



MUSLIM ARTS COLLEGE

(Autonomous)

(Accredited by NAAC with B+ grade & Affiliated to Manonmaniam Sundaranar University,
Tirunelveli; Recognized US 2(f) 12 (B) of UGC Act.)

Thiruvithancode, Kanyakumari District, Tamil Nadu - 629174.

DEPARTMENT OF ZOOLOGY

CBCS SYLLABUS

Learning Outcome-based Curriculum Framework for

ZOOLOGY (B.Sc.)

*Applicable for students admitted from June 2026 as per the Resolutions of the Academic Council Meeting held
on 01.06.2026*

Vision

- To integrate science education, respect for nature, and ethical values in the study and practice of zoological sciences.

Mission

- To help students understand and interpret the environment and biodiversity
- To develop the ability to address issues in conservation biology
- To combine theoretical knowledge and practical skills for research
- To prepare students for active participation in scientific research and environmental protection

Academic and Professional Attributes of the Graduates

- **Disciplinary Knowledge**
Acquire comprehensive knowledge of animal diversity, taxonomy, physiology, genetics, ecology, evolution, biotechnology, and applied zoology.
- **Scientific and Analytical Skills**
Develop the ability to observe, analyze, interpret, and solve biological problems using scientific reasoning and evidence-based approaches.
- **Laboratory and Field Competence**
Demonstrate proficiency in laboratory techniques, field investigations, specimen identification, data collection, documentation, and the use of modern biological instruments.
- **Research Aptitude**
Apply research methodology, experimental design, data analysis, and scientific writing skills to conduct independent and collaborative research in zoological sciences.
- **Environmental and Ethical Responsibility**
Promote biodiversity conservation, environmental sustainability, animal welfare, bioethics, and responsible scientific practices.
- **Communication and Professional Skills**
Communicate scientific concepts effectively through oral, written, digital, and technical presentations while working efficiently in multidisciplinary teams.
- **Critical Thinking and Problem Solving**
Evaluate biological issues critically and propose innovative solutions to challenges related to health, environment, wildlife, and sustainable resource management.
- **Leadership and Entrepreneurship**
Demonstrate leadership, teamwork, managerial abilities, and entrepreneurial skills in areas such as aquaculture, apiculture, sericulture, biotechnology, wildlife management, and other life science sectors.
- **Professional Readiness**
Possess the knowledge, technical competence, and employability skills required for higher education, research, teaching, healthcare, environmental agencies, industries, and government services.
- **Lifelong Learning**
Engage in continuous learning, adapt to emerging scientific developments, and

contribute effectively to society through professional excellence and lifelong intellectual growth.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Upon completion of the B.Sc. Zoology Degree Programme, graduates are expected to	Mapping with Mission
PEO1	Demonstrate comprehensive knowledge of zoological sciences, including animal diversity, physiology, genetics, ecology, evolution, and applied zoology, with strong scientific and analytical skills.	M1 & M2
PEO2	Apply scientific principles, laboratory techniques, research methodology, and modern technologies to investigate biological problems and contribute to environmental conservation and sustainable development.	M2 & M4
PEO3	Exhibit ethical values, social responsibility, environmental awareness, teamwork, and effective communication while addressing biological, health, and societal challenges.	M3 & M5
PEO4	Pursue higher education, entrepreneurship, employment, and lifelong learning through continuous professional development, innovation, and scientific inquiry.	M4 & M6

Programme Outcomes (POs)

POs	Upon completion of the B.Sc. Zoology Degree Programme, students will be able to	Mapping with PEOs
PO1: Disciplinary Knowledge	Demonstrate comprehensive knowledge of animal diversity, taxonomy, physiology, genetics, ecology, evolution, biotechnology, and applied zoology.	PEO1
PO2: Critical Thinking	Analyze biological concepts, interpret scientific data, and evaluate zoological problems using logical and evidence-based approaches.	PEO1, PEO2
PO3: Problem Solving	Apply zoological knowledge and scientific principles to solve problems related to biodiversity, health, environment, wildlife, and sustainable development.	PEO1, PEO3
PO4: Scientific and Analytical Reasoning	Design experiments, collect and analyze biological data, interpret results, and draw valid scientific conclusions.	PEO2
PO5: Research Competence	Demonstrate laboratory skills, field techniques, research methodology, and the ethical use of scientific tools and technologies in zoological investigations.	PEO2
PO6: Self-directed and Lifelong Learning	Engage in independent learning, adapt to emerging scientific advancements, and pursue higher education and professional development.	PEO4
PO7: Environmental and Ethical	Demonstrate environmental awareness, biodiversity conservation ethics, animal welfare,	PEO3, PEO4

Responsibility	and responsible scientific practices.	
PO8: Laboratory and Field Skills	Perform laboratory experiments, field observations, specimen collection, identification, documentation, and project work following scientific standards.	PEO2, PEO4
PO9: Communication and Professional Skills	Communicate scientific information effectively through oral, written, digital, and technical presentations while working efficiently as an individual and in teams.	PEO3, PEO4
PO10: Leadership and Social Responsibility	Exhibit leadership, teamwork, entrepreneurship, ethical values, and social responsibility in addressing biological, environmental, and community health issues.	PEO3, PEO4

Programme Specific Outcomes (PSOs)

