GONDWANAUNIVERSITYGADCHIROLI
SEMESTERSYSTEMSYLLABUS
FOR
M.Sc.Part II
Subject- Zoology,Semester-III,
Paper IX-Parasitology

Unit-I

1.1 Spirochaetesand Ricketsia-Life cycle, modeoftransmission, infection and treatment.

1.2 *Vibrio cholerae*-Life cycle, modeof transmission, infection and treatment.

1.3 *Clostridium titani*-Lifecycle, mode oftransmission, infection and treatment.

1.4 *Yersinia pestis*(Plaguebacteria) -Lifecycle,mode oftransmission, infection and treatment.

Unit-II

2.1Influenza and H1 N1viruses-Lifecycle, modeof transmission, infection and treatment.

2.2 Polio virus -Lifecycle, modeof transmission, infection and treatment.

2.3 Dengue andHepatitis-Lifecycle, mode oftransmission, infection and treatment.

2.4 Rabies virus-Lifecycle, modeof transmission, infection and treatment.

Unit-III

3.1 *Entomoeba*-Lifecycle, modeof transmission, infection and treatment.

3.2 *Trypanosoma*-Lifecycle, mode oftransmission, infection and treatment.

3.3*Leishmania*-Lifecycle, modeof transmission, infection and treatment.

3.4 *Giardia* and *Tricomonas*-Lifecycle, mode oftransmission, infection and treatment.

Unit-IV

4.1*Wuchereria*and *Trichinella*-Lifecycle, mode oftransmission, infection and treatment

4.2 Malaria: pathogen vectors and mode oftransmission, infection and treatment

4.3 Epidemic typhus:-pathogen vectorsand modeof transmission, infection and treatment.

4.4 Toxins and antitoxin.

Paper-X,Immunology

Unit-I

1.1 Immunesystem- innate andadaptiveimmunity.
1.2 Cellsand organsofimmunesystem– hematopoiesis, primaryand secondarylymphoid organs.
1.3 Antigensand antibodies– antigenicity, immunogenicity, antigen– antibodyinteractions, superantigens, antibodydiversity.
1.4 Organization ofimmunoglobulin genes– antibodystructure, heavy, light, kappa,lambdachain generearrangements.

Unit-II

2.1 Complement system– classical,alternative and lectin pathways, regulation ofcomplement system, biological consequencesofcomplement activation.
2.2 Major HistocompatibilityComplex (MHC)- general organizationand inheritanceoftheMHC, MHC moleculesand genes, cellulardistribution andregulationofMHC expression.
2.3 Tcells -maturation, activation and differentiation, Tcell receptors.
2.4 B cells - maturation, activation and differentiation, B cell receptors.

Unit-III

3.1 Cytokines - propertiesofcytokines, cytokinereceptors, cytokinesecretionbyTH1 and TH2 subsets, cytokine-related diseases, therapeuticusesofcytokinesand their receptors.
3.2 Cell mediatedcytotoxicresponses– effectormechanisms, leukocyte activation andmigration.
3.3 Hypersensitivityreactions – types, prevalence, factors, mechanismsoftypeIto IV hypersensitivityreactions.
3.4 Immunetolerance andautoimmunity – central, peripheralandacquiredtolerance, organ specific autoimmunediseases, animalmodels, treatment ofautoimmunediseases.

Unit-IV

4.1 Transplantation immunology– blood antigens, transplantation rejection, graft rejection, familial grafting, tissuetyping, crossmatching, immunosuppression.
4.2 Tumorimmunology– typesand rolesoftumor antigens, immuneresponsetotumor, tumor evasion ofimmunesystem, cancer immunotherapy.
4.3 Immuneresponseto infectiousdiseasesandimmunedefeciences– bacterial, fungal, viral, parasiticdiseasesand AIDS.
4.4 Applicationsofimmunologyand immunotechniques– immunotherapies,immunizationand vaccineproduction, precipitation reaction, agglutination reaction, radioimmunoassay, ELISA.

M.Sc.IISemester-III,
Practical-V,ParasitologyandImmunology

Section-A

1.Studyofdifferent typesofparasiticprotozoan'swith thehelpofalreadyavailablepermanent slides/ ICT tools/ Models/Charts/ Photographsetc.

2. Studyofdifferent typesofparasitichelminthes with thehelpofalreadyavailablespecimens, permanent slides/ ICT tools/ models/charts/ photographsetc.

3. Studyofdifferent typesofinsect vectors with thehelp ofalreadyavailablespecimens, permanent slides/ ICT tools/ models/charts/ photographsetc.

4. Identification and studyof variousectoandendoparasites withthehelp ofalreadyavailable permanent slides/ ICT tools/ models/charts/ photographsetc.

5. Studyofdifferent typesofinsect vectorsand theirmouth parts withthehelpofalreadyavailable specimens, permanent slides/ ICT tools/models/ charts/ photographsetc.

6. Studyoflifecyclesof variousparasites withthehelp ofalreadyavailablespecimens, permanent slides/ ICT tools/ models/charts/ photographsetc.

Section-B

7. Antigen-antibodyreaction.

8. Preparation oftissuesectionsofthymus, spleen, and lymph nodes. (Sourceoftissue: Animal wastesfromlocal recognized slaughter houses/ poultryfarms/ fish marketsetc.)

9.Immunological diagnosisof pregnancy.

10. Agargel diffusion.

11. Demonstration of immunoelectrophoresis.

12.Identification ofTand Bcells.

13. Demonstration ofMast cells. (Sourceoftissue:Animal wastesfromlocalrecognized slaughter houses/ poultryfarms/ fish marketsetc.)

Distribution ofmarks Total: 80

1.Identification andcomments on spot (1 to 10) …….	20
2. Demonstration ofGram + ve (Positive), Gram– ve (Negative) bacteria……..	10
3. Antigen-antibodyreaction/Agargel diffusion/diagnosis of pregnancy……	10
4. T and B cells identification/Mast celldemonstration…….	15
5. Submission ofslides and collection……	10
6. Practical record ……..	10
7. Viva-voce……...	05

Suggested Readings

Parasitology

1. Brock Biologyof Microorganisms(Ed. IX) M. T. Madigan J. M. Martinkoand J. Parker. Prentice Hall International Publication.
2. TheNematodeParasitein Vertebrate, W. Youleand Maplestone.
3. General Parasitology, V. A. Dogiel.
4. Helminthology, E. C.Fausy.
5. Platyhelminthesand Parasitisium, D.R.Birt.
6. Animal Parasite- O.W. Aisen
7. ParasiticProtozoa, J.P.KreierandJ.R. Baker. Allen and UnwinPress.
8. Medicaland VeterinaryProtozoalogyM. G. Kathering,A. JamespaulandV.Zaman. Churchill Livingstone.

Immunology

1. Immunology– R. C. Kubyet al..
2. Immunology- Tizzard.
3. Immunology-. Roitt, Brostoffand D. Male.
4. Microbiology- M. T. Pelzer. Jr.E. C. S. ChanandN. R. Krieg.TataMcGraw-Hill
5. Immunology- Abbas

M.Sc.IISemester-III

Paper-XI, SpecialGroup-Entomology-I

Insect Morphologyand Physiology

Unit-I

1.1 Integument:molecularstructure, moultingand sclerotization.

1.2 Morphologyofhead, thorax andabdomen.

1.3 Appendages: antennae, legsand genitalia.

1.4 Wingstructureand mechanism of flight.

Unit-II

2.1 Mouth parts: type, morphologyand feedingmechanism.

2.2 Structureofalimentarycanal and salivaryglands, mechanism ofdigestion.

2.3 Respiratorysystem: tracheal,aquatic and plastron respiratorymechanism.

2.4 Circulatorysystem: organs, mechanism ofcirculation,haemolymph- cellular andchemical composition. Functionsofhaemocytes.

Unit-III

3.1 Excretorysystem: organsand physiologyofexcretion.

3.2 Nervoussystem: structure andanatomyofbrain and ventral nerve cord.

3.3 Neuroendocrinesystem: structure and function,roleinmetamorphosisandreproduction.

3.4 Exocrineglands: Pheromonesand allomones-chemistryand functions.

Unit-IV

4.1 Reproduction:male and femalereproductive system, structureoftestisandovary, mechanismof spermatogenesisand vitellogenesis.

4.2 Specialized reproductivemechanism:viviparity,polyembryony, paedogenesisand parthenogenesis.

4.3 Earlyembryonicdevelopment up to germband formation.

4.4 Metamorphosis:typesoflarvae and pupae.

Paper-XI,SpecialGroup-Fishand Fisheries-I
Generalstudies

Unit-I

1.1 Origin and Evolutionof fishes: Fossil record,classification,cyclostoms, ostracoderms, placoderms, Sharklikefisher, Bonyfishes

1.2 Development ofjawsand limbsin fishes.

1.3 Classificationand generalcharactersofPlacoderms: Acanthodii, Coccostei, Pterychthyes, Stegoselachii, Palaeospondyli.

1.4 Affinities ofPlacodermsand fossil record.

Unit-II

2.1 Classificationand generalcharactersofElasmobranch/Chondrichthyes: Sharksand Rays, Holocephali

2.2 AffinitiesofElasmobranchs, specializedcharactersofElasmobranchs.

2.3 Classificationand generalcharactersofActinopterygii/Rayfinned fishes:Palaeonisciformes,Polypteriformes, Acipenseriformes, Amiiformes, Teleostea (Osteoglossomorpha, Elopomorpha, Clupeomorpha,Euteleostei)

2.4 AffinitiesofActinopterygiians.

Unit-III

3.1 Dipnoi: Generalcharacters,classification, origin, fossil Dipnoiansand distribution ofDipnoians.

3.2 Specialized charactersofDipnoi, Blood vascularsystem ofProtopterusandaffinitiesof Dipnoians.

3.3 Respiratorysystem: Structureof gillsin fishes, gill histology

3.4 Blood supplyand modeofrespiration and gaseousexchangeinteleosts.

Unit-IV

4.1 Accessaryrespiratoryorgans: Origin ofair breathingorgans; skin, buccopharynxoperculararcavity, air bladder

4.2 Mechanism ofair breathing, function ofaccessoryrespiratoryorgan.

4.3 Air bladder: Origin, Development, typesofair bladder;physostomous, physoclists, structureof gassecreatingcomplex

4.4 Blood supplyto air bladder and functionsofair bladder

Paper- XI,SpecialGroup-Aquaculture-I
FreshwaterAquaculture

Unit-I

1.1 Aquaculture: Definition, importanceand presentstatusin India.

1.2 Physicochemical conditionsofpond water.

1.3 Biological conditions– Aquaticvegetation, Association ofmacro vegetation.

1.4 Plankton: Seasonal distribution, Diurnalmovement and itsrolein fisheries.

Unit-II

2.1 Pond soil, Chemical conditions.

2.2 Pond ecosystem: Trophiclevel, food chain and food web in pond.

2.3 Methodsofproductivitymeasurement.

2.4 Planningandconstruction of fresh water fish farm.

Unit-III

3.1 Biologyofculturable indigenouscarps.

3.2 Biologyofculturableexoticcarps.

3.3 Reproductivesystem and breedingbehavior in Indian carps.

3.4 Fisheriesofmajor river systemsin India.

Unit-IV

4.1 Reverinecollectionof fish seed.

4.2 Fish breedingin wet and drybundhs.

4.3 Induced breedingbyhypophysation.

4.4 Hatchingtechniquesand typesofhatcheries.

Paper: XI
SpecialGroup-EnvironmentalBiology-I
Ecosystemsand Communities

Unit-I

1.1 Ecosystem: Structureand functionsofmarine and freshwater ecosystems, grassland, desertand forest ecosystems, abioticand biotic componentsofecosystems.

1.2 Energyflow: Y shaped and universalmodel.

1.3 Food chain, food web, ecologicalpyramid-typesand diversity.

1.4 Planktons: nature, distribution, seasonal succession, beneficialand harmfuleffects, qualitative and quantitative estimation

Unit-II

2.1 Nekton, Benthos:nature, distribution andanalysis, Periphyton- definition,collection, preservationand importance.

2.2 Eutrophication: Definition, types, effectsandcontrolmeasures.

2.3 Biogeochemical Cyclesin Nature- GaseousCycles: Water, Carbonand Oxygen cycle.

2.4 SedimentaryCyclesinnature- Nitrogen, sulphurand Phosphoruscycles.

Unit-III

3.1 Productivity: concept,Primaryand secondaryproductivity, measurement ofproductivity bylight and dark bottlemethod, factorsaffectingprimaryand secondaryproductivity.

3.2 Bioticcommunity: definition, concept andcharacteristicsofcommunity, community structure, stratificationand periodicity, ecotoneandedge effect.
3.3 Ecologicalniche, ecotype, ecophene and ecologicalindicators.
3.4 Ecological succession:definition,typesand processofecological succession, significance.

Unit –IV

4.1 Biosphere: Major biomesoftheworld with emphasison Indian biomes.
4.2 Biometeorology: scope and factors
4.3 Water and soilasessential factorsfor themeteorological studies.
4.4 Radiantenergy, temperature andlight.

Semester –III
Paper-XII,SpecialGroup-Entomology-II
Classification and IndustrialInsects

Unit-I

1.1 Modern schemeofinsectclassification and general charactersof various Orders.
1.2 General charactersandclassificationofThysanura and Collembola.
1.3 General charactersandclassificationofMallophaga and Siphunculata.
1.4 General charactersandclassificationofSiphonaptera.

Unit-II

2.1 General charactersandclassificationofOrthoptera.
2.2 General charactersandclassificationofHemiptera.
2.3 General charactersandclassificationof Lepidoptera.
2.4 General charactersandclassificationofColeoptera.

Unit-III

3.1 Mulberrysilkworm*Bombyxmori*, life cycle, silkglandand silk proteins.
3.2 Silkwormrearing, cocoon harvestingand seed production.
3.3 Bacterialand viraldiseasesin silkworm.
3.4 Lacinsect-biology, laccultivationand economicimportance.

Unit-IV

4.1 Tasarsericulture- life cycle, host plant, rearing, cocoon formationand silkproduction.
4.2 Erisericulture- life cycle, host plant rearingand silk production.
4.3 Honeybee- types, life cycle, colonyformation and apiaryproducts.
4.4 Beekeeping- movable framehive, beerearing management and diseases.

Paper-XII,SpecialGroup-Fish and Fisheries-II
Applied fisheries

Unit-I

1.1 Fresh water fisheriesof India, Riverineand Reservoir fisheries.
1.2 Estuarineand Marine fisheriesof India.
1.3 Breedingof Indian Major carps: i Natural breeding, ii Induced breeding, iiiMethodsofobtaining eggs, spawn, fryand fingerlingsfromnaturalresources.
1.4 Neuroendocrine control ofcarp reproduction.

Unit-II

2.1 Cultureofexoticfishes– commoncarp, Composite culture.
2.2 Monoculture, Monosexculture.
2.3 Integrated Fish farming – Poultry, Duck,Fish rice culture.
2.4 Sewagefed fisheries

Unit-III

3.1 Catfish culture
3.2 Troutculture
3.3 Ornamentalfish culture: i) Oviparous,ii) Livebearers.
3.4 Cultureofseaweedsand Spirulina.

Unit-IV

4.1 Pearlculture
4.2 Oyster culture: i) Species- edibleii) Culturemethods.
4.3 Prawn culture(Lifecycleand breeding)
4.4 Frogculture

Paper- XII,SpecialGroup-Aquaculture-II
Aquacultureand RuralDevelopment

Unit-I

1.1 Cultureof zooplankton
1.2 Prawn culture&Methodsofbreeding
1.3 Cultureofcrabs
1.4 Pearlculture/ Oyster culture

Unit-II

2.1 Development and advancement ofaquaculturein India.
2.2 Larvivorousfishesin relationto publichealth.
2.3 CultureofExotic and transplanted fishes
2.4 Breedingand careoffresh water aquarium fishes.

Unit-III

3.1 Definition ofeconomicsand application ofeconomicprinciplesto aquaculture.
3.2 Aquaculture and ruraldevelopment in India.
3.3 RoleofFFDAin development ofaquaculturein India.
3.4 Fisheryextension techniques.

Unit-IV

4.1 Socio-economicstatusof fishermencommunity.
4.2 Fisheriesco-operativesand their rolein fish production andmarketing.
4.3 Organization and operational problemsin fisheriesco-operativesocieties.
4.4 Fisherylegislation andtheirrolein fisherydevelopment.

Paper-XII
SpecialGroup- EnvironmentalBiology-II Adaptations, Population dynamