswell, 1964. Test Book of Zoology. Vol.1 [Invertebrata]. A.Z.T; B.S.Publishersand distributors, New Delhi.

Supplementary Readings

1. N.C. Nayar., S.Leelavathy,N.Soundrapandian., T.Murugan and N.Arumugam,2013. A text book of Invertebrates, Saras PublicationsTamilnadu
2. Dr. N.Arumugam and Dr,N.Sivakumar.2020. Invertebrata in Tamil version. Tamilnadu
3. Barrington E.J.W.(2012)Invertebrate structure and function. Affiliated East West Press Pvt. Ltd., New Delhi.

OUTCOME MAPING

PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	3	1
CO2	3	3	3	3	1
CO3	3	3	3	3	1
CO4	3	3	3	3	1
CO5	3	3	3	3	1

SEMESTER: I PART:III	22UZOOC14 – INVERTEBRATA - II	CREDIT:4 HOURS :4

Course Objectives

1. To obtain broad knowledge about different kinds of animal species of invertebrates.
2. To understand the systematic and functional morphology of various groups of invertebrates
3. To study their economic importance, affinities and adaptations.
4. To understand the role of invertebrates in biological communities, ecological interactions and conservation problems
5. To assess the diversity of animals in a phylogenetic conditions.

Unit I :

ASCHELMINTHES: General characters and classification up to classes with examples.

Type study – **Wuchereria bancrofti. Gneneral Topic: P**arasitic adaptations of Aschelminth parasites (Ancylostoma duodenale and Ascaris lumbricoides).

Unit II:

ANNELIDA: General characters and classification up to classes with examples.

Type study: **Megascolex mauritii, Gneneral Topic:**Metamerism in Annelids, Excretion and Economic importance of Annelids.

Unit III:

ARTHROPODA: General characters and classification up to classes with examples.

Type study – Prawn, Gneneral Topic: Larval forms of Crustacea, Respiration,Excretion in Arthropods,Peripatus and its affinities, Mouth parts of insect, Beneficial Insects

Unit IV:

MOLLUSCA: General characters and classification up to classes with examples.

Type study – Lamellidens marginalis, Gneneral Topic: Respiration. Foot and Torsion in Mollusca,Economic importance of Mollusca.

Unit V:

ECHINODERMATA: General characters and classification up to classes with examples.

Type Study- Asterias rubens, Gneneral Topic: Larval forms of Echinidermata, Water Vascular System and Phylogeny of Echinidermata.

COURSE OUTCOMES

1. To understand the principle of taxonomy animals
2. To identify the general characters, classification, phylum of Invertebrates
3. To understand the morphology and their systems of various groups of Invertebrates.
4. To study the economic importance of invertebrates and important parasites
5. To study the affinities and adaptations of Invertebrates

Text Books (In API Style)

1. Ekambaranatha Ayyar.M. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol.1
    a. [Invertebrata], Viswanathan [Printers and Publishers] Pvt. Ltd.; Madras
2. Ekambaranatha Ayyar.M. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol.1
    a. [Invertebrata], Viswanathan [Printers and Publishers] Pvt. Ltd.; Madras.
3. Kotpal, R.L. 1988-1992 Protozoa, Porifera, Coelenterata, Helminthes, Annelida,
    a. Arthropoda,Mollusca, Echinodermata. Rastogi Publications, Meerut.
4. Parker and Haswell, 1964. Test Book of Zoology. Vol.1 [Invertebrata]. A.Z.T; B.S.Publishersand distributors, New Delhi.

Supplementary Readings

1. N.C. Nayar., S.Leelavathy,N.Soundrapandian., T.Murugan and N.Arumugam,2013. A text book of Invertebrates, Saras PublicationsTamilnadu
2. Dr. N.Arumugam and Dr,N.Sivakumar.2020. Invertebrata in Tamil version. Tamilnadu
3. Barrington E.J.W.(2012)Invertebrate structure and function. Affiliated East West Press Pvt. Ltd., New Delhi.

