

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)

Re-Accredited with A++ Grade by NAAC (3rd Cycle)

Uthamapalayam - 625 533.



DEPARTMENT OF ZOOLOGY

PART IV - ZOOLOGY

SYLLABUS

Choice Based Credit System – CBCS

(As per TANSCHÉ)

With

Outcome Based Education (OBE)

(Academic Year 2023 -2026)

Semester-I

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – IV	23UZYSE11	Ornamental Fish Farming and Management (NME)	2	25	75	100	2
	23UZYFN11	Perspectives of Biology	2	25	75	100	2

Semester-II

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – IV	23UZYSE21	Medical Laboratory Techniques (NME)	2	25	75	100	2
	23UZYSE22	Food Nutrition and Health	2	25	75	100	2

Semester-III

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – IV	23UZYSE31	Aquarium Keeping	1	25	75	100	1
	23UZYSE32	Basic Course in Ornithology	2	25	75	100	2
	23UGEVS41	Environmental Studies	1	-	-	-	-

Semester-IV

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – IV	23UZYSE41	Agricultural Entomology	2	25	75	100	2
	23UZYSE42	Biocomposting for Entrepreneurship	2	25	75	100	2
	23UGEVS41	Environmental Studies	1	25	75	100	2

Semester-V

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – IV	23UGVED51	Value Education	2	25	75	100	2
	23UZYIS51	Internship / Industrial Training	-	-	-	-	2

Semester-VI

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part – IV	23UZYSE61	Economic Zoology	2	25	75	100	2

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UZYSE11	ORNAMENTAL FISH FARMING AND MANAGEMENT	NME	2	2	25	75	100

Learning Objectives		
L1	Thigh light the importance of ornamental fish culture in relation to entre premiership development.	
L2	To enable the identification, culture and maintenance of commercially important ornamental fishes.	
L3	To provide the knowledge on the techniques of ornamental fish breeding, rearing, disease control and economics of ornamental fish farming.	
L4	To know the about artificial and live feeds for fishes and transportation of fishes.	
L5	To now breeding methods and about the fish diseases.	
UNIT	Contents	No. of Hours
I	Introduction - ornamental fish keeping as hobby and cottage industry. Scope and self-employment of ornamental fish culture. Domestic and global scenario of ornamental fish trade and export potential.	6
II	Identification of popular Ornamental fishes: Siamese fighting fish, Gold fish, Rosy barb, Blackmolly, Guppy, Koi carp, Arowana and Angel fish.	6
III	Construction of fish tank: Size and shape of fish tank, bottom settings, stocking of fish, planting with aquarium plants, Accessories of fish Tank - aerators, types of filters, nets, lights and hood.	6
IV	Transport off ishes: Oxygenpacking, Food and feeding: Cultureoflivefoodorganisms-Microworms, vinegar eel,tubifex. Artificial feed-Pelletfeed formulation	6
V	Breeding, hatchery and nursery management of Butterfly fish, Sword tails, Blue morph andAnemone fish- Common diseases and treatment of ornamental fishes:- Nutritional diseases, Whitespotdiseases, fungaldiseases, Bacterialdiseases, Dropsy diseases and ecto-parasites.	6
Total		30
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Understand the scope of the ornamental fish culture and about the trade and world market.	K1,K2,K3,K4
2	Learn about various ornamental fish species and their morphological characteristics to identify the species	K1,K2,K3,K4,K5,K6
3	Understand about the tools and techniques to setting up of fish aquarium	K1,K2,K3,K4,K5,K6
4	Learn about the fish handling, feeding and transport methods of fishes	K1,K2,K3,K4,K5,K6
5	Learn the breeding methods for various species and disease control on breeding.	K1,K2,K3,K4,K5
Textbooks		

1.	Manual of Ornamental fishes and forming technologies, Jameson J.D & R. Santhanam, 1996, Fisheries college & Research Institute, Tamil Nadu.
Reference Books	
1.	Manual of tropical fish diseases diagnosis. Felix S. Sunderraj and S. Thilakar, Tamil Nadu Veterinary & Animal Sciences University, Chennai.
2.	Manual of Breeding & Larval rearing of Cultivable fishes, Ramanathan, N and T, Francis, Tamil Nadu Veterinary & Animal Sciences University, Chennai. 3
3.	Manual of Aquatic Engineering, Sampathkumar J.S. & Sundararaj.V. Tamil Nadu Veterinary & Animal Sciences University, Chennai.
Web Resources	
1.	https://cifa.nic.in/sites/default/files/Ornamental_fish.pdf
2.	https://ccari.icar.gov.in/Technical%20Bulletin%20No.%2069.pdf
3.	https://prgc.ac.in/uploads/study_material/Ornamental%20fisheries-converted.pdf573.pdf

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	2	3	3	2	2	3
CO 2	3	3	2	3	3	1	2	2
CO 3	3	2	2	3	3	2	2	1
CO 4	2	3	3	2	3	2	3	3
CO 5	2	3	3	2	3	3	2	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UZYFN11	PERSPECTIVES OF BIOLOGY	Foundation Course	2	2	25	75	100

Learning Objectives		
L1	To understand the concepts in the branch of biological science	
L2	To understand the evolution of various branches in biological science	
L3	To understand the research activities in various branches of biological science and about the institution which are engaged in the researches	
L4	To understand the basic concepts and theories on which the biological sciences build in.	
L5	To understand the basic unit of all biological systems.	
UNIT	Contents	No. of Hours
I	Science: Definition, Major branches (Physical, Life and Earth Science); fields of science in biology–scientific methods :observation, prediction, experiment, hypothesis, consistency, theory–scientific theory, scientific law–impact of science in human life: positive and negative aspects	6
II	Life and its manifestations –History of Biology – Biology in ancient times-Landmarks in the progress of Biology-Branches of Zoology– Opportunities for zoologists	6
III	Institutes of Zoological and Scientific importance in India-Location, major achievements and present activities of following academic And scientific organizations :Zoological Survey of India, Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, RajivGandhi Centre for Biotechnology, Bioinformatics Centre and Library, Indian Institute of Science, Stem Cell Institute,National Institute of Immunology,Centre for Cellular & Molecular Biology,Centre for DNA Finger printing and Diagnostics, Central Drug Research Institute.	6
IV	Origin of a earth – big bang theory- theory of special creation-theory of extra terrestrial origin theory of spontaneous generation- modern concepts of the origin of life-origin of cells: Oparins coacervate theory –proteinois and microspheres – earliest cells –origin of eukaryotic cells	6
V	Cell theory – Structure of animal cell and plant cell – types of cells: prokaryotic and eukaryotic–structure of cellular components: plasma membrane, cell wall, cytoplasm, nucleus, and sub cellular organelles	6
	Total	30
Course Outcomes		Knowledge

		Level
CO	On completion of this course, students will	
1	Understand the various study branches in biological science	K1,K2,K3,K4
2	Knew the important events and incidence which change the direction of science and about the origin of various branches in biological science	K1,K2,K3,K4, K5,K6
3	Knew the ongoing research activities in various research institutions.	K1,K2,K3,K4, K5,K6
4	Understand the basic concepts and important theories on which the biological sciences build in.	K1,K2,K3,K4, K5,K6
5	Understand the functional aspects of the basic unit of all biological systems.	K1,K2,K3,K4, K5
Textbooks		
1.	Cell Biology – De Robertis, E.D. Nowinski and Saez. (2001 reprint) WB Saunders Co. Philadelphia.	
2.	Essential Cell Biology, 3rd edition, by Alberts et al., Garland. Publishing Co., 2009.	
3.	Cell and Molecular Biology – De Robertis and De Robertis. (2004 reprint)	
Reference Books		
1.	Bowler Peter J and Iwan RhysMorus. (2005) Making Modern Science: A Historical Survey.2 nd Edition, University of Chicago Press, Chicago, IL	
2.	Ernst Myer.(1997).This is Biology : The Science of the living World.1 st Edition,Harvard University Press, London	
3.	Aggarwal, S.K. (2010) Foundation course in Biology. 3 rd Edition, Ane Books India, NewDelhi	
4.	CollinsH. And Pinch,T. (1993) The Golem: What every one should know about Science. Cambridge university press.	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	3	3	3	2	2	1
CO 2	3	2	3	2	3	2	2	1
CO 3	2	2	3	2	3	3	2	1
CO 4	1	3	3	2	3	2	3	3
CO 5	3	3	2	2	3	2	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UZYSE21	MEDICAL LABORATORY TECHNIQUES	NME	2	2	25	75	100