PSOs	Upon completion of the B.Sc. Zoology Degree Programme, students will be able to	Mapping with POs
PSO1	Core Zoological Knowledge and Practical Competence Apply comprehensive knowledge of animal diversity, taxonomy, anatomy, physiology, genetics, cell biology, developmental biology, ecology, evolution, and biotechnology, while demonstrating proficiency in laboratory techniques, microscopy, specimen identification, and field investigations.	PO1, PO2, PO4
PSO2	Scientific Research and Analytical Skills Develop the ability to formulate scientific hypotheses, design and conduct laboratory and field experiments, analyze biological data using appropriate scientific methods and statistical tools, and communicate research findings effectively while adhering to ethical research practices.	PO2, PO3, PO4, PO9
PSO3	Biodiversity Conservation and Sustainable Resource Management Evaluate biodiversity, wildlife, aquatic resources, environmental issues, and ecosystem functions to promote conservation, sustainable utilization of biological resources, environmental protection, and public health through scientifically informed decision-making.	PO2, PO7, PO9, PO10
PSO4	Employability, Entrepreneurship, and Applied Zoology Apply zoological knowledge and technical skills in fisheries, aquaculture, apiculture, sericulture, vermiculture, poultry science, dairy science, medical laboratory technology, wildlife management, environmental monitoring, and biotechnology, fostering entrepreneurship and career readiness.	PO5, PO6, PO8
PSO5	Professional Development and Lifelong Learning Demonstrate scientific temperament, leadership, communication skills, teamwork, ethical values, digital literacy, and lifelong learning to pursue higher education, research, competitive examinations, and professional careers in zoology and allied life sciences.	PO3, PO6, PO9, PO10

Mapping of Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

POs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
PO1: Disciplinary Knowledge	3	2	2	2	2
PO2: Critical Thinking	2	3	2	2	3
PO3: Problem Solving	2	3	3	3	2
PO4: Scientific and Analytical Reasoning	3	3	2	2	2
PO5: Research Competence	3	3	3	2	2
PO6: Self-directed and Lifelong Learning	2	2	2	3	3
PO7: Environmental and Ethical Responsibility	2	2	3	2	2
PO8: Laboratory and Field Skills	3	2	2	2	2
PO9: Communication and Professional Skills	2	2	2	3	3
PO10: Leadership and Social Responsibility	2	2	3	3	2

3 – High Correlation • 2 – Moderate Correlation • 1 – Low Correlation

COURSES OFFERED

SEMESTER I

Part	Course Code	Title of the Course	Credits	Hours / Week
Part I	AGTL11/ AGMY11/ AGAB11	Language: Tamil /Malayalam/Arabic	3	6
Part II	AGEN11	English:	3	6
Part III	AMZO11	Core Course I: Invertebrata	5	5
	AMZOP1	Core Course II: Lab on Invertebrata	3	3
	AAZO11	Elective Course I: Allied Botany I / Industrial Fish and Fisheries-I Biology of fish	3	4
	AAZOP1	Elective-I- Lab on Allied Botany / Industrial Fish Fisheries-I Biology of Fish	2	2
Part IV	ASZO11	Skill Enhancement Course SEC I: Human Nutrition	2	2
	AFZO11	Foundation Course: Introduction to Zoology	2	2
Total			23	30

SEMESTER I

CORE COURSE I: INVERTEBRATA

Course Code:

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
AMZO11	Core	Y	Y	-	-	5	5	25	75	100

Pre-requisite

Basic knowledge of Biology acquired at the Higher Secondary level. Fundamental understanding of cell structure and organization of living organisms

Learning Objectives

The course aims to:

1. To understand the basic concepts of lower animals and observe the structure and functions.
2. To illustrate and examine the systematic and functional morphology of various groups of invertebrates.
3. To differentiate and classify the various groups of animal modes of life and to estimate the biodiversity.
4. To compare and distinguish the general and specific characteristics of reproduction in lower animals.
5. To infer and integrate the parasite and economic importance of invertebrate animals.

Course Outcomes (COs)

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Understand the basic concepts of invertebrate animals and recall its structure and functions.	K1
CO2	Illustrate and examine the systemic and functional morphology of various groups of invertebrata.	K2
CO3	Differentiate and classify the animal's mode of life in various taxa and estimate the biodiversity.	K3
CO4	To compare and distinguish the various physiological processes and organ systems in lower animals.	K4
CO5	Infer and integrate the parasitic and economic importance of invertebrate animals.	K3

Bloom's Taxonomy Levels

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 – Create

Course Content

Units	Contents	No. of Hours
I	Protozoa: Introduction to Classification, taxonomy and nomenclature. General characters and classification of Phylum Protozoa up to classes. Type study: Paramecium and Plasmodium - Parasitic protozoans (Entamoeba, Trypanosoma & Leishmania) - Economic importance Nutrition in protozoa - Host-parasitic interactions in Entamoeba and Plasmodium - Locomotion in protozoa Porifera: General characters and classification up to Classes. Type study: Sycon- Canal system in sponges. Reproduction in sponges	15
II	Coelenterata: General characters and classification up to classes – Type study: Obelia - Corals and coral reefs - Economic importance of corals and coral reefs - Polymorphism in Hydrozoa. Platyhelminthes: General characters and classification of up to classes. Type study: Fasciola hepatica. Parasitic adaptations. Host-parasitic interactions of Helminthine parasites	15
III	Aschelminthes : General characters and classification of up to classes - Type study: Ascaris lumbricoides. Nematode Parasites and diseases - Wuchereria bancrofti, Enterobius vermicularis, Ancylostoma duodenale. - Parasitic adaptations. Annelida: General characters and classification up to Classes. Type study: Nereis, - Metamerism - Modes of life in Annelids.	15
IV	Arthropoda: General characters and classification of Phylum Arthropoda up to Classes. Detailed study: Penaeus indicus. Affinities of Peripatus – Larval forms in Crustacea. Economic importance of Insects. Insect pests of Agricultural Importance- Pest of rice: Rice stem borer (Scirpophaga incertulas) – Pest of Sugarcane: The shoot borer (Chilo infuscatellus) – Pest of coconut: The rhinoceros beetle (Oryctes rhinoceros). Principles of Integrated Pest Management.	15
V	Mollusca: General characters and classification of Phylum Mollusca up to Classes. Detailed study: Pila globosa. Foot and torsion in Mollusca. Economic importance of Cephalopods. Echinodermata: General characters and classification of Phylum Echinodermata up to Classes. Detailed study: Asterias. Water vascular system in Echinodermata – Larval forms of Echinoderms.	15
	Total	75