OUTCOME MAPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	1
CO2	3	3	3	3	1
CO3	3	3	3	3	1
CO4	3	3	3	3	1
CO5	3	3	3	3	1

SEMESTER: II PART:III	22UZOOC23 - CHORDATA	CREDIT:4 HOURS: 4

COURSE OBJECTIVES

1 To understand the taxonomy and relationship and evolution of animals.
2 To understand the systematic and functional morphology of various groups of Chordates
3 To study their economic importance, affinities and adaptations.
4. To understand the role of vertebrates in biological communities, ecological interactions and conservation problems
5 To assess the diversity of animals in a phylogenetic conditions.

UNIT I:

1. **General charecters of Chordata**, classification of Chordata upto upto orders Vertebrata**. Prochordata**: General Characters, Classification of Prochordata. **Type Study:** Ascidian, Amphioxus and Balanoglossus, **General Topic**:Affinities of Hemichordata, Cephalochordata & Urochordata

Unit II: PISCES

1) General characters and classification up to upto orders
2) Type study : **Labeo rohita**. **General Topic**: Fins of fishes, Migration of fishes, Parental care in fishes.

AMPHIBIA

1) General characters and classification up to upto orders

Type study :Frog,General Topic-Adaptive features of Apoda, Origin of Amphibia, Parental care in Amphibia

Unit III: REPTILIA

1. General characters and classification up to upto orders

Type study-Calotes.General Topic: Origin and Evolution of Reptilia**,**Identification of poisonous and non-poisonous snakes of South India,Poison apparatus and biting mechanism, Venom and Antivenom.

Unit IV: AVES

1. General characters and classification upto orders

Type study-**Pigeon.General Topic:** Characters of Archaeopteryx, Ratitae, Origin of Birds, Flight adaptation, Migration of Birds.

Unit V: MAMMALIA

General characters and classification upto orders.

Type study-Rabbit.General Topic: Origin of Mammals, Dentition in mammals,Flying Mammals,Aquatic mammals.

COURSE OUTCOMES

1. To understand the diversity of chordates and their classification.
2. To identify the general characters, classification, phylum of Chordates
3. To understand the morphology and their systems of various groups of Vertebrates.
4. Familiarize with gradual development of habit and habitat
5. To study the affinities and adaptations of Invertebrates

Text Books (In API Style)

1) 1. Hyman. L.H. Comparative vertebrate Zoology. McGraw Hill Co., New York. B.Sc. Zoology: Syllabus (CBCS) 11
2) Waterman, Allyn J.et al.1971, Chordate Structure and functions. Mac.Millan and Co., New York
3) Kotpal, R.L. 1988-1992 Protozoa, Porifera, Coelenterata, Helminthes, Annelida,
4) Arthropoda,Mollusca, Echinodermata. Rastogi Publications, Meerut.
5) Parker and Haswell, 1964. Test Book of Zoology. Vol.1 [Invertebrata]. A.Z.T; B.S.Publishersand distributors, New Delhi.
6) Nigam.H.C. 1983 Zoology of chordates, Vishal publications, Jalandhar.

Supplementary Readings

1) A.Thangamani., S.Prasannakumar., L.M. Narayanan and N.Arumugam,2013. A text book of Invertebrates, Saras PublicationsTamilnadu
2) Kent, G.C. (2015). Comparative anatomy of the vertebrates.McGraw Hill,UK.
3) Kenneth Kardong. 2018. VertebratesL compatrative anatomy, Function,Evolution. McGraw Hill.UK.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	1
CO2	3	3	3	3	1
CO3	3	3	3	3	1
CO4	3	3	3	3	1
CO5	3	3	3	3	1

SEMESTER: I&II PART:III	22UZOOP24 PRACTICAL- I: INVERTEBRATA and CHORDATA	CREDIT:4 HOURS: 3

COURSE OBJECTIVES

1. To understand the taxonomy and relationship and evolution of animals.
2. To understand the systematic and functional morphology of various groups of Chordates
3. To study their economic importance, affinities and adaptations.
4. To understand the role of vertebrates in biological communities, ecological interactions and conservation problems
5. To assess the diversity of animals in a phylogenetic conditions.