Learning Objectives		
L1	To understand the different protocols and procedures to collect clinical samples.	
L2	To explain the characterisitics of clinical samples.	
L3	To demonstrate skill in handling clinical equipment.	
L4	To evaluate the safety precautions while handling clinical samples.	
L5	To summarise the control measures to avoid contamination of clinical samples.	
UNIT	Contents	No. of Hours
I	Laboratory Safety and Human Health and Hygiene : Laboratory safety –toxic chemicals and biohazards waste- biosafety level- good laboratory practice – hygiene and health issue – physiology effect of alcohol, tobacco, smoking & junk food &its treatment-biomedical waste management.	6
II	Haematology: Composition of blood and their function- collection of blood & lab procedure-haemopoiesis-types of anaemia- mechanism of blood coagulation- bleeding time- clotting time-determination of hemoglobin-erythrocyte sedimentations rate- packed cell volume- Totalcount of RBC & WBC- Differential count WBC- blood grouping and typing- haemostasis-bleeding disorder of man - Haemolytic disease of newborn, Platelet count, reticulocytescount,Absolute Eosinophil count.	6
III	Medical Microbiology and Instrumentation Techniques : Definition and scopeof microbiology- structure and function of cells- parasites - Entamoeba- Plasmodium-Leishmaniaand Trypanosome- Computer tomography (CTscan) – Magnetic Resonanceimaging– flowcytometry– treadmill test – PET.	6
IV	Medical Physiology : Cardiovascular system- Blood pressure - Pulse – regulationof heart rate, cardiac shock. Heart sounds, Electrocardiogram (ECG) – significance – ultrasonography- Electroencephalography(EEG).	6
V	Diagnostic Pathology : Handling and labelling of histology specimens - Tissueprocessing - processing of histological tissues for paraffin embedding, block preparation.Microtomes – types of microtome- sectioning, staining –staining methods- vital staining - mounting- problems encountered during section cutting and remedies - Frozen sectiontechniques-freezingmicrotome.	6
Total		30

Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Understand protocols and procedures to collect clinical samples for blood analysis and to study human physiology.	K1,K2,K3,K4
2	Explain the characteristics of clinical samples.	K1,K2,K3,K4 ,K5,K6
3	Demonstrates skill in handling clinical equipment.	K1,K2,K3,K4 ,K5,K6
4	Evaluate the haematological and histological parameters of biological samples.	K1,K2,K3,K4 ,K5,K6
5	Elaborate the role of medical laboratory techniques in health care industry.	K1,K2,K3,K4 ,K5
Textbooks		
1	Godker,P.B.andDarshan,P,Godker,2011.TextbookofmedicalLaboratory	
2	Technology,Mumbai.	
3	Guyton and Hall,2000. Text Book of medical Physiology, 10 th edition, Elseiner, NewDelhi.	
4	Mukerjee,K.L,1999.MedicalLaboratoryTechnology-Vol,I,II,III.TataMCGrawHill, New Delhi.	
5	Sood,R,2009.MedicalLaboratorytechnology,Methodsand interpretation.	
Reference Books		
1.	Manoharan,A, andSethuraman, 2003. Essentialof Clinical Heamatology, Jeypreebrothers,New Delhi.	
2.	Richard, A, McPherson, Mathew, R, Pincus, 2007. Clinical and management	
3.	bylaboratorymethods,Elsevier,Philadelphia.PublishedbyTataMcGraw-HillEducationPvt.Ltd.,	
4.	Ochei.J.,A.Kolhatkar(2000).MedicalLaboratoryscience: Theory and practice, PublishedbyTata McGraw-HillEducation Pvt.Ltd, Firstedition.	
Web Resources		
1.	https://bit.ly/3tUs8In	
2.	https://bit.ly/2XKu7mT	
3.	https://bit.ly/3hNS1EP	
4.	https://bit.ly/2ZgrLga	
5.	https://bit.ly/3hTBO1b	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3	2	2	3	3	2	3
CO 2	3	1	2	3	2	2	2	3
CO 3	3	3	3	2	3	2	1	2
CO 4	3	2	3	2	3	3	1	2
CO 5	3	3	2	2	3	3	2	1