S. No.	Text Book
1	Ekambaranatha Iyer, 2000. A Manual of Zoology, 10th edition, Viswanathan, S., Printers & Publishers Pvt Ltd
2	Jordan, E.L. and Verma P.S, 1995. Invertebrate Zoology, 12th edn.S. Chand& Co.

3	Kotpal, R.L, 1992. Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca, Echinodermata.
S. No.	Reference Books
1	Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2	Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
3	Barrington, E.J.W. (1979). Invertebrate Structure and Functions, II Edition, E.L.B.S. and Nelson
4	Hyman L.H, 1955. The invertebrates - Vol. I to Vol. VII – Mc Graw Hill Book Co.
5	Parker, J. and Haswell , 1978. A text book of Zoology Vol. I - Williams and Williams.

S. No.	Web Resources
1	https://www.nationalgeographic.com/animals/invertebrates/
2	https://www.britannica.com/science/parasitic-disease
3	https://www.nio.res.in/
4	https://greatbarrierreef.org/

Mapping with Programme Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	2	1	1	1	2	1	1
CO2	3	3	2	3	2	2	1	3	2	1
CO3	3	3	3	2	2	2	3	2	2	2
CO4	3	3	3	3	3	2	2	2	2	2
CO5	3	2	3	2	3	2	3	2	2	3

3 – Strong, 2 – Medium , 1 – Low

Mapping with Programme Specific Outcomes

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	1
CO2	3	3	2	2	2
CO3	3	3	3	2	2
CO4	3	3	3	2	2
CO5	3	3	3	3	2
Weightage	15	14	12	10	9
Weighted Percentage of Course Contribution to PSOs	3	2.8	2.4	2	1.8

Mapping Scale: 3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation

FIRST YEAR - SEMESTER I**CORE II – LAB ON INVERTEBRATA**

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
AMZOP1	Core	-	-	Y	Y	3	3	25	75	100

Learning Objectives

The course aims to:

1. To dissect and mount various body parts and to study the various functional details of invertebrates.
2. To understand the organs, organ system and their functions in lower animals.
3. To dissect and mount various body parts and to study the various functional details of chordates.
4. To identify the different groups of invertebrate animals by observing their external characteristics.
5. To identify the different groups of Invertebrates to gather adequate knowledge and to record.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Identify and label the external features of different groups of invertebrate animals.	K2
CO2	Illustrate and examine the nervous system and reproductive system of invertebrate animals.	K4
CO3	Differentiate and compare the structure, function and mode of life of various groups of animals.	K2
CO4	Compare and distinguish the dissected internal organs of lower animals.	K4
CO5	Prepare and develop the mounting procedure of economically important invertebrates.	K5

Bloom's Taxonomy Levels

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyse, **K5** – Evaluate, **K6** – Create
Course Content

Units	Contents	No. of Hours
I	Dissection: 1. Cockroach: Nervous system 2. Cockroach: Reproductive system	15
II	Dissection: 3. Cockroach: Digestive system	15

III	Mounting: 1. Mouth Parts – Cockroach 2. Mouth Parts - Honey bee, Mosquito, House fly 3. Prawn appendages 4. Earth worm – body setae, penial setae (Demo)	15
IV	Spotters: (i). Protozoa: Amoeba, Paramoecium, Paramoecium Binary fission and Conjugation, Entamoeba histolytica, Plasmodium vivax (ii). Porifera: Sycon, Gemmule (iii). Coelenterata: Obelia – Colony & Medusa, Aurelia, Physalia, Gorgonia, (iv). Platyhelminthes: Planaria, Fasciola hepatica, Fasciola larval forms – Miracidium, Redia, Cercaria, Taenia solium, (v). Nematelminthes: Ascaris (Male & Female), (vi). Annelida: Nereis, Chaetopteurs, Hirudinaria, Trochophore larva (vii). Arthropoda: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea., (viii). Mollusca: Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, (ix). Echinodermata: Asterias, Ophiothrix, Cucumaria, Antedon, Bipinnaria larva	15
V	Record / Observation Note (SUBMISSION IS MANDATORY)	15
	Total	75

S. No.	Text Book
1	Ekambaranatha Iyyar and T. N. Ananthakrishnan, 1995 A manual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai
2	Ganguly, Sinha and Adhikari, 2011. Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.
3	Sinha, Chatterjee and Chattopadhyay, 2014. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1070 pp.
4	Lal, S. S, 2016. Practical Zoology Invertebrate, Rastogi Publications.
5	Verma, P. S. 2010. A Manual of Practical Zoology: Invertebrates, S Chand, New Delhi