DISSECTIONS

cockroach /Earth worm - Digestive and Nervous system

Prawn – Nervous system, **Fish** –Digestive system

MINOR PARCTICAL

MOUNTING **– Setae**:Mounting of Body setae and Penial setae of Earthworm, **Insect Mouth parts :** Mounting of mouth parts of Honey bee, House Fly and Mosquito **Prawn** – Appendages, **Shark** - Placoid scales,

SPOTTERS

Study of the following specimens

1.Classify by giving reasons

Paramecium,Euglena, Sycon, Obelia, Taenia solium, Neries, Prawn, Fresh water mussel, Seastar, Amphioxus, Shark, Hyla, Rhacophorus, Calotes, Pigeon, Rabbit.

2.Adaptations to their respective modes of life

Entamoeba, Trypanosoma, Plasmodium, Corals [any 2], Ascaris, Wuchereria bancrofti, Cheatopterus, Leech, Limulus, Nauplius, Mysis, Zoea, Balanoglossus, Ascidian,
Ichthyophis, Draco, sea snake and Bat.

3.Biological significance:

Paramecium conjugation and binary fission, Fasciola hepatica,physalia, Trochophore Larva, Peripatus,Sacculina On Crab, Sea Anemone on Hermit Crab, Pearl Oyster, Bipinnaria Larva, Anabas,Hippocampus, Narcine, Echeneis, Arius, Exocoetus, Eel, Amblystoma, Axolotl Larva, Bufo,Cobra, Krait, Russels Viper, Echis Carinata, Turtle, Parrot, Woodpecker, King Fisher.

4. Relate structure and function:

Sponge Spicules, Obelia Polyp, Taenia Scolex, Nereis - Parapodium, Book lungs of scorpion/Honey bee sting apparatus, Pedicellaria of Sea star, Ctenoid Scale and Quill Feather of pigeon.

5.Draw labeled sketches:

T.S. Fasciola, T.S. of Leech, Obelia medusa, T.S. of Amphioxus through Pharynx, T.S. through arm of Sea star. **Skeleton -** Pectoral girdles of Frog and Pigeon.,Pelvic Girdles of Frog and Pigeon. Fore and Hind limbs of Frog and Pigeon., Synsacrum of Pigeon. **Dentition -** Rabbit

Record of Laboratory work shall be submitted at the time of practical examination

COURSE OUTCOMES

1. To Understand the diversity of chordates and their classification.
2. To identify the general characters, classification, phylum of Chordates
3. To understand the morphology and their systems of various groups of Vertebrates.
4. Familiarize with gradual development of habit and habita
5. To study the affinities and adaptations of Invertebrates

Text Books (In API Style)

1. Verma, P.S. 2013. A Manual of Practical Zoology of Invertebrates, S. Chand &Company Ltd., New Delhi.
2. Verma. P.S. 2011 A Manual of Practical Zoology INVERTEBRATES Chand & Co, Ltd, Ram Nagar -New Delhi.
3. Vijayaraman. K and palanivel.K, 1997 Cheimurai Vilangial, chimeera Publications.
4. Amsath, A. 2013. Practical manual in Zoology. MMA Publications, Adirampattinam.
5. Jayanpa Sinha . 2010 Advanced Practical Zoology, Books & Allied (p) Ltd. No.1. SubhamPlaza IFloor, Calcutta.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	1
CO2	3	3	3	3	1
CO3	3	3	3	3	1
CO4	3	3	3	3	1
CO5	3	3	3	3	1

SEMESTER: II PART: III	22UZOOE27A: BIODIVERSITY CONSERVATION	CREDIT: 3 HOURS: 3

COURSE OBJECTIVES

1. To give the student insight of scientific developments in Conservation of Biodiversity.
2. To understand the distribution of species and threats to concerning biodiversity.
3. To study the climate change and its problems in conservation of biodiversity.
4. To study the various conservation measures adopted in India.
5. To make the student get aware with various legislations related to wildlife and conservation.