Strong-3

Medium-2

Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	3	3	3	3
C02	3	3	3	3	3
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	3	3	3	3	3

Strong-3

Medium-2

Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UZYSE22	FOOD, NUTRITION AND HEALTH	SEC	2	2	25	75	100

Learning Objectives		
L1	To know about the basic components of the Diet and dietary requirements for various age group and life conditions.	
L2	To know the various dietary components and their role in the biological system	
L3	To know about malnutrition and related ailments in Human beings.	
L4	To know about important lifestyle diseases and social health problems.	
L5	To know about the diseases related to poor food hygiene	
UNIT	Contents	No. of Hours
I	Nutrition and dietary nutrients: Basic concepts of Food: Components and nutrients. Concept of balanced diet, nutrient requirements and dietary pattern for different groups viz., adults, pregnant and nursing mothers, infants, school children, adolescents and elderly people	6
II	Macronutrients and micronutrients: Macronutrients. Carbohydrates, Lipids, Proteins- Definition, their dietary source and role. Micro nutrients. Vitamins- Water-soluble and Fat-soluble vitamins-their sources and importance. Important minerals viz., Iron, Calcium, Phosphorus, Iodine, Selenium and Zinc: their biological functions	6
III	Malnutrition and nutrient deficiency diseases: Definition and concept of health: Common nutritional deficiency diseases-Protein Malnutrition(e.g., Kwashiorkor and Marasmus), Vitamin A deficiency, Iron deficiency and Iodine deficiency disorders-their symptoms, treatment, prevention and government initiatives	6
IV	Life style dependent diseases: hypertension, diabetes mellitus, and obesity their causes and prevention. Social health problems-smoking, alcoholism, narcotics .Acquired Immuno Deficiency Syndrome (AIDS): causes, treatment and prevention.	6
V	Diseases caused by microorganisms: Food hygiene: Potable water- sources and methods of purification at domestic level. Food and Water-borne infections: Bacterial Diseases: typhoid fever- viral diseases: Poliomyelitis- Protozoan diseases: Giardiasis-Parasitic diseases: Taeniasis and their transmission, causative agent, sources of infection, symptoms and prevention.	6
	Total	30
Course Outcomes		Knowledge

		Level
CO	On completion of this course, students will	
1	Understand the role of food and nutrients in health and disease	K1,K2,K3,K4
2	Gain knowledge about hygiene, food safety, disease transmission.	K1,K2,K3,K4,K5,K6
3.	Perform food system management and leadership functions that consider sustainability in business, health care, community and institutional areas	K1,K2,K3,K4,K5,K6
4	Understand life style depended diseases and ailments to overcome the diseases	K1,K2,K3,K4,K5,K6
5	Under the basic hygiene and understand the mode of transmission of diseases	K1,K2,K3,K4,K5
Textbooks		
1.	Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; FifthEd;; New Age International Publishers.	
2.	Srilakshmi,B.(2007).Food Science;Fourth Ed; New Age International(P) Ltd.	
3.	Swaminathan,M.(1986).Handbook of Foods and Nutrition; Fifth Ed; BAPPCO.	
4.	Bamji, M.S.; Rao, N.P. and Reddy, V. (2009). Text Book of Human Nutrition; Oxford & IBH Publishing Co. PvtLtd.	
5.	Lakra, P. and Singh M.D. (2008). Textbook of Nutrition and Health; FirstEd; Academic Excellence. Gibney,M.J.etal.(2004).Public Health Nutrition;Blackwell Publishing.	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3	2	2	3	3	2	3
CO 2	3	2	3	1	2	2	3	2
CO 3	3	2	3	3	2	3	2	1
CO 4	3	1	3	2	3	2	2	3
CO 5	2	2	2	3	3	3	2	3
Strong-3	Medium-2	Low-1						