S. No.	Reference Books
1	Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
2	Barnes, R.D. (1982). Invertebrate Zoology, V Edition. Holt Saunders International Edition.
3	Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson
4	Boradale, L.A. and Potts, E.A. (1961). Invertebrates: A Manual for the use of Students. Asia Publishing Home.
5	Lal, S.S. 2005. A text Book of Practical Zoology: Invertebrate, Rastogi, Meerut
S. No.	Web Sources

1	https://nbb.gov.in/
2	https://www.agshoney.com/training.htm
3	https://icar.org.in/
4	https://nisa.icar.gov.in/
5	https://www.nationalgeographic.com/animals/invertebrates/

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	2	2	1	1	3	1	1
CO2	3	3	2	3	3	2	1	3	2	1
CO3	3	3	3	3	2	2	2	3	2	2
CO4	3	3	3	3	3	2	2	3	2	2
CO5	3	2	2	2	2	1	1	3	1	1

3 – Strong, 2 – Medium , 1 – Low

Mapping with Programme Specific Outcomes

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	1
CO2	3	3	2	2	2
CO3	3	3	2	2	2
CO4	3	3	3	2	2
CO5	3	3	3	3	2
Weightage	15	14	11	10	9
Weighted percentage of Course Contribution to POs	3	2.8	2.4	2	1.8

Mapping Scale: 3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation

FIRST YEAR - SEMESTER I

ME 1– ALLIED BOTANY I

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
AAZO11	Allied I	Y	Y	-	-	4	4	25	75	100

Learning Objectives

The course aims to:

1. Understand the morphology, anatomy, reproduction, and economic importance of algae.
2. Study the general characteristics, life cycles, and economic significance of fungi, bacteria, and viruses.
3. Acquire knowledge of the morphology, reproduction, and life histories of bryophytes, pteridophytes, and gymnosperms.
4. Understand the structure and functions of prokaryotic and eukaryotic cells and their organelles.
5. Develop fundamental knowledge of genetics, plant tissue culture, and their applications in biotechnology.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Describe the morphology, reproduction, life cycle, and economic importance of algae.	K2
CO2	Explain the characteristics, structure, reproduction, and significance of fungi, bacteria, and viruses.	K2
CO3	Illustrate the morphology and life cycles of bryophytes, pteridophytes, and gymnosperms.	K3
CO4	Analyze the structure and functions of prokaryotic and eukaryotic cells and their organelles.	K4
CO5	Apply the principles of Mendelian genetics and plant tissue culture in plant biotechnology.	K3

Bloom's Taxonomy Levels

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyse, **K5** – Evaluate, **K6** – Create

Course Content

Unit	Contents	No. of Hours
I	Algae: General characters of algae - Structure, reproduction and life cycle of the following genera - Sargassum , economic importance of algae.	15
II	Fungi, Bacteria and Virus: Fungi- General characters of fungi, structure, reproduction and life cycle of the following genera - Penicillium and economic importance of fungi. Bacteria - general characters, structure and reproduction of Escherichia coli and economic importance of bacteria. Virus - general characters, structure of TMV.	15
III	Bryophytes, Pteridophytes and Gymnosperms: General characters of Bryophytes, Structure and life cycle of Marchantia General characters of Pteridophytes, Structure and life cycle of Selaginella General characters of Gymnosperms, Structure and life cycle of Cycas.	15
IV	Cell Biology: Prokaryotic and Eukaryotic cell- structure. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus.	15
V	Genetics and Plant Biotechnology: Mendelism - Law of dominance, Law of segregation, Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - MS medium, plant tissue culture protocol. Application in biotechnology.	15
	Total	75

S. No.	Text Books
1	Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut.
2	Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.
3	Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi.
4	Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
5	Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.
S. No.	Reference Works
1	Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi.
2	Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
3	Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
4	Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
5	Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
S. No.	Web Sources (URL)
1	https://www.kobo.com/us/en/ebook/the
2	http://www.freebookcentre.net/biology

3	http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm
4	https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/
5	https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf
6	https://www.us.elsevierhealth.com/medicine/cell-biology

Mapping with Programme Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	2	1	2	1	1	2	1
CO2	3	2	2	2	1	2	1	1	2	1
CO3	3	3	2	3	1	2	1	1	2	2
CO4	3	3	3	3	2	2	2	1	2	2
CO5	3	3	3	2	2	2	2	2	2	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	3	2	2	1	2
CO3	3	3	2	2	2
CO4	3	3	3	2	2
CO5	3	3	3	3	2
Weightage	15	13	11	9	10
Weighted Percentage of Course Contribution to PSOs	3.0	2.6	2.2	1.8	2.0

Mapping Scale: 3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation

FIRST YEAR - SEMESTER I
ME 1– LAB ON ALLIED BOTANY

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
AAZOP1	Allied Practical	-	-	Y	Y	2	2	25	75	100

Learning Objectives

The course aims to:

1. To develop skill-based detection of the morphology and microstructure of different plant groups
2. To comprehend the ultra structure of various cell organelles
3. To be familiar with the basic concepts of mendelian genetics and laws of inheritance.
4. To understand the methods involved in plant tissue culture.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Gain knowledge on the internal organization of various plant groups	K2
CO2	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.	K6
CO3	Analyse the ultra structure of different cell organelles	K4
CO4	Understand the fundamental concepts of Genetics	K2
CO5	Apply the methods in plant tissue culture	K3

Bloom's Taxonomy Levels

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyse, **K5** – Evaluate, **K6** – Create

Course Content

S.No	PRACTICALS	No. of Hours
I	1. Make suitable micro preparation and observation of slides/ specimen of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.	15
II	2. Micro photographs of the cell organelles - ultra structure.	15
III	3. Simple genetic problems.- Monohybrid and dihybrid	15
IV	4. Microphotographs related to plant tissue culture.	15
V	5. Field trip (Minimum 2 days) to places under the guidance of teachers to study plants in their natural habitat and submit a report.	15
	Total	75

S. No.	Text Books
1	Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
2	Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
3	Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd.
4	Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York.
5	Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.
S. No.	Reference Works
1	Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
2	Nancy Sereidiak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae lab. Ottawa Agriculture and Agri food Canada publisher.
3	Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes Academic Publishing.
4	Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
5	Steward, F.C. 2012. Plant Physiology Academic Press, US
S. No.	Web Sources (URL)
1	https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883
2	https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms
3	https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96N
4	https://medlineplus.gov/genetocs/understanding/basics/cell/
5	https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf
6	http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf

Mapping with Programme Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	2	1	2	1	1	2	1
CO2	3	3	2	3	1	2	1	1	2	2
CO3	3	3	3	3	2	2	2	1	2	2
CO4	3	2	2	2	1	2	1	1	2	2
CO5	3	3	3	2	2	2	2	2	2	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	3	3	2	2	2
CO3	3	3	3	2	2
CO4	3	2	2	2	2
CO5	3	3	3	3	2
PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Weightage	15	13	11	10	10
Weighted Percentage of Course Contribution to PSOs	3.0	2.6	2.2	2.0	2.0

Mapping Scale: 3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation

FIRST YEAR - SEMESTER I

ME 1– INDUSTRIAL FISH AND FISHERIES-I BIOLOGY OF FISH

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
AAZO12	Allied	Y	Y	-	-	3	4	25	75	100

Learning Objectives

The course aims to:

1. Understand the basic concepts, types and problems of capture fisheries.
2. Analyse the different techniques of capturing methods.
3. Identify and compare the cultivable fish species and benefits.
4. Apply the knowledge of fish marketing.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Recollect the basic concepts of fisheries and recognize and solve the problems in capture fisheries	K2
CO2	Understand and adopt suitable/ recent technology for capturing	K5
CO3	Apply knowledge on feeding patterns and design local strategies for management.	K2
CO4	Evaluate and adopt suitable marketing methods and overcome the problems.	K4
CO5	Emphasize the application of laws and acts of Fisheries welfare.	K2

Bloom's Taxonomy Levels

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyse, **K5** – Evaluate, **K6** – Create

Course Content

Unit	Contents	No. of Hours
I	Introduction: Fish Biology – Definition and basic concepts of biosystematics. Importance of classification – Theories of biological classification. Variations in structure, Form, Skin, Coloration, Scales, Mouth, Jaws, Teeth, Fins, Spines and other structures used in taxonomic studies. Induced breeding techniques – Hatching methods – Seed and Brood transport.	15
II	Study of external morphology and internal organization of a typical Elasmobranch and Teleost. Alimentary Canal and Associated Structures – Gills – Swim Bladder – Accessory Respiratory organs – Lateral line system – Sound and Light producing organs. Morphological and anatomical characters of Prawn, Crab, Lobster, Bivalve, Gastropod and Cephalopod (one example each)	15
III	Natural food of fishes – Feeding habits in various groups of fresh water and marine fishes, Prawns, Crabs, Lobsters and Cephalopods. Qualitative and Quantitative estimation of food consumption based on experimental studies and stomach content analysis – Seasonal changes in food availability and food preference – Food and Feeding in relation to age – Food selectively – Feeding intensity. Nutrition of fishes and utilization of food, Feeding strategies and energies. Artificial feeding – Nutritional requirement.	15
IV	Growth of fish – Absolute, Relative, Isometric and Allometric growth. The Cube Law – Methods for determination of growth – Length frequency analysis – Analysis of growth checks on hard parts like Scales, Otolith and Vertebrae – Estimation of growth by direct methods – Marking and tagging of fish for growth studies – Aging of fish and shell-fish based on length data and growth checks – Length weight relationships, Ponderal index, Relative condition factor and Gonado – Stomach index.	15
V	Types of reproduction, Sex differences – Sexual maturity, Classification of maturity stages, Size at first maturity. Estimation of fecundity – Ova diameter frequency – Fecundity in relation to length, Weight, Age and food supply. Spawning habits – Factors affecting Spawning, Spawning seasons and frequency. Embryonic and early development – Types of egg and Larvae – Metamorphosis of larva – Larval life and feeding habits. Reproductive behaviour and parental care – Social behaviour – Aggregation and Shoaling. Migrations – Anadromous and Catadromous.	15
	Total	75

S. No.	Text Books
1	Kyle, H. M., (1926), The Biology of Fishes, T.F.H. Publication, Hong Kong.
2	Marshall, N.B. (1965), The Life of Fishes, Weidenfeld& Nicolson, London.
3	Munro I.S.R, (1982), The Marine and Freshwater Fishes of Ceylon, Soni Reprints Agency, New Delhi.
S. No.	Reference Works

1	Talwar, P.K. and A.G. Jhingran, (1991), Inland Fishes of India and Adjacent Countries., Vol I & Vol II, Oxford & IBH Publishing Co. Ltd., New Delhi 1958 P.
2	Pitcher, T.J. & P.J.E. Hart, (1992), Fisheries Ecology, Room Helm, London.
3	Insel P., Ross D., McMahon K., Bernstein M. (2016) Discovering Nutrition. 5 th Ed., Jones & Bartlett Learning, Massachusetts, USA.
4	Rounsfell, G.A. and W.H. Everheart, (1993), Fisheries Science its methods and application, John William & Sons New York.
S. No.	Web Sources (URL)
1	https://www.worldfishcenter.org
2	https://www.nbfgr.res.in
3	https://dof.gov.in
4	https://www.cife.edu.in
5	https://www.cmfri.org.in