Unit I: Biodiversity and their values

Biodiversity: definition – Biodiversity conservation strategies - types of diversity – genetic, species and ecosystem.

Value of Biodiversity: Biodiversity and environmental services - Consumptive, Productive, Social, Ethical and moral values, Aesthetic value.

Unit II: Biodiversity Hot spot and Threats

Hot spot: Mega diversity centers – Global 200 - India's Biogeographic Zones - Biodiversity Hot spot - North-East, the Western Ghats, Andaman and Nicobar Islands.

Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, invasive species; consequences of biodiversity loss; Endangered faunal species of India.

Unit III: Global warming and Biodiversity

Global warming: Greenhouse gases and sources – CO_2 –Methane –and Chloro-flouro-carbon (CFCs) –Aerosols in the atmosphere – Sea level rise– Ozone depletion– Irregular monsoon – Droughts – Cyclones & Cloudburst –Tsunami – Acid rain – Impact of climate change on biodiversity.

Unit IV: Conservation of biodiversity

Conservation Methods:*In situ* conservation (Biosphere Reserves, National Parks, Wildlife Sanctuaries); *Ex-situ* conservation (botanical gardens, zoological gardens, gene banks, seed and seedling banks, pollen culture, tissue culture and DNA banks),

Integrated Protected Area System (IPAS): Community Reserves or Community Conserved Areas - Sacred Grooves – Corridors.

Unit V: People participation, Environmental legislation & Authority

People participation in Conservation: Chipko Movement – **Navdanya Movement andEcotourism.**

Environmental legislation & Authorities: Wildlife Protection Act (1972) - Biological diversity Act 2002– The National Green Tribunal Act 2010 – National biodiversity authority (NBA) and State Biodiversity Boards.

COURSE OUTCOMES

1) Able to understand the types and values of Biodiversity.
2) Able to understand the distribution and threats.
3) Analyse and interpret the problems in conservation of biodiversity.
4) Explain the various strategies adopted in conservation of various species.
5) Able to follow and interpret various rules and regulations related to biodiversity.

Text Books

1) Lawmann, J. (2017). *Wildlife Protection Act 1972*. Kamal Publishers, New Delhi.
2) Majumdar, A.B., Nandy, D, and Mukherjee, S. (2013). *Environment and Wildlife Laws in India.* LexisNexis Publishers.
3) Saha,T. K. (2007) . Ecology and environmental Biology. Books and allied(P) Ltd. Kolkata, India.
4) Mitra, A.P., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S. and Sen, K. (2004). *Climate Change and India.* Universities Press, India.
5) Khitoliya, R. K. (2004). Environmental pollution:Managment and control for sustainable developments. S. Chand & company (p) Ltd., New Delhi, India.

Supplementary Readings

1) Sodhi, N.S., Gibson, L. and Raven, P.H. (2013). *Conservation Biology: Voices from the Tropics.* Wiley-Blackwell, Oxford, UK.
2) Philander, S.G. (2012). *Encyclopedia of Global Warming and Climate Change* (2nd edition). Sage Publications.
3) Hardy, J.T. (2003). *Climate Change: Causes, Effects and Solutions*. John Wiley & Sons.
4) Primack, R.B. (2002). *Essentials of Conservation Biology* (3rd edition). Sinauer Associates, Sunderland, USA.
5) Divan, S. and Rosencranz, A. (2001). *Environmental Law and Policy in India.* Oxford University Press.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	1
CO2	3	2	3	2	1
CO3	3	3	3	3	1
CO4	3	3	3	3	1
CO5	3	3	2	3	1

SEMESTER: II PART: III	22UZOOE27B : VECTOR BIOLOGY	CREDIT: 3 HOURS: 3

COURSE OBJECTIVES

1. To acquire Knowledge of the types of vectors, host, parasite and their control.
2. To study the types of metamorphosis and disease transmission cycle of Vector.
3. To learn morphology, life cycle, diseases transmission and control measures of Housefly and Sandfly.
4. To learn morphology, life cycle, diseases transmission and control measures of Fleas, Lice and Ticks.
5. To learn morphology, life cycle, diseases transmission and control measures of Cyclopes and freshwater snail and to emphasis the National and International programmes and Agencies in vector control.