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Strong-3	Medium-2	Low-1			

	Publications.
3.	Moe Jr., M. A. (1989). <i>The marine aquarium handbook: Beginner to breeder</i> . Green Turtle Publications.
4.	Jhingran, V. G., & Gopalakrishnan, R. (2001). <i>Fundamentals of ornamental fish technology</i> . Narendra Publishing House.
Reference Books	
1.	Santhanam, P., Sukumaran, N. & P. Natarajan, A manual of freshwater aquaculture (1987), Reprint 1999, Oxford & IBH Publishing Company Pvt., Ltd., New Delhi.
2.	Cliff Harrison, A colour guide to Tropical Fish (1980), Chartwell Books, INC, Cerkshire, printed in Hon Kong.
3.	O'Connell, R. F., The freshwater aquarium (1977), Arco Publishing Company, INC New York.
4.	Jingran V.G., 1991: Fish and Fisheries in India – Hindustan Publ.co. New Delhi.
5.	Mill Dick, 1993: Aquarium Fish, Daya Pub.co., New Delhi.
Web Resources	
1.	https://archive.org/details/manualoffishheal0000andr_o3p0
2.	https://www.fao.org/4/E7995E/E7995E00.htm
3.	https://books.google.com/books/about/Fundamentals_of_Ornamental_Fish_Health.html?id=ZwydxKMbzz8C
4.	https://course.cutm.ac.in/courses/ornamental-fish-production-and-management/

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3	3	3	3	2	3	3
CO 2	2	3	3	2	3	3	2	3
CO 3	3	2	2	3	3	3	3	3
CO 4	3	2	3	3	3	2	3	2
CO 5	3	3	3	2	2	2	2	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	2	3	3	2	3
CO3	3	2	2	3	3
CO4	3	2	3	3	3
CO5	3	3	3	2	2

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UZYSE32	BASIC COURSE IN ORNITHOLOGY	SEC	2	2	25	75	100

Learning Objectives							
L1	To create an awareness to the students about the theories, concepts and basics course in Ornithology.						
L2	To enable students to comprehend the biological evolution of birds and their structural adaptations.						
L3	To enable students to understand and learn aspects of bird behaviour.						
L4	To enable students to learn about the breeding biology of birds.						
L5	To equip students with a knowledge of macroecology of birds, bird populations and communities, bird diseases, bird conservation and on the role of citizen science in ornithology.						
UNIT	Contents						No. of Hours
I	Introduction to Ornithology Bird Lore; Birds and Humans; Classification of Birds, Bird Evolution and Speciation; Endemism.						6
II	External Morphology of the Bird Structure of bird feather, Internal Structure of the Bird; Adaptations to Flight.						6
III	Bird Behaviour Foraging, Roosting, Vocalization, Imprinting, Feather care, Bird Intelligence, Social Behaviour, Mixed Species Flocks, Migration.						6
IV	Breeding Biology Differential investment of sexes; territoriality, courtship and display behaviour, nesting, eggs, incubation and care of young, brood parasitism.						6
V	Studying bird populations and communities Sampling methods; Macro ecology; Molecular Techniques in Ornithology; Avian Disease; Citizen Science and Ornithology; Threats faced by birds; Bird Conservation with case studies.						6
							30
Course Outcomes						Knowledge Level	
CO	On completion of this course, students will						
1	To Recall the taxonomic position of birds, their external morphology and internal parts, types of bird behavior, sampling methods and types of avian diseases.						K1,K2,K3,K4
2	To Identify the external parts of the bird, internal structures of the bird and different types of bird behaviors.						K1,K2,K3,K4, K5, K6
3	To Differentiate birds based on their morphology, foraging						K1,K2,K3,K4,

	strategies and other behaviour.	K5,K6
4	To Explain and discuss how birds evolved, bird adaptations to flight, different aspects of bird behavior, threats to birds and the role of citizen science in ornithology.	K1,K2,K3,K4, K5, K6
5	To Discuss and analyze case studies relating to bird conservation.	K1,K2,K3,K4, K5
Textbooks		
1.	Gill, F. B., Prum, R. O., & Robinson, S. K. (2020). <i>Ornithology</i> (4th ed.). Macmillan Learning.	
2.	Scott, G. (2010). <i>Essential ornithology</i> . Oxford University Press.	
3.	Cornell Lab of Ornithology. (2016). <i>Handbook of bird biology</i> (3rd ed.). Wiley. Proctor, N. S., & Lynch, P. J. (1993). <i>Manual of ornithology: Avian structure and function</i> . Yale University Press.	
Reference Books		
1.	Lovette, I.J and Fitzpatrick, J.W. (2016). <i>Handbook of Bird Biology</i> , 3 rd ed. Wiley.	
2.	Birkhead, T. (2013). <i>Bird Sense: What it's like to be a bird?</i> Bloomsbury, NY.	
3.	Birkhead, T., Wimpenny, J., and Montgomerie, B. (2014). <i>Ten Thousand Birds:</i>	
4.	<i>Ornithology since Darwin</i> . Princeton University Press, Princeton, NJ.	
5.	Gill, F.B, and Prum, R.O. (2019). <i>Ornithology</i> , 4 th ed. Macmillan.	
Web Resources		
1.	https://onlinecourses.nptel.ac.in/noc25_ge03/preview	
2.	https://academy.allaboutbirds.org/	
3.	https://ebird.org/home	
4.	https://www.audubon.org/bird-guide	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3	3	2	3	3	2	3
CO 2	2	3	3	3	3	3	2	3
CO 3	3	2	3	3	3	3	3	3
CO 4	3	2	3	3	3	2	2	3
CO 5	3	2	3	3	2	3	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	3	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	2

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UZYSE41	AGRICULTURAL ENTOMOLOGY	SEC	2	2	25	75	100

Learning Objectives							
L1	To Explain the basic concepts of entomology and observe the pest status of agriculture.						
L2	To Illustrate and examine the systemic and functional morphology of various group of agricultural insect pests.						
L3	To Differentiate and classify the various groups of insect animals and estimate biodiversity.						
L4	To compare and distinguish the general and specific characteristics integrated pest management.						
L5	To Infer and integrate the economic importance of insect species.						
UNIT	Contents						No. of Hours
I	Outline classification of insects Causes for insect assuming pest status - Methods of collection, mounting and preservation of insect pests.						6
II	Insect vectors of plant diseases Insect pests of stored grains their preventive and curative methods, most common insect pests of the following plants and their control measures: Paddy, Sugarcane, Groundnut, Coconut and Cotton: Locust and its control. Insect pollinators & scavenger.						6
III	Apiculture Introduction, types of honey bees, hive, apiary, selection of bees for apiary, Newton's bee hive, enemies and diseases of honey bees. Sericulture: Introduction, types of silk worms, silk worm races, life history of mulberry silk worm, features of sericulture industry, pests and diseases of silk worm. Lac Culture.						6
IV	Applied Entomology IPM, physical, mechanical, chemical and biological control methods, Pesticide application equipment.						6
V	Introduction and steps towards IPM Pheromones, antifeedents, repellents and biopesticide.						6
	TOTAL						30
Course Outcomes					Knowledge Level		
CO	On completion of this course, students will						
1	To Examine and identify the systemic and functional morphology of various group of agricultural insect pests.				K1,K2,K3,K4		
2	To Differentiate and classify the various groups of insects and estimate the biodiversity.				K1,K2,K3,K4,K5, K6		
3	To Explain the pest status in agriculture and control measures.				K1,K2,K3,K4,K5, K6		

