TWO YEAR POST GRADUATION COURSE IN ZOOLOGY

M.Sc. Zoology (III & IV Sem.)

Semester	Course Type-Course Title	Course Code	Paper	Semester	Credit	Max. Marks	Min. Marks	CIA	ESE
III	Research Methodology	ZOSC-09T	T	III	4	100	40	30	70
	Characteristics, Classification and Gross Morphology of Insects	ZOSE-13T	T	III	3	100	40	30	70
	Insect Physiology, Applied Entomology	ZOSE-14T	T	III	3	100	40	30	70
	Limnology and Ichthyology	ZOSE-15T	T	III	3	100	40	30	70
	Aquaculture and Culture Fisheries	ZOSE-16T	T	III	3	100	40	30	70
	Lab Course I: Based on ZOSE-13&14	ZOSE-17P	P	III	2	50	20	15	35
	Lab Course II: Based on ZOSE-15&16	ZOSE-18P	P	III	2	50	20	15	35
				Total	**20**	**600**			
IV	**Research Work & Dissertation**	ZORD-01		IV					
	A. Topic Selection and Literature Review				2	50	20		
	B. Research Methodology				2	50	20		
	C. Experimental Work / Data Collection				8	200	80		
	D. Report Writing and Documentation				4	100	40		
	Internship/Training/Project	ZOITP-01			2	100	40		
	Seminar	ZOS-01			2	100	40		
				Total	20	600			
	Grand Total				80	1200			

Name and Signature of Convener and Members of CBo

Abhishek Gupta

S K Dutta

Sumita Pandey

Kalpana Mandawat

Part – A: Introduction

Program: Master In Zoology		Semester - III	Session: 2025-26
1	Course Code	ZOSC- 09T	
2	Course Title	Research Methodology	
3	Course Type	Discipline Specific Course (DSC)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcome (CLO)	At the end of this course, student will be able to ➢ Understand the fundamentals of research including objectives, motivation, types, and characteristics of good research. ➢ Formulate a research problem, hypothesis, and objectives effectively using literature review. ➢ Design and evaluate research designs with an understanding of errors and reliability. ➢ Apply measurement, scaling, and sampling techniques in research instrument development. ➢ Use appropriate data collection methods and tools for both qualitative and quantitative research. ➢ Perform data analysis using software tools like MS Excel and SPSS	
6	Credit Value	04 Credits	Credit = 15 Hours – Learning and Observation
7	Total Marks	Max. Marks: 100	Minimum Pass marks – 40

PART B: CONTENT OF THE COURSE

Total No. of Teaching/Learning Periods: 150 days

Unit	TOPIC (Course Contents)	No. of Periods
I	**Introduction:** Meaning, objectives and motivations in research, Characteristics and limitations of research, Components of research work, Criteria of good research, Research process – Types of Research, Fundamental, Pure or Theoretical Research, Applied Research, Descriptive Research, Evaluation Research – Experimental Research, Survey Research, Qualitative Research, Quantitative Research, Historical Research.	15
II	**Research Design Research Design** – Definition – essentials and types of research design – errors and types of errors in research design. Research problem: Selecting and analysing the research problem – problem statement formulation – formulation of hypothesis. Literature review: purpose, sources, and importance - literature review procedure. Objectives: Learning Objectives; Definitions; Formulation of the research objectives.	15
III	**Measurement. Scaling and Sampling** Variables in Research – Measurement and scaling, Different scales – Construction of instrument – Validity and Reliability of instrument. Data Collection methods – primary and secondary data – Construction of questionnaire and instrument – validation of instruments. Sample size determination - Sample design and sampling techniques. Data Analysis and Tools Processing of Data: Editing of Data – Coding of Data – Classification of Data – Statistical Series.	15
IV	**Research Ethics and Integrity and Research Writing**: Application of statistical software Excel, SPSS for data analysis. Research Report Writing Research report, Different types, Contents of report, report writing, the role of audience, readability, final proof, report format, title of the report, Research paper, Review Article Ethical issues in research: Code of Ethics in Research,	15

	Ethics and Copy rights, Patents, Industrial designs, Trademarks. Thesis Report, Importance of Ethics in Research, Intellectual property Right (IPR), Plagiarism, AI tools in Research	
Keywords	**Research Design, Hypothesis, Sampling & Scaling, Data Analysis (SPSS/Excel), Research Ethics, IPR**	

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Book Recommended:

1. Research Methodology: Methods and Techniques" by C.R. Kothari and Gaurav Garg
2. Business Research Methods" by Donald R. Cooper and Pamela S. Schindler
3. Research Methods for the Behavioral Sciences" by Frederick J. Gravetter and Lori-Ann B. Forzano
4. Social Research Methods" by Alan Bryman
5. The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams

Online Resources – e-Resources/e-Books and e-learning portals

1. https://ndl.iitkgp.ac.in/
2. https://www.researchgate.net/
3. https://swayam.gov.in/
4. https://www.coursera.org/courses?query=research%20methods
5. **https://onlinecourses.nptel.ac.in/noc23-ge15/preview**

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 Marks
Continuous Internal Assessment: 30 Marks
End Semester Exam: 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/Quiz - **(2)**: **20+20** Assignment/Seminar – **10** Total Marks - **30**	Better Marks out of the two Test/Quiz + Obtained marks in Assignment Shall be Considered against **30** marks
End Semester Exam (ESE):	**Two Section – A & B** **Section A: Q1. Objective 10 × 1 = 10 Mark, Q2. Short answer type - 5×4 = 20 Marks** **Section B: Descriptive answer type qts., 1 out of 2 from each unit - 4×10 = 40 Marks**	

Name and Signature of Convener and Members of CBoS

Part – A: Introduction

Program: Master In Zoology		Semester - III	Session: 2025-26
1	Course Code	ZOSE-[illegible]13T	
2	Course Title	INSECT BIOLOGY AND PHYSIOLOGY PAPER – I CHARACTERISTICS, CLASSIFICATION AND GROSS MORPHOLOGY OF INSECT	
3	Course Type	[illegible] DSE	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcome (CLO)	At the end of this course, student will be able to ➢ Describe the general characteristics and classification of insect groups with key examples. ➢ Understand insect body morphology, including head, thorax, abdomen appendages, and integument. ➢ Explain the structure and function of respiratory, circulatory, and nervous systems in insects. ➢ Analyze insect sensory organs, including simple and compound eyes and image formation mechanisms.	
6	Credit Value	04 Credits	Credit = 15 Hours – Learning and Observation
7	Total Marks	Max. Marks: 100	Minimum Pass marks – 40

PART B: CONTENT OF THE COURSE

Total No. of Teaching/Learning Periods: 150 days

Unit	TOPIC (Course Contents)	No. of Periods
I	General characteristics of insects 2. Classification of different groups of insects with important examples	15
II	Study of the morphology and various organ systems of 1. Appendages of insects (head, thoracic and abdominal) 2. Integument in insect 3. Respiratory structure of insects	15
III	Blood, blood vessels and pumping organ in insects 2. Nervous system of insects (primitive and advance) 3. Sense organ of insects Structure of simple eye in insects 2. Compound eye 3. Mechanism of image formation	15
IV	Reproductive system in insects 2. Metamorphosis (types) 3. Endocrinal regulation of metamorphosis	15
Keywords	Insect Classification, Appendages & Integument, Nervous & Sensory Systems, Metamorphosis	

Name and Signature of Convener and Members of CBo

Abhishek

SK Dutta

Kalpana Mandaval

Sumita Pandey

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Book Recommended:

1. Insect Structure and Function - R.F. Chapman
2. General and Applied Entomology - Little
3. Insect Physiology- Wiggilsworth

Online Resources – e-Resources/e-Books and e-learning portals

1. https://www.huck.psu.edu/assets/uploads/documents/Introduction-to-Insects.pdf
2. https://davuniversity.org/images/files/study-material/ento%20(1).pdf
3. https://library.uniteddiversity.coop/More_Books_and_Reports/Encyclopedia_of_Insects.pdf
4. https://www.royensoc.co.uk/understanding-insects/classification-of-insects/
5. https://www.fast-growing-trees.com/pages/insect-classification

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 Marks
Continuous Internal Assessment: 30 Marks
End Semester Exam: 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/Quiz - (2): Assignment/Seminar – Total Marks -	**20+20** **10** **30**	Better Marks out of the two Test/Quiz + Obtained marks in Assignment Shall be Considered against **30** marks
End Semester Exam (ESE):	**Two Section – A & B** **Section A: Q1. Objective 10 × 1 = 10 Mark, Q2. Short answer type - 5×4 = 20 Marks** **Section B: Descriptive answer type qts., 1 out of 2 from each unit - 4×10 = 40 Marks**		

Name and Signature of Convener and Members of CBo

Part – A: Introduction

Program: Master In Zoology		Semester - III	Session: 2025-26
1	Course Code	ZOSE-[illegible]14T	
2	Course Title	INSECT BIOLOGY AND PHYSIOLOGY PAPER – II INSECT PHYSIOLOGY and APPLIED ENTOMOLOGY	
3	Course Type	[illegible] DSE	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcome (CLO)	At the end of this course, student will be able to ➢ Understand insect physiology related to nutrition, digestion, circulation, respiration (aquatic and terrestrial), and excretion. ➢ Explain neuroendocrine and chemical communication mechanisms in insects, including the role of pheromones. ➢ Analyze physiological mechanisms of salt-water balance, vision, and muscle movement in insects. ➢ Explore insect social behaviours and their ecological significance. ➢ Identify major insect pests of crops and apply principles of integrated pest management (IPM).	
6	Credit Value	04 Credits	Credit = 15 Hours – Learning and Observation
7	Total Marks	Max. Marks: 100	Minimum Pass marks – 40

PART B: CONTENT OF THE COURSE

Total No. of Teaching/Learning Periods: 150 days

Unit	TOPIC (Course Contents)	No. of Periods
I	Physiology of nutrition, digestion in insects, Physiology of circulation and Haemocyte in insect, Physiology of terrestrial respiration 2. Physiology of aquatic respiration	15
II	Physiology of chemical communication, Neuroendocrinal physiology and its influence, Pheromones	15
III	Regulation of salt and water in insect 2. Muscular system and movement, Mechanism of vision in insect	15
IV	Social behaviour in insect, Insect pests of crop 3. Insect pest management, Applied Entomology Apiculture 2. Sericulture 3. Lac-culture	15
Keywords	**Insect Physiology, Pheromones & Neuroendocrine System, Insect Pest Management (IPM), Apiculture, Sericulture, Lac-culture**	

Name and Signature of Convener and Members of CBo

Part – C: Learning Resources

Text Books, Reference Books and Others
Text Book Recommended: 1. Insect Structure and Function - R.F. Chapman 2. General and Applied Entomology - Little 3. Insect Physiology- Wiggilsworth 4. Physiology of Insecta by Barrington 5. General and Applied Entomology by K.K. Nayer 6. Medical Physiology by Bijlani
Online Resources – e-Resources/e-Books and e-learning portals 1. https://zoologynotes.com/insect-endocrine-system/ 2. https://www.bioexplorer.net/ 3. https://mlsu.ac.in/econtents/1208_Insect%20Anatomy%20and%20Physiology%20%E2%80%93%20I,II,III&IV.pdf 4. https://www.scientificpubonline.com/websitehome/downloadanyfile?key=zPQze8lX8ysvqqfUIo85U0u5DgAWo2ua/itu4fSthce0C3KSdbAMmj4AvztcbAQnt/r8w9t9hdVa9IvchxN3UvpVm1hyHlgJDtqwVLhDpnnEzn3I5j1isQ== 5. https://davuniversity.org/images/files/study-material/ento%20(1).pdf
Part – D: Assessment and Evaluation
Suggested Continuous Evaluation Methods: **Maximum Marks: 100 Marks** **Continuous Internal Assessment: 30 Marks** **End Semester Exam: 70 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/Quiz - (2): Assignment/Seminar – Total Marks -	20+20 10 30	Better Marks out of the two Test/Quiz + Obtained marks in Assignment Shall be Considered against 30 marks
End Semester Exam (ESE):	**Two Section – A & B** **Section A: Q1. Objective 10 × 1 = 10 Mark, Q2. Short answer type - 5×4 = 20 Marks** **Section B: Descriptive answer type qts., 1 out of 2 from each unit - 4×10 = 40 Marks**		