Unit I: Concept of Vector, Host, Parasite

Vectors: Definition - characteristics - types – mechanical – direct – indirect, biological - **propagative– cyclo-propagative – cyclo-developmental –** transovarial.

Host& Parasite: Definition - characteristics – types.

Vector control: Integrated vector management - chemical - larvicides, adulticides and Insect growth regulators(IGRs), biological - bio-larvicides, larvivorous fish, other predators, pathogens.

Unit II: General Features of Vectors

General Features of Medical and Public Health import vectors: Breeding habitats; metamorphosis – Complete and Incomplete.

Mosquito: Morphology and Life cycle –identification characters of different stages of Anopheles, Ades and Culex; Disease transmission cycle - role of mosquito in disease transmission of Malaria, Filariasis, Dengue.

Unit III: Housefly and Sandfly

Housefly: Morphology - life cycle - disease transmission (Amoebic Dysentery) – control measures.

Sand fly: Morphology –life cycle - disease transmission (Leishmaniasis) - control measures.

Unit IV: Flea, Louse and Ticks

Fleas: Morphology **-** life cycle - disease transmission (Plague) control measures.

Louse: Morphology –life cycle - disease transmission (relapsing fever and secondary dermatitis) - lice control.

Ticks: Morphology - difference between Hard and Soft ticks - disease transmission (typhus, 'Q' fever) – control measures.

Unit V: Cyclopes, Freshwater snail, Disease control programmes

Cyclops (water-flea)**:** Morphology – disease transmission (Dracunculiasis) – prevention and control measures.

Freshwater snails – Disease transmission (Schistosomiasis), Control measures.

Role of International and National disease control programmes & Agencies: WHO; NMCP; ICMR.

COURSE OUTCOMES

After completing the class, students will be

1) acquire basic knowledge on types of vectors, host and parasites & take up integrated vector management activities.
2) acquire basic knowledge on the general characters of vectors, types of disease transmission.
3) acquire basic knowledge on the biology, epidemiology and control of these three vectors (Housefly and Sandfly).
4) acquire basic knowledge on the biology, epidemiology and control of these three vectors (Fleas, Lice and Ticks).
5) acquire basic knowledge on the biology, life cycle and control methods of Cyclopes and freshwater snail, understand the rationale of a global strategy to control these diseases by National and International Agencies and take up jobs in vector control and public health departments.

Text Books

1) Park, K. (2021). *Park's Text book of preventive and social medicine*. 26th Edition. Banarsidas Bhanot Publisher, USA.
2) Jayaram Panikar, C.K.(2018).*Textbook of Medical Parasitology.* Jaypee Brothers Medical publishers Pvt. Ltd, New Delhi.
3) Tembhare, D.B. (2012). *Modern Emtomology.*Himalaya Publishing House, New Delhi.
4) Tyagi , B.K. (2012). *Medical Entomology*. Scientific publishers, Chennai.
5) Parthiban, M. and B. Vasantharaj David, (2007). *Manual of Household & Public Health pests and their control.* Namrutha Publications, Chennai.

