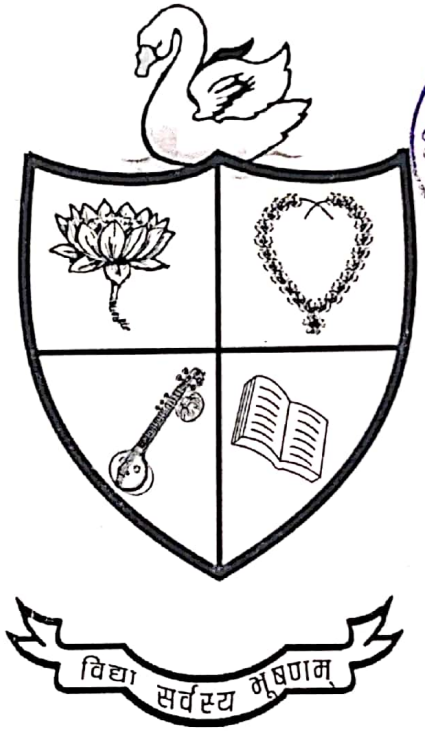
GOVT. DIGVIJAY P.G. AUTONOMOUS COLLEGE
RAJNANDGAON (C.G.)

DEPARTMENT OF ZOOLOGY



M.Sc. Zoology Semester I – IV

Syllabus

(2021 – 2022)

GOVT. DIGVIJAY COLLEGE RAJNANDGAON
DEPARTMENT OF ZOOLOGY
(2021 - 2022)

Syllabus based on Credit Based System

At post-graduate level, candidates are required to study 16 Paper in I[st], II[nd], III[rd] and IV[th] semester examination (4 - papers in each semester). There will be sixteen papers in each post-graduate examination in zoology containing 80 credits. In first, second, third and fourth semester, each paper carry 100 marks (80 marks for external examination and 20 marks for internal examination). All four semester including two practical, each practical is containing 100 marks. There shell be 2400 marks in M.Sc. Candidates shall have to secure 36 percent marks in aggregate of all papers in order to pass the M.Sc. Examination. (Semester IV has two optional SUBJECTs, Elective A & Elective B, out of which student has choose to option one).

Semester	Title of Paper	Credits
I[st] SEMESTER	I. Structure and Functions in Invertebrates	4
	II. Biosystematics And Taxonomy	4
	III. Comparative Anatomy of Vertebrates	4
	IV. Population Ecology and Quantitative Biology.	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
		20
II[nd] SEMESTER	I. Molecular Cell Biology	4
	II. Environmental Physiology & Ecology	4
	III. General and Comparative Endocrinology	4
	IV. Tools and Techniques in Biology	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
		20
III[rd] SEMESTER	I. Animal Behaviour	4
	II. Population Genetics and Evolution	4
	III. Gamete and Developmental Biology	4
	IV. Comparative Physiology of Vertebrates	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
		20
IV[th] SEMESTER	**Elective A: Fish & Fisheries and Aquaculture**	
	I. Limnology	4
	II. Ichthyology	4
	III. Capture Fisheries	4
	IV. Fisheries and Aquaculture	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
		20
IV[th] SEMESTER	**Elective B: Insect Biology & Physiology**	
	I. Characteristics, classification & Types	4
	II. Gross Morphology of Insects	4
	III. Insect Physiology	4
	IV. Behavior and Economic Importance.	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
	Total Credits	80

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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV
Elective A: Fish & Fisheries and Aquaculture
Paper –I
Limnology PZOCT-401

M.M. 80

Objectives: - This syllabus contains information of limnological study of fresh water. Students find detail information of water quality management detailed study of plankton. How water quality affected by sewage water study of different physic-chemical parameters.

Unit I –

1. Characteristics of water
2. Lotic ecosystem
3. Rivers and lake-forms and origin of lake
4. Lentic ecosystem

Unit II-

1. Pond ecosystem and communities
2. Phytoplankton of fresh water
3. Zooplankton of fresh water
4. Estuaries

Unit III -Physical condition of water

1. Light (light as a limiting factors, penetration, thermal radiation)
2. Heat (thermal stratification, flow of heat,)
3. Water (properties of water, hydrological cycle, global water balance)
4. Water movement (flow of water, motion in epilimnion, motion in thermocline, motion in hypolimnion)

Unit IV- Chemical component of fresh water

1. Oxygen (oxygen as a limiting factors, measurement in waters, pollution monitoring and productivity measurement)
2. Carbon complex (carbon as a limiting factor, productivity measurement, seasonal variations, utilization)
3. Nitrogen (cycle, forms of N_2 in lakes, seasonal distribution, nitrogen fixation and Di-nitrification)
4. Phosphorus (distribution, cycle, recycling)
5. Iron, silica and sulphur (cycle, bacterial transformation)

SUGGESTED READING MATERIAL

1. Fundamental of limnology. Arvind kumar ,APH Publication,2005
2. T G, Wetze Limnology, Third Edition; Lake and River Ecosystem.
3. Fresh water Ecology, Second Edition; Concept and Environmental Application of Limnology (Aquatic Ecology), Walter K. Dodds, Matt R Whiles.

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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV
Elective A: Fish & Fisheries and Aquaculture
Paper –II PZOCT-402
ICHTHYOLOGY

M.M. 80

Objectives: - This syllabus contains study of general characters, classification and phylogeny of fishes and fish biology and fish anatomy.

UNIT – I - General Characteristic & Classification of Fish

1. Placoderm
2. Chondrichthyes
3. Osteichthyes
4. Holocephali
5. Dipnoi

UNIT – II - Anatomy:-

1. Integuments (Skins and its derivatives)
2. Medium paired Fins of Fishes
3. Food and Alimentary canal, Modification of Alimentary canal
4. Blood Vascular System
5. Respiration- Respiratory Organs and Mechanism, A.R.O.

UNIT-III

1. Swim bladder- structure & functions
2. Nervous system
3. Sense organs (eye, membranous labyrinth, lateral line system)
4. Endocrine glands in fishes
5. Fish diseases and their control

UNIT-IV

1. Excretion (structure of kidney , histology)
2. Osmoregulation – in marine and fresh water fishes
3. Reproduction and development
4. Hatching and post embryonic development
5. Parental care in fishes.

SUGGESTED READING MATERIAL

1. Anintroduction to Fishes S.S. Khanna.
2. Fish and Fisheries R.P.Parihar.
3. Fisheries and Aquaculture R.C. Gupta and P.K. Gupta-
4. Biology of Fishes - Jingran.

H Thakur
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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV
Paper –I Elective A: Fish & Fisheries and Aquaculture

LAB COURSE I BASED ON PAPER I& II **MM 100**

P20CL-405

1. Chemical analysis of pond water (DO, Temperature, Free Carbon dioxide , pH, Transparency, Conductivity, Turbidity and Alkalinity)
2. Study of representative fishes form museum specimens.
3. Study of histology through permanent slide of fish.
4. Dissections to show cranial nerve and accessories respiratory organ. (presentation through alternative technique)

EXAMINATION SCHEME.

1.	Major dissection of fish	=	20
2.	Minor dissection of fish	=	10
3.	Spotting	=	20
4.	Physcio-chemical parameter test of fresh water pond	=	20
5.	viva-voce	=	10
6.	Sessional	=	20
	Total	=	100 Marks

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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV
Elective A: Fish & Fisheries and Aquaculture
Paper –III P20CF-403
CAPTURE FISHERIES **MM 80**

Objectives: - This syllabus contains study of general characters, food commodity, diversity, Ecology of aquatic ecosystem of fishes.

UNIT –I

1. Fish as food commodity (Biochemical composition of raw fish and nutritional value of raw fish)
2. Systematic and bionomics of local fresh water fishes.
3. Fishing gear and crafts
4. Unconventional fishing methods (electro fishing, light fishing, ecosound and sonar.)

UNIT-II

1. Marine fisheries of India.
2. Riverine fisheries.
3. Estuarine fisheries.
4. Cold water fisheries.
5. Fisheries of reservoir and pond.