Mapping with Programme Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO1	3	2	2	2	2	1	2	2	1	1
CO2	3	3	2	3	3	2	2	2	2	2
CO3	3	3	3	2	3	2	3	2	2	2
CO4	2	3	3	3	3	2	2	2	3	3
CO5	2	2	3	2	3	2	3	2	3	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	1	1
CO2	3	3	2	2	2
CO3	3	3	3	2	2
CO4	2	3	3	3	2
CO5	2	2	3	3	3
Weightage	13	13	13	11	10
Weighted percentage of Course Contribution to PSOs	3	2.8	2.4	2	1.8

Mapping Scale: 3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation

FIRST YEAR - SEMESTER I

LAB ON ALLIED 1– INDUSTRIAL FISH FISHERIES-I BIOLOGY OF FISH

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
AAZOP2	Allied	Y	Y	-	-	2	2	25	75	100

Learning Objectives

The course aims to:

1. Understand the basic concepts, types and problems of capture fisheries.
2. Analyse the different techniques of capturing methods.
3. Identify and compare the cultivable fish species and benefits.
4. Apply the knowledge of fish marketing.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Recollect the basic concepts of fisheries and recognize and solve the problems in capture fisheries	K2
CO2	Understand and adopt suitable/ recent technology for capturing	K5
CO3	Apply knowledge on feeding patterns and design local strategies for management.	K2
CO4	Evaluate and adopt suitable marketing methods and overcome the problems.	K4
CO5	Emphasize the application of laws and acts of Fisheries welfare.	K2

Bloom's Taxonomy Levels

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyse, **K5** – Evaluate, **K6** – Create

Course Content

Unit	Contents	No. of Hours
	PRACTICALS 1. Methods for Collection, Handling, Identification and Preservation of fish for taxonomic purposes. 2. Study of the external morphology of fish. Specific identification of important freshwater and marine fishes, prawns, crabs, bivalves and cephalopods of India. 3. Identification of scales of fishes – Placoid, Cycloid and Ctenoid scales. 4. Study of food and feeding habits of fishes – Plankton feeder, Herbivore feeder, Carnivore feeder, Omnivore feeder, and Detritus feeder. Study of Structural Adaptations for Diet. 5. Qualitative and Quantitative methods for Stomach content analysis. 6. Estimation of Oxygen, Carbon dioxide, and Salinity content in water samples. 7. Plankton analysis in the water samples – any two. 8. Identification of Anadromous and Catadromous fishes.	30
	Total	30

S. No.	Text Books
1	Kyle, H. M., (1926), The Biology of Fishes, T.F.H. Publication, Hong Kong.
2	Marshall, N.B. (1965), The Life of Fishes, Weidenfeld& Nicolson, London.
3	Munro I.S.R, (1982), The Marine and Freshwater Fishes of Ceylon, Soni Reprints Agency, New Delhi.
S. No.	Reference Works
1	Talwar, P.K. and A.G. Jhingran, (1991), Inland Fishes of India and Adjacent Countries., Vol I & Vol II, Oxford & IBH Publishing Co. Ltd., New Delhi 1958 P.
2	Pitcher, T.J. & P.J.E. Hart, (1992), Fisheries Ecology, Room Helm, London.
3	Insel P.,Ross D., McMahon K.,Bernstein M.(2016) Discovering Nutrition. 5thEd., Jones & Bartlett Learning, Massachusetts,USA.
4	Rounsfell, G.A. and W.H. Everheart, (1993), Fisheries Science its methods and application, John William & Sons New York.
5	Royce, W.F. (1984), Introduction to the Practice of Fisheries Science, Academic Press.
S. No.	Web Sources (URL)
1	https://www.fishbase.se
2	https://www.fao.org/fisheries
3	https://www.fao.org/fishery
4	https://www.cmfri.org.in
5	https://www.cife.edu.in

Mapping with Programme Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0
CO1	3	2	2	2	2	1	2	3	1	1
CO2	3	3	2	3	3	2	2	3	2	2
CO3	3	3	3	2	3	2	3	3	2	2
CO4	2	3	3	3	3	2	2	3	3	3
CO5	2	2	3	2	3	2	3	2	3	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO /PO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	1	1
CO2	3	3	2	2	2
CO3	3	3	3	2	2
CO4	2	3	3	3	2
CO5	2	2	3	3	3
Weightage	13	13	13	11	10
Weighted percentage of Course Contribution to POs	2.6	2.6	2.6	2.2	2

Mapping Scale: 3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation

SEMESTER I

NON MAJOR ELECTIVE I (NME) HUMAN NUTRITION

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
ASZO11	Core	Y	Y	-	-	2	2	25	75	100

Learning Objectives

The course aims to:

1. Understand the history and development of nutrition as a science.
2. Identify and describe the various nutrients and their roles in the body.
3. Assess nutritional status using a thropometric, biochemical, clinical, and dietary methods.
4. Analyze the physiological significance and health impacts of carbohydrates, proteins, lipids, vitamins, and minerals.
5. Develop dietary plans that meet nutritional guidelines and promote health.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Define nutrients and terms related to nutrition.	K2
CO2	Describe the sources, recommended allowances of macronutrients, micronutrients, and water.	K3
CO3	Interpret the significance of macro and micronutrients, and water for maintenance of optimum health.	K3
CO4	Explain the functions, deficiency or toxicity of macro and micronutrients, and water.	K4
CO5	Evaluate the role of macronutrients, micronutrients, and water in health and disease.	K3

Bloom's Taxonomy Levels

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyse, **K5** – Evaluate, **K6** – Create

Course Content

Unit	Contents	No. of Hours
I	Introduction to nutrition: History of Nutrition – Development of Nutrition as a Science Food as a source of nutrients, definition of nutrients, Balanced diets and dietary guidelines- current concepts Assessment of Nutritional status- Anthropometric, Biochemical, Clinical and Dietary guidelines aspects.	6
II	Carbohydrates: Classification, Food Sources, Requirements and Functions of carbohydrates in the body. Physiological significance of Monosaccharides, Disaccharides and Polysaccharides Glycemic Index, Glycemic load of Foods Role of fibre in prevention of non-communicable diseases. Proteins Aminoacids-Classification, Sources, Requirements and functions of protein. Protein deficiency-Protein Energy Malnutrition-Kwashiorkor and Marasmus –etiology, clinical features, treatment and prevention.	6
III	Lipids -Classification, Sources, Requirements and functions, Essential fatty acids-deficiency food sources and functions. Energy - Determination of energy value of foods using Bomb calorimeter, Physiological value of foods, relation between oxygen used and calorific value. Direct and Indirect calorimeter -Basal metabolism, factors affecting BMR.	6
IV	Fat Soluble Vitamins Food sources, Requirements, Functions, Effects of deficiency or Toxicity (wherever applicable). Water Soluble Vitamins Food sources, Requirements, Functions, Effects of deficiency. Antioxidant role of certain Vitamins in Health promotion	6
V	Macrominerals Calcium, Phosphorous, Magnesium, Potassium- Distribution in the body, functions, foods sources, requirements, effects of deficiency and toxicity. Micro/Trace minerals Iron, Zinc, Iodine, Selenium, Manganese, Chromium, Fluoride-Distribution in the body; functions, effects of deficiency, food sources and requirements, Water - As a nutrient, functions, sources. Water balance, factors regulating it, dehydration, water in toxication.	6
	Total	30

S. No.	Text Book
1	Srilakshmi, B. (2023). Nutrition Science (8th ed.). New Age International Publishers, New Delhi.
2	Wardlaw, G. M., Smith, A. M., & Collene, A. L. (2020). Contemporary Nutrition (11th ed.). McGraw-Hill Education.

S. No.	Reference Books
1	Anderson J.J.B., Root M.M., Garner S.C. (2015) Human Nutrition: Healthy Options for Life. Jones & Bartlett Learning, Massachusetts, USA.
2	Guthrie, H.A. (1989) Introductory Nutrition. 7th ed. Times Mirror/Mosby College Publishing, St. Louis
3	Insel P., Ross D., McMahon K., Bernstein M. (2016) Discovering Nutrition. 5th Ed., Jones & Bartlett Learning, Massachusetts, USA.
4	Mahan K and Sylvia E. Stump (2000) Krause's Food Nutrition and Diet Therapy, Saunders, USA
5	Medeiros D.M., and Wildman R.E.C. (2019) Advanced Human Nutrition. 4th Ed., Jones & Bartlett Learning, Massachusetts, USA.
6	Ross A.C., Caballero B., Cousins R.J., Tucker K.L., Ziegler T.R. (2014) Modern Nutrition in Health and Disease. 11th Ed., Wolters Kluwer Lippincott Williams & Wilkins, Philadelphia, USA.

S. No.	Web Resources
1	http://www.merck.com/mmhe/seciz/ch155/ch155a.html
2	http://www.whereincity/medical/vitamins

MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	1	1	1	2	1	1	1
CO2	3	2	2	2	2	1	2	1	2	1
CO3	3	3	2	2	2	2	3	1	2	2
CO4	2	3	3	3	2	2	3	1	2	2
CO5	2	3	3	3	3	2	3	1	3	3

3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation.

MAPPING OF COURSE OUTCOMES WITH PROGRAMME SPECIFIC OUTCOMES (PSOs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	1	1	1
CO2	3	2	2	1	2
CO3	3	3	3	2	2
CO4	2	3	3	2	2
CO5	2	3	3	2	3
Weightage	13	13	12	8	10
Weighted Percentage of Course Contribution to POs	2.6	2.6	2.4	1.6	2

3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation

FIRST YEAR – SEMESTER I

FOUNDATION COURSE-INTRODUCTION TO ZOOLOGY

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
AFZO11	Foundation Course	Y	Y	-	-	2	2	25	75	100

Learning Objectives

The course aims to:

1. Explore fundamental concepts and principles of zoology, including animal classification, taxonomy, and evolution.
2. Acquire knowledge of the anatomical structures and physiological processes of various animal groups.
3. Explore the diversity of the animal kingdom, focusing on the characteristics and evolutionary relationships of major animal phyla.
4. Develop essential laboratory and fieldwork skills, including techniques for observing, dissecting, and analyzing animals.
5. Examine the behavioural patterns of animals and their ecological interactions within ecosystems.

Course Outcomes

Upon successful completion of the course, students will be able to:

CO No.	Course Outcomes	BT Level
CO1	Demonstrate knowledge of fundamental zoological concepts and principles.	K1
CO2	Identify and classify major animal groups based on their characteristics.	K2
CO3	Explain the physiological and anatomical adaptations of animals to their environments.	K3
CO4	Describe the processes of evolution and the role of genetics in animal diversity.	K3
CO5	Analyze animal behavior from an evolutionary and ecological perspective.	K4

Bloom's Taxonomy Levels

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 – Create

Course Content

Unit	Contents	No. of Hours
I	Animal Biodiversity and Systematics: Taxonomic hierarchy: Classification of animal kingdom-Two kingdom and five kingdom classification- Binomial nomenclature Different phyla of animal kingdom – Salient features of Invertebrates and Chordates with examples.	6
II	Cell Biology & Genetics: Cell theory- Ultra structure of a typical Prokaryotic and Eukaryotic cell- importance of cell organelles. General Account on Mendelism and inheritance DNA and RNA- Modern concept of gene- Central dogma of Molecular Biology.	6
III	Biochemistry and Physiology: Introduction to role of essential biological Compounds- Proteins, Carbohydrates, Lipids, Water and Vitamins. Introduction to organ systems of vital physiological functions.	6
IV	Environmental Biology: Basics of atmosphere and its strata- habitats- concept and components of ecosystem- ecological balance. Developmental Biology: General account on gametogenesis- fertilization and developmental stages. Evolution: Importance of Paelaeontology - Origin of life - Darwinism- Modern synthetic theory. Telephone and Everyday Conversations	6
V	Entrepreneurial Courses in Zoology: General introduction and applications: Aquaculture - Aquarium keeping - Apiculture - Sericulture - Lac culture - Vermiculture - Poultry keeping- Dairy farming- Biotechnology-Ecotourism.	6
	Total	30

S. No.	Text Books
1	EkambaranathaIyer, 2000. A Manual of Zoology, 10th edition, Viswanathan, S., Printers & Publishers Pvt Ltd Jordan, E.L. and Verma P.S, 1995. Invertebrate Zoology, 12th edn. S. Chand& Co.
2	Kotpal, R.L.2019 Modern text book of Zoology: Invertebrates. RastogiPublication,New Delhi.
3	Kotpal (2015). Modern Textbook of Zoology Vertebrates, Rastogi publishers, New Delhi.
4	H.C, Nigam. 2010., Biology of Chordates., Vishal Publications, New Delhi
5	Gupta. P.K., 2017, Cell and Molecular Biology, Fifth Revised Edition, RastogiPublication, Meerut, India.

S. No.	Reference Books
1	Singh. H.R, &Neeraj Kumar (2017) Animal Physiology and Biochemistry, Vishal Publishing Co.
2	ErachBharucha. 2005. Text book of Environmental Studies for undergraduate courses, University Grants Commission, New Delhi.
3	Shukla, G.S. &Upadhyay, V.B. (2014). Applied and Economic Zoology, Rastogi Publications.
4	Bee keeping in South India – Cherian M.C. & Ramachandran, Govt.Press,Chennai.
5	Apiculture – J. Johnson and Jeyachandra, Marthandam, TamilNadu.
6	VermicologyVermiculture Biotechnology – U.S. Bhawalkar BERI, PUNE.
7	Kesary, M and M.Johnson, Sericulture, Department of Zoology, N.M.. Christian College, Marthandam.
8	G. Ganga., Introduction to Sericulture, Oxford and IBH Publishingm 2019 1995-ISBN 1853393317
9	Jhingan, V.G. Fish and Fisheries of India, Hindustan Publishing Corporation (India).
10	Poultry farm manual: A reference guide for Central and State Poultry Farms, 2014- www.dadf.gov.in and www.dadh.nic.in Delhi
11	Gnanamani MR, Modern aspects of commercial poultry keeping, 2010, Deepam Publications, Madurai.
12	Santhanakumar, G &A.M. Selvaraj. Concepts of Aquaculture. Meenam Publications. NagercoilLekshmi Papers, Thirumal Complex, Opp. Chakkaravarthi theatre. Chettikulam Jn., Nagercoil – 629 002.
13	Sundararaj, V. &B. Srikrishnadhas, Cultivable Aquatic Organisms, Narendra Publishing House,1417, KishanDutt street, Maliwara, Delhi – 110 006
14	Livestock and Poultry Production: Singh, Herbans and Earl Moore; Prentice Hall in India. Klaus, A. J. (2015). Dairy Farming: The Beautiful Way
15	Seethaleksmy, M and Dr.Samthi, R.Vermitechnology, SarasPublications ,Nagercoil.2012.

S. No.	Web Resources
1	http://lib.mylibrary.com/ Open.aspx?id=463009
2	http://globalacademicgroup.com
3	http://tbmicollege.ac.in>gallery
4	http://www.researchgate.net>3473
5	http://www.periyaruniversity.ac.in
6	http://www.profitableventure.com
7	http://www.thinkwithniche.cpm>five
8	http://www.99businessideas.com

MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	1	1	2	1	2	2	1
CO2	3	2	2	2	1	2	1	2	2	1
CO3	2	3	3	2	2	2	2	2	3	1
CO4	2	3	3	3	2	2	2	1	3	2
CO5	2	2	3	2	2	3	3	2	3	3

Mapping Scale

3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation

MAPPING OF COURSE OUTCOMES WITH PROGRAMME SPECIFIC OUTCOMES (PSOs)

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	3	2	2	1	2
CO3	3	3	2	2	2
CO4	2	3	3	2	3
CO5	2	2	3	3	3
Weightage	13	12	11	9	12
Weighted Percentage of Course Contribution to PSOs	2.6	2.4	2.2	1.8	2.4

Mapping Scale

3 – Strong Correlation, 2 – Moderate Correlation, 1 – Low Correlation