Supplementary Readings

1) Sudhir R. Wagh and Vishnu K. Deshmukh. (2015). Medical Entomology. Success Publications.
2) Rathanswamy, G.K, (2010). *A Hand book of Medical Entomology*. S.Viswanatham Printers & Private & Ltd., Chennai.
3) *Arthropods of Medical importance* (1981) Edited by Nicholas R.H.Burgess, Published by Noble Books Ltd, Hampshire.
4) Rao, T. R. (1981). *The Anophelines of India*. Indian Council of Medical Research, New Delhi.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	1
CO2	3	3	3	3	1
CO3	3	3	3	3	1
CO4	3	3	3	3	1
CO5	3	2	3	3	1

SEMESTER: II PART: III	COURSE CODE: 22UZOOE27C AQUACULTURE	CREDIT: 3 HOURS: 3

COURSE OBJECTIVES

1) To acquire knowledge about the importants of aquaculture.
2) To know the different types of culture and pond management.
3) To obtain knowledge about cultivable species and aquarium keeping.
4) To gather information about poly culture
5) To learn the role of organizations and funding agencies involved in aquaculture.

Unit I : Importance of aquaculture

Definition - Scope and importance – status of aquaculture in India, Role of aquaculture on economic development. Types of aquaculture - Freshwater, coastal and marine water aquaculture.

Unit II: Fish ponds and Management

Definition, breeding ponds, nursery ponds, rearing ponds, culture ponds (stocking ponds). Preparation of pond for fish culture, management of fish ponds, water quality management of fish ponds. Importance and composition of feeds; types of feed, wet and dry feeds, Artificial and live feeds.

Unit III: Cultivable species

Cultivable species of fish, crustaceans, molluscs and algae; Different types of cultures, Monoculture, Poly culture, composite fish culture, cageculture, penculture, race wayculture- extensive, intensive and semi intensive culture; Common species for ornamental fish farming.

Unit IV: Fish disease management

Common bacterial, viral, fungal, protozoan and crustacean diseases, their symptoms and treatment. Aquatic pollution –Definition, causes, ecological effects and control ofwater pollution.

Unit V: Marketing the products

Marketing the fish to local markets and for export - Harvesting and transport of fish and its products -Fish preservationand fish processing technology; Organizations involved and their role of aquaculture - ICAR, CMFRI, CIFRI, CICFRI, CIFA, CIBA, CIFT &MPEDA.

COURSE OUTCOMES

At the end of the course, the student will be able to

1) Students will be able to describe the history and development of aquatic life.
2) Students will be able to theoretical and practical aspects of fisheries across different species.
3) Students will be able to explain how the management of aquatic ponds and to analyze biological samples of Aquaculture ponds.
4) Students can make knowledge of how the difference of cultivable forms evolved in the earth.
5) To take up jobs in Aquaculture farms.

Text Books

1) Pillay, T.V.R. 1995. *Aquaculture principles and practices*. Fishing New Books, Blackwell Science Ltd.,Oxford.
2) Shanmugam, K. 1990. *Fishery biology and Aquaculture*. Leo Pathipagam, Madras.
3) Santhanam, Sugumaran and Natarajan, P. 1997. *A Manual of freshwater aquaculture.*OxfordandIBHPub.Co.Ltd.,NewDelhi.

Supplementary Readings

1) Arumugam.N. 2008. *Aquaculture*. Saras Publications,Nagercoil.
2) Baradach, JE, JH Ryther and WO McLarney (1972) *Aquaculture.The farming and Husbandry of Freshwater and Marine Organisms.* Wiley Interscience, NewYork.
3) Chadar, S.L. 1980. *Hypophysation of Indian major carps*. Satish Book Enterprise, Agra,PP.146
4) ExportersmanualandDocumentation.1999.JainBookAgency.NewDelhi.
5) Jhingran.V.C. 1991. *Fish and fisheries of India*, Hindustan Pub. Cord. New Delhi.
6) Kurian,C.V and Sebastin. 1992. *Prawn and prawn fisheries of India*, Hindustan Pub. Cord. NewDelhi.
7) Rath, R.K. (2000) *Freshwater Aquaculture*. Scientific Publishers, (India), PO.Box.91,Jodhpur.

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	1
CO2	3	3	3	3	1
CO3	3	3	3	3	1
CO4	3	3	3	3	1