UNIT –III - Ecology of aquatic ecosystem

1. Rivers and streams
2. Reservoirs
3. Lacks
4. Brackish water
5. Ocean
6. Fish farm

UNIT IV

1. Pollution of water bodies
2. Effects of pollutants on fish life
3. Control and abatement of pollution
4. The EEZ concept and its implementation

SUGGESTED READING MATERIAL

1. Source book for the inland fishery resources of Africa.J.P.Vandan,Bossche,G.M.Bernacsek.
2. Capture based Aquaculture F.Ottolenglin, F Silvestri..
3. Technologycal trends in capture fisheries.J.W.Waled, Marsen 2001.
4. Gloom and doom the future of marine capture fisheries.S.M.Garcia and Grainger.

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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV
Elective A: Fish & Fisheries and Aquaculture
Paper –IV PZOCT-404

FISHERIES AND AQUACULTURE MM 80

Objectives: - This syllabus contains study of Aquaculture, Cultivable Fisheries, fish culture and farming of fishes.

UNIT I

1. Aquaculture (aims, objectives, strategies adapted)
2. Physico-chemical and biological characteristics of fish pond.
3. Fish ponds (planning, construction and layout).
4. Maintenance and improvement of the fish form.
5. Aquatic weeds and their control

UNIT II

1. Principle Cultivable Fisheries.
2. Fish Seed (collection, identification and transportation)
3. Induced breeding in fishes
4. Composite fish culture
5. Air breathing fishes

UNIT III

1. Paddy- cum -fish culture.
2. Sewage -fed fish forming.
3. Larvicidal fishes (characteristics, propagation and introduction in water bodies)
4. Exotic Fishes
5. Open water stocking and ranching

UNIT IV

1. Harvesting The Fishes (harvesting, sorting, preservation and processing)
2. Fish by product.
3. Fish Marketing
4. Prawn fisheries (capture and culture)
5. Molluscan fisheries (capture and culture)

Fish disease and their control.

SUGGESTED READING MATERIAL

1. Aquaculture and fisheries. Wageningen,U.R.
2. Fish forming Aquaculture Commerrical fishing WWW.ftal.com.
3. Aquaculture fisheries and fish Science Wiley.

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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV PZOCL-406
Elective A: Fish & Fisheries and Aquaculture

LAB COURSE II – BASED ON PAPER III & IV **MM 100**

1. Identification of phytoplanktons and zooplanktons
2. Study of aquatic weed and aquatic insects
3. Identification of fresh water Fish.
4. To determine the age of fish by scale reading method.
5. Estimation of fish fecundity. (only method)
6. Study of histology through permanent slide of fish (Microtomy only method)

EXAMINATION SCHEME

1.	Identification of Phyto and Zooplankton	=	**10**
2.	Fish identification	=	**20**
3.	Spotting 10	=	**20**
4.	Local fish collection/ determine the age	=	**10**
5.	Fish fecundity	=	**10**
6.	Viva	=	**10**
7.	Sessional	=	**20**
	TOTAL	=	**100 Marks**

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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV
Elective B : Insect Biology And Physiology
Paper –I
CHARACTERISTICS, CLASSIFICATION AND TYPES **M.M 80**

Objectives: - This syllabus contains study of general characters, classification and phylogeny of insects and insect biology and insect anatomy.

UNIT-I

1. General characteristics of insects.
2. Classification of different group of insects with important examples.

UNIT-II

1. Study of the morphology and various organ systems of Periplaneta.

UNIT- III

1. Study of the morphology and various organ systems of Grasshopper

UNIT - IV

1. Reproductive organs and fertilization in insects.
2. Growth and development of insects. (pre-embryonic and post embryonic)

Suggested reading materials

1. Insect structure and function -R.FChapman.
2. General and applied entomology.- Little.
3. Insect physiology- Wigglesworth.

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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV
Elective B ; Insect Biology And Physiology
Paper –II PZOCT-406
GROSS MORPHOLOGY OF INSECTS

M.M.80

Objectives: - This syllabus contains study of morphology and insect anatomy.

UNIT –I

1. 1.Appendages of insects (head, thoracic and abdominal)
2. Integument in insects.
3. Respiratory structure of insects.

UNIT - II

1. Blood vessels and pumping organs in insects.
2. Nervous system in insects.

UNIT-III-

2. Structure of simple eyes in insects.
1. Compound eye
2. Mechanism of image formation

UNIIT - IV

1. Reproductive system in insecct.
2. Metamorphosis
3. Endocrinal regulation of metamorphosis.

Suggested Reading Material

1. An introduction to the study of insects by borer and Delong.
2. Imms entomology by Imms
3. General and Applied Entomology by Nayer.
4. Entomology Text Book by Jack De Angelis.

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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV
Elective B ; Insect Biology And Physiology
Lab Course - (Based on paper I & II) **M M 100**

PZOEL-405

1. Study of insects through museum specimens
2. Identification of insects.
3. Dissection to show different organs.

Examination scheme

1. Major dissection	=	15 marks
2. Minor dissection	=	05 marks
3. Spotting	=	20 marks
4. Identification of insects.	=	10 marks
5. Slide prepration of organ	=	15 mark
6. Viva	=	15 marks
7. Sessional(internal)	=	20 marks
Total =		**100 marks**

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SUBJECT: ZOOLOGY (M.Sc.)
(2021 - 2022)
SEMESTER - IV
Elective B ; Insect Biology And Physiology
PAPER -III
INSECT PHYSIOLOGY MM 80

PZOET-407

Objectives: - This syllabus contains study of morphology of diversified insect.

UNIT - 1

1. Physiology of nutrition, digestion in insect.
2. Intermediary metabolism.
3. Physiology of circulation and hemocyte in insect.

UNIT -II

1. Physiology of Terrestrial respiration.
2. Physiology of aquatic respiration.
3. Physiology of respiration in parasitic insects.

UNIT -III

1. Regulation of salt and water in insect.
2. Muscular system and movement.
3. Physiology of sonification in insects.

UNIT - IV

1. Mechanism of vision in insects.
2. Physiology of chemical communication.
3. Neuro-endocrinal physiology, its influence.
4. Pheromones.

Suggested reading materials:-

1. Physiology of insects by Barrington.
2. General and applied Entomology by K.K. Nayer.
3. Medical physiology by Bijlani.

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SUBJECT: ZOOLOGY (M.Sc.)
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SEMESTER - IV
Elective B ; Insect Biology And Physiology
PAPER - IV
BEHAVIOUR AND ECONOMIC IMPORTANCE

M.M. 80

P20ET- 408

Objectives: - This syllabus contains study of Behaviour, Economic Importance of insect and insect pest management.

UNIT- I

1. Social behavior in insects.
2. Innate and Learned Behaviour and waggle dance.
3. Neuro – physiology basis of behavior.

UNIT-II

1. Adaptive value of insect behavior.
2. Insect pests of corp.
3. Insect pest management.

UNIT -III

1. House holds insects, parasitic insect,
2. Mites, Ticks and their control.
3. Life cycle of Moth and Ants

UNIT –IV

1. Apiculture.
2. Sariculture.
3. Lac- culture

Suggested Reading Materials.

1. General and applied Entomology by K.K. Nayer.
2. Insect physiology By Wigglesworth.

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SUBJECT: ZOOLOGY (M.Sc.)
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SEMESTER - IV
Elective B ; Insect Biology And Physiology
LAB COURSE – II (Based on paper III & IV) **M.M. - 100**

PZOEL-406

1. Dissection to show endocrinal bodies of insects.
2. Identification of insects of economic important (assign taxonomic position.
3. Spots of insects (museum specimens)
4. Histological preparation through microtome.
5. Slide preparation.

Examination scheme

1. Dissection (endocrine gland)	=	15 marks
2. Identification of insects.	=	10 marks
3. Spots (museum specimens -10)	=	20 marks
4. Histology through microtome	=	20 marks
5. Slide preparation.	=	10 marks
6. Viva	=	15 marks
Sessional	=	10 marks
Total	=	**100 Marks**

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