4	To compare the methods and outcomes of integrated pest management.	K1,K2,K3,K4,K5, K6
5	To List the economic importance of agricultural insect species.	K1,K2,K3,K4,K5
Textbooks		
1.	David,BandAnanthakrishnan,T.N.2006.Generaland Applied Entomology, Second edition, Tata McGraw hill publishing company Ltd.,New Delhi, India.	
2.	Vasanthraj David, B. and Ramamurthy, VV. 2012. Elements of Economic Entomology, Seventh edition, Namrutha publications, Chennai.	
3.	Pruthi,H.S.1969.TextbookonAgriculturalEntomology,I.C.A.R.Publication,New Delhi.	
Reference Books		
1.	Awasthi, V.B. 2012. Introduction to General and Applied Entomology, third edition, Scientific publishers.	
2.	Abishek Shukla, D. 2009.A Hand Book of Economic Entomology, Vedamse Books, NewDelhi.	
3.	MinistryofAgriculture,GovernmentofIndia,1995.ManualonIntegratedPest Management in Rice and Cotton.	
4	John WilliamS. 1995. Management of Natural Wealth, Loyola College Publications, Chennai.	
Web Resources		
1.	http://www.fao.org	
2.	http://flybase.bio.indiana.edu/	
3.	http://www.ipm.ucdavis.edu	
4.	http://www.ent.iastate.edu/list/	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3	3	2	2	3	2	3
CO 2	2	3	3	3	3	2	2	1
CO 3	3	2	3	3	3	3	3	2
CO 4	3	3	2	3	3	2	3	2
CO 5	3	3	3	1	3	1	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	2
CO2	2	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	2	3	3
CO5	3	3	3	1	3

Strong-3 Medium-2 Low-1

1.	Van der Wurff, A.W.G., Fuchs, J.G., Raviv, M., Termorshuizen, A.J. (Editors) 2016. Handbook for Composting and Compost Use in Organic Horticulture. BioGreenhouse COST Action FA 1105
Web Resources	
1.	www.biogreenhouse.org .

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3	3	3	3	3	3	1
CO 2	2	3	3	2	3	2	3	3
CO 3	3	2	3	3	3	3	3	2
CO 4	3	3	3	3	3	2	3	2
CO 5	3	3	3	3	2	2	2	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	2	3	3	2	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	2

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UZYSE61	ECONOMIC ZOOLOGY	SEC	2	2	25	75	100

Learning Objectives		
L1	To understand the culturing techniques and production methods of different farm animals.	
L2	To know the life history of animals and disease control methods used in farming.	
L3	To understand the concept of breeding, cross breeding and the importance of high yield varieties.	
L4	To know about the marketing strategies.	
UNIT	Contents	No. of Hours
I	Economic Entomology: Apiculture: Species of honey bees – Social organisation of honey bee – selection of bees and location for apiary – Newton's bee hive – products of bee keeping – enemies and diseases of honey bees. Sericulture: Species of silkworm – life history of mulberry silkworm – Rearing of silkworm – pests and diseases of silkworm. Lac Culture: Introduction – Life history – Host plants – cultivation of Lac – Enemies of lac cultivation – Economic importance of Lac.	6
II	Vermiculture: Introduction: Types of earthworms – ecological classifications of earthworms – Physical, chemical and biological changes caused by earthworms in the soil – Natural enemies of earthworms. Vermicomposting: vermicomposting methods – factors affecting vermicomposting – Vermiculture unit. Harvesting of vermicompost – vermicast – advantages of vermicompost – vermiwash and its applications.	6
III	Aquaculture: Fresh water aquaculture: Carp culture – types of ponds – preparation – maintenance – harvesting and management. Integrated and composite culture. Prawn culture. Marine Aquaculture: Edible – pearl oyster culture. Ornamental fish culture: Aquarium fishes – Aquarium maintenance in home.	6
IV	Poultry Farming: Poultry industry in India – Poultry for sustainable food production and livelihood - Commercial poultry farming – Nutritive value of egg and meat- Broiler management (Definition; Housing and equipment; Brooding, feeding and health cover of broilers; Record keeping; Broiler integration) – Layer management (Brooder; Grower and layer management; Culling of layers; Marketing of eggs and meat). Women in backyard poultry farming.	6
V	Dairy Farming: Dairy farming – advantages of dairying – classification of breeds of cattle – Indigenous and exotic breeds – Selection of dairy cattle. Breeding – artificial insemination – Dairy cattle management – housing – water supply – cattle nutrition feeding standards – Common contagious diseases. Milk - Composition of milk – milk spoilage – pasteurization – Role of milk and milk products in human nutrition –	6

	Dairying as a source of additional income and employment.	
	Total	30
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	To identify the breeds and varieties of poultry, fish, bees, and cattle and understand the basic aspects of farming and marketing strategies of products.	K1,K2,K3,K4
2	To assess and integrate the available tools and techniques to increase the productivity in farms.	K1,K2,K3,K4,K5,K6
3	To analyze the pros and cons of different methods of farming	K1,K2,K3,K4,K5,K6
4	To evaluate the use of available resources in improving the breeds, vermicomposting, farm products etc.	K1,K2,K3,K4,K5,K6
5	To design new methods to improve farm animals with increased productivity and disease resistance and to construct new methods in vermicomposting.	K1,K2,K3,K4,K5
Textbooks		
1.	Gupta, P.K., 2008. Vermicomposting for sustainable agriculture, 2 nd Edition, Agrobios, India.	
2.	Abishek Shukla, D ., 2 0 0 9 . A Hand Book of Economic Entomology, Vedamse Books, New Delhi .	
3.	Banerjee, G.C., 2006. Text book of Animal Husbandry 8 th Ed.Oxford and IBH Publishing Company Ltd., New Delhi.	
4.	ICAR, 1997. Handbook of Animal Husbandary– The Indian Council of Agricultural Research, New Delhi.	
5.	Jhingran, AVG, 1991. Fish and Fisheries of India. Hindustan Publishing Co. New Delhi.	
6.	James. N. Marner, 1975. Principles of dairy processing, wiley eastern limited, New Delhi.	
Reference Books		
(Latest editions, and the style as given below must be strictly adhered to)		
1.	GlennMunroe,2017.Manualofon-Farmvermicompostingandvermiculture,Holdanca Farms Ltd, Wallace, Nova Scotia.	
2.	Dunham,R.A.,2004.AquacultureandFisheriesBiotechnologyGeneticApproaches. CABI publications, U.K.	
3.	Walstra,P.Wouters,J.T.M.andGeurts,T.J.2006.DairyScienceandTechnology.CRC Press, New York.	
4.	Baradach, JE.Ryther:JH. and, MClarneyWO.,1972.Aquaculture.Thefarmingand Husbandry of Freshwater and Marine Organisms. Wiley Inter Science, NewYork.	
Web Resources		
1.	https://bit.ly/3tXHjk8	
2.	https://bit.ly/3tUTHBu	
3.	https://bit.ly/3hVv96q	
4.	https://bit.ly/39nztH1	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3	3	2	2	2	3	3
CO 2	2	2	3	3	2	2	2	2
CO 3	3	3	3	3	1	3	3	3
CO 4	2	3	2	1	3	2	2	3
CO 5	3	2	3	3	3	2	2	1

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	2	3	3
CO2	3	2	2	2	2
CO3	3	1	3	3	3
CO4	1	3	2	2	3
CO5	3	3	2	2	1

Strong-3 Medium-2 Low-1