Name and Signature of Convener and Members of CBo

Part – A: Introduction			
Program: Master In Zoology		**Semester - III**	**Session: 2025-26**
1	**Course Code**	**ZOSE-16**	
2	**Course Title**	**FISH AND FISHERIES AND AQUACULTURE PAPER – I LIMNOLOGY & ICHTHYOLOGY**	

1	Course code	ZOSE-15T	
2	Course Title	Limnology and Ichthyology	
3	**Course Type**	DSE	
4	**Prerequisite (If Any)**	**As per Program**	
5	**Course Learning Outcome (CLO)**	**At the end of this course, student will be able to** ➢ Understand general characteristics and classification of Pisces and major fish groups (Placoderms, Acanthodes, Chondrichthyes, Osteichthyes, Dipnoi, Crossopterygii). ➢ Describe the anatomical and physiological adaptations of fishes including fins, skin, swim bladder, and major Indian carps. ➢ Analyze physical and chemical characteristics of aquatic ecosystems (lotic & lentic), eutrophication, and water quality. ➢ Understand structure and ecology of aquatic systems, including rivers, lakes, reservoirs, seas, estuaries, and fish ponds.	
6	**Credit Value**	**04 Credits**	**Credit = 15 Hours – Learning and Observation**
7	**Total Marks**	**Max. Marks: 100**	**Minimum Pass marks – 40**

PART B: CONTENT OF THE COURSE

Total No. of Teaching/Learning Periods: 150 days

Unit	TOPIC (Course Contents)	No. of Periods
I	General characteristics and classification of Pisces, Characteristics, phylogeny and affinities of Placoderms and Acanthodes, Characteristics, phylogeny and affinities of Chondrichthyes, Characteristics, phylogeny and affinities of Osteichthyes, Dipnoi and Crossopterygii	15
II	Physical characteristics of water, Chemical characteristics of water 3. Lotic ecosystem 4. Lentic ecosystem, Eutrophication; Integument (skin and derivatives), Median and paired fins of fishes, General anatomy of fish, Swim bladder in fishes, Major Indian carp	15
III	Marine fisheries of India (fishery, yield assessment, gear and crafts and conservation), Estuarine fisheries of India (estuary, types and fishery), Riverine fisheries (river system and fisheries), Cold water fisheries (indigenous and exotic), Fisheries of reservoir and pond	15
IV	Ecology of aquatic ecosystem (a) Rivers and streams (b) Reservoirs (c) Lakes (d) Brackish water (e) Sea (f) Fish farm pond, Planktons and their economic use, Pollution of water bodies, Effect of pollutants on fish life, Control and abatement of pollution, Aquarium and aquarium fishes	15
Keywords	**Fish Classification & Phylogeny, Aquatic Ecosystems (Lotic, Lentic), Indian Fisheries, Aquaculture**	

Name and Signature of Convener and Members of CBo

Part – C: Learning Resources
Text Books, Reference Books and Others

Text Book Recommended:

1. 1. Source book for the inland fishery resources of Africa -J.P. Vanden, Bossche, G.M. Bernacsek
2. Capture based Aquaculture- F. Ottolenglin, F. Silvestri
3. Gloom and doom the future of marine capture fisheries- S. M. Garcia and Grainger
4. Technological trends in capture fisheries- J.W. Walde, Marsen 2001
5. Aquaculture and fisheries - Wageningen, U.R.
6. Fish farming Aquaculture Commerical fishing - www.ftai.com.
7. Aquaculture fisheries and fish Science – Wiley

Online Resources – e-Resources/e-Books and e-learning portals

1. **https://libguides.lib.msu.edu/c.php?g=96186&p=626052**
2. **https://nibmehub.com/opac-service/pdf/read/Aquaculture%20and%20Fish%20Farming-%20Marshal.pdf**
3. **https://nfdb.gov.in/PDF/Fish%20&%20Fisheries%20of%20India/1.Fish%20and%20Fisheries%20of%20India.pdf**
4. **https://catalog.uaf.edu/courses/fish/**

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 Marks
Continuous Internal Assessment: 30 Marks
End Semester Exam: 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/Quiz - **(2):** Assignment/Seminar – Total Marks -	**20+20** **10** **30**	Better Marks out of the two Test/Quiz + Obtained marks in Assignment Shall be Considered against **30** marks
End Semester Exam (ESE):	**Two Section – A & B** **Section A: Q1. Objective 10 × 1 = 10 Mark, Q2. Short answer type - 5×4 = 20 Marks** **Section B: Descriptive answer type qts., 1 out of 2 from each unit - 4×10 = 40 Marks**		

Name and Signature of Convener and Members of CBo

Part – A: Introduction		
Program: Master In Zoology	**Semester - III**	**Session: 2025-26**

1	**Course Code**	**ZOSE-16T**	
2	**Course Title**	**FISH AND FISHERIES AND AQUACULTURE PAPER – II AQUACULTURE AND CULTURE FISHERIES**	
3	**Course Type**	DSE	
4	**Prerequisite (If Any)**	**As per Program**	
5	**Course Learning Outcome (CLO)**	**At the end of this course, student will be able to** Understand the aims, objectives, and strategies of aquaculture and its significance in food security and economy. ➢ Analyze physico-chemical and biological features of fish ponds, including planning, construction, and maintenance. Identify and manage common problems in aquaculture such as weeds, predators, and weed fishes. ➢ Recognize principal cultivable fish species, and apply techniques in fish seed collection, transport, and induced breeding.	
6	**Credit Value**	**04 Credits**	**Credit = 15 Hours – Learning and Observation**
7	**Total Marks**	**Max. Marks: 100**	**Minimum Pass marks – 40**

PART B: CONTENT OF THE COURSE

Total No. of Teaching/Learning Periods: 150 days

Unit	TOPIC (Course Contents)	No. of Periods
I	Aquaculture (aims, objectives, strategies adopted), Physico-chemical and biological characteristics of fish ponds, Fish ponds (planning, construction, layout), Maintenance and improvement of the fish farm, Control of weed fish and predators	15
II	Principal cultivable fisheries, Fish seed (collection, identification and transportation), Induced breeding in fishes, Composite fish culture	15
III	Integrated Fish Culture, Paddy field fish culture, Sewage fed fisheries, Larvicidal fishes (characteristics, propagation and introduction in water bodies), Exotic fishes, Open water stocking and ranching	15
IV	Harvesting the fishes (harvesting, sorting, preservation and processing), Fish production and by-products, Transportation and marketing, Fish disease and their control, Prawn fisheries (capture and culture).	15
Keywords	**Aquaculture Techniques, Fish Breeding, Fish Pond Management, Fish Farming**	

Name and Signature of Convener and Members of CBo

Part – C: Learning Resources
Text Books, Reference Books and Others

Text Book Recommended:

1. Aquaculture and fisheries - Wageningen, U.R.
2. Fish farming Aquaculture Commerical fishing - www.ftai.com
3. Aquaculture fisheries and fish Science – Wiley
4. Source book for the inland fishery resources of Africa -J.P. Vanden, Bossche, G.M. Bernacsek
5. Capture based Aquaculture- F. Ottolenglin, F. Silvestri
6. Gloom and doom the future of marine capture fisheries- S. M. Garcia and Grainger
7. Technological trends in capture fisheries- J.W. Walde, Marsen 2001

Online Resources – e-Resources/e-Books and e-learning portals

1. **https://igor.crew.c-base.org/aquaculture.pdf**
2. **https://www.fisheries.noaa.gov/national/aquaculture/aquaculture-references-and-further-reading**
3. **https://awionline.org/content/fish-farming-and-aquaculture**
4. **https://www.cabidigitallibrary.org/subject-areas/aquaculture-fisheries**
5. **https://www.fao.org/publications/fao-flagship-publications/the-state-of-world-fisheries-and-aquaculture/en**

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 Marks
Continuous Internal Assessment: 30 Marks
End Semester Exam: 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/Quiz - **(2)**: Assignment/Seminar – Total Marks -	**20+20** **10** **30**	Better Marks out of the two Test/Quiz + Obtained marks in Assignment Shall be Considered against **30** marks
End Semester Exam (ESE):	**Two Section – A & B** **Section A: Q1. Objective 10 × 1 = 10 Mark, Q2. Short answer type - 5×4 = 20 Marks** **Section B: Descriptive answer type qts., 1 out of 2 from each unit - 4×10 = 40 Marks**		

Name and Signature of Convener and Members of CBo

TWO YEARS POSTGRADUATE PROGRAMM IN ZOOLOGY
(M.Sc. Zoology)

Course Curriculum

2025-26

M.Sc. SEM III (Zoology)		Year: 2025	Session:2025-26
PART-A: Introduction			
1	Course Code	ZOSE-131 P	
2	Course Title	Based on ZOSE-13&14	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Outcome (CLO)	At the end of this course student will be able to ➢ Studying the physical structure and forms of insects. ➢ Examining the functions of insect organs and systems. ➢ Investigating the interaction between insect and their environment. ➢ Applying the entomological knowledge on management of different insect colonies. ➢ Developing different strategies for controlling insect population that damage crops and vector for different diseases.	
6	Credit Value	1 C	Credit = 30 Hrs. of Practical/ Field Work
7	Total Marks	Max. Marks :50	Minimum Pass marks – 20

PART B: CONTENT OF THE COURSE

Total No. of Teaching/Learning Periods:30Hours

Module	TOPIC (Course Contents)	No. of Periods
Lab./Field Training/Experiment contents of Course	1. Study of different insects through museum specimen. 2. To study the histological slides of insects and their preparation. 3. Major Dissection: Grasshopper and Cockroach (Digestive, Nervous, and Reproductive system) 4. Minor Dissection: Sting apparatus of Honey Bee, Tentorium of Grasshopper. 5. [illegible] 6. Spotting. 7. Viva.	30
Keyword	Taxonomy, Comparative Anatomy, Dissection, Insect Diversity	

Name and Signature of Convener and Members of BOS

PART:C

Learning Recourses: Textbooks, Reference Books and Others

Textbooks Recommended:

1. Insect Structure and Function - R.F. Chapman
2. General and Applied Entomology - Little
3. Insect Physiology- Wiggilsworth

Online Recourses:

1. https://www.histology.leeds.ac.uk/
2. https://www.olabs.edu.in/
3. https://praxilabs.com/
4. https://human.biodigital.com/login?returnUrl=/studio
5. https://animaldiversity.org/
6. https://indiabiodiversity.org/

PART D: Assessment And Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal Test/Quiz - (2):** **Assignment/ Seminar + Attendance: 05** **Total marks:**	**10 & 10** **15**	Better Marks out of twoTest/Quiz + Obtained marks in Assignment shall be considered against 15 marks
End Semester Exam (ESE):	**Laboratory /Field Skill Performance: On spot Assessment** **Perform the Task based on lab. Work –** **Spotting based on tools and technology (written)–** **Viva-voce (based on principle/technology)-**	**20Marks** **10 Marks** **05Marks**	**Managed by course teacher as per lab. status**

PART : A Introduction			
1	Course Code	ZOSE-1516P	
2	Course Title	Based on ZOSE-15&16	
3	Course Type	Laboratory Course	
4	Prerequisite(IfAny)	As per Program	
5	Course Outcome (CLO)	At the end of this course, student will be able to ➢ To develop strong understanding of indian carps, exotic carps etc. ➢ To understand the anatomy and physiology of fishes ➢ To develop processes involved in fish processing and conservation. ➢ To develop various aquaculture techniques in breeding and hatchery management etc. ➢ Understand fish physiology and diseases.	
6	Credit Value	1 C	Credit = 30Hrs. of Practical/ Fieldwork
7	Total Marks	Max.Marks:50	Minimum Pass marks – 20

PART B:CONTENT OF THE COURSE

Total No. of Teaching/Learning Periods:30Hours

Module	TOPIC (Course Contents)	No. of Periods
Lab./Field Training/Experiment contents of Course	1. Identification of different types of phytoplanktons and zooplanktons. 2. Identification of fish eggs, fish fries, and fingerlings. 3. Study of different types of fishes through museum specimens. 4. Identification of aquatic weeds and aquatic insects. 5. Major dissection of fishes (Indian major carp/ exotic carp/ cat fish), dissection/ clay models 6. Chemical analysis of water (DO, pH, BOD, COD, Turbidity, alkalinity, etc.) 7. Viva	30
keyword	Exotic Fish, Cat Fishes, Water quality analysis, Planktons	

PART:C

Learning Recourses: Textbooks, Reference Books and Others

Textbooks Recommended:

1. 1. Source book for the inland fishery resources of Africa -J.P. Vanden, Bossche, G.M. Bernacsek
2. 2. Capture based Aquaculture- F. Ottolenglin, F. Silvestri
3. 3. Gloom and doom the future of marine capture fisheries- S. M. Garcia and Grainger
4. 4. Technological trends in capture fisheries- J.W. Walde, Marsen 2001
5. Aquaculture and fisheries - Wageningen, U.R.
6. Fish farming Aquaculture Commerical fishing - www.ftai.com.
7. Aquaculture fisheries and fish Science – Wiley

Online Recourses:

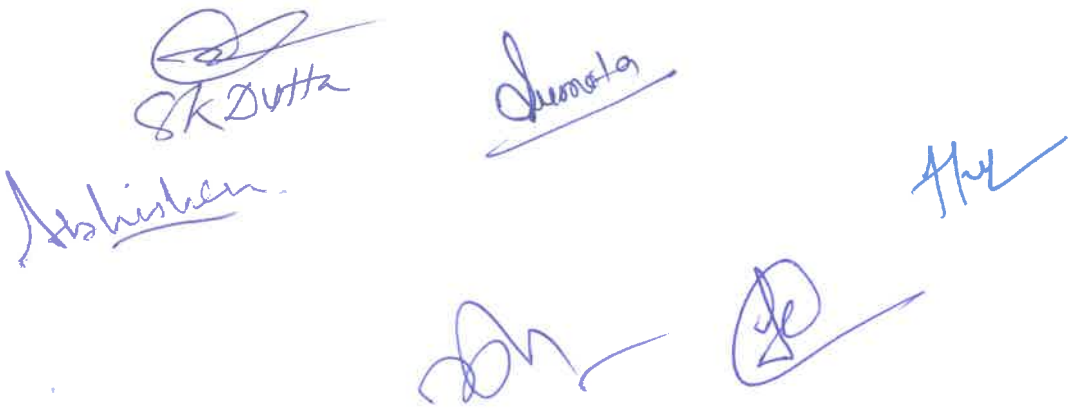
1. https://learn.genetics.utah.edu/
2. https://www.biologycorner.com/worksheets/hardy-weinberg-simulator.html
3. https://www.socscistatistics.com/tests/chisquare2/default2.aspx
4. https://openstax.org/books/biology/pages/12-2-laws-of-inheritance
5. https://evolution.berkeley.edu/

PART D:Assessment And Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 Marks
Continuous Internal Assessment (CIA): 15 Marks
End Semester Exam(ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal Test/Quiz - (2):** **10 & 10** **Assignment/ Seminar + Attendance: 05** **Totalmarks: 15**	Better Marks out of twoTest/Quiz+ Obtained marks in Assignment shall be considered against 15 marks	
End Semester Exam (ESE):	**Laboratory /Field Skill Performance: On spot Assessment** **Perform the Task based on lab. Work – 20 Marks** **Spotting based on tools and technology (written)–10 Marks** **Viva-voce (based on principle/technology)- 05 Marks**		**Managedbycourse teacher as per lab. status**

Name and Signature of Convener and Members of CBoS



Part – A: Introduction				
Program: Master In Zoology		Semester - IV		Session: 2024-25
1	Course Code	ZORD-01		
2	Course Title	Dissertation / Research Project		
3	Course Type	Core (Research-Based)		
4	Prerequisite (If Any)	As per Program		
5	Course Learning Outcome (CLO)	At the end of this course, student will be able to ➢ To develop independent research skills and scientific inquiry among students. ➢ To train students in experimental design, data collection, analysis, and interpretation. ➢ To promote critical thinking and problem-solving in real-world research contexts. ➢ To strengthen students' abilities in scientific writing, reporting, and communication. ➢ To inculcate ethical research practices, teamwork, and professional conduct.		
6	Credit Value	20 Credits	Credit = 15 Hours – Learning and Observation	
7	Total Marks	Max. Marks: 600	Minimum Pass marks – 240	

PART B: CONTENT OF THE COURSE

Total No. of Teaching/Learning Periods: 150 days

Unit	TOPIC (Course Contents)	No. of Periods
I	**Topic Selection and Literature Review**: Identifying the research problem, Literature Review, Framing objectives and hypotheses	15
II	**Research Methodology**: Research design and techniques, Materials, tools, instruments, Ethical considerations, Scientific Documentation	15
III	**Experimental Work / Data Collection:** Problem Selection and Formulation, Data Sampling Methods, Hands-On Laboratory/Field Work, Primary or Secondary Data Generation, Observations and Record Maintenance. Data Analysis and Interpretation - Statistical Methods / Software Tools, Graphical and Tabular Representation, Discussion in Relation to Objectives	90
IV	**Report Writing and Documentation**: Dissertation Structure: Introduction, Methodology, Results, Discussion, Conclusion, Citations and References (APA/MLA/Vancouver Style), Annexures (Plagiarism Report, Raw Data, Photographs, Etc.)	30

Name and Signature of Convener and Members of CBoS

Part – C : Learning Resources

Text Books, Reference Books and Others

Text Book Recommended :

- Zar, J.H. – *Biostatistical Analysis*
- Norman & Streiner – *Biostatistics: The Bare Essentials*
- Rosner, B. – *Fundamentals of Biostatistics*

Reference Books :

- Kothari, C.R. – *Research Methodology: Methods and Techniques*
- Wayne Goddard & Stuart Melville – *Research Methodology: An Introduction*
- Robert V. Hogg & Johannes Ledolter – *Applied Statistics for Engineers and Physical Scientists*
- Day, R.A. & Gastel, B. – *How to Write and Publish a Scientific Paper*

Online Resources – e-Resources/e-Books and e-learning portals

- https://scholar.google.com
- https://pubmed.ncbi.nlm.nih.gov
- https://www.sciencedirect.com
- https://www.researchgate.net
- https://shodhganga.inflibnet.ac.in
- https://www.scopus.com
- https://link.springer.com

Part – D : Assessment and Evaluation

Suggested Continuous Evaluation Methods :
Maximum Marks : 600 Marks
Continuous Internal Assessment : 250 Marks
End Semester Exam : 350 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Synopsis Preparation & Research Proposal :** 50 **Two Month Progress Evaluation (1st) :** 100 **Two Month Progress Evaluation (2nd) :**100 **Total Marks - 250**
End Semester Exam (ESE) :	**Two Section – A & B** **Section A : Q1. Experimental Work & Diligence =** 75 Marks **, Q2. Final Dissertation Report –** 75 Marks **Section B :** Presentation & Viva-Voce = **100 Marks**

Name and Signature of Convener and Members of CBoS

SK Dutta

Kalpana Mandawoi

Sumita

Sumit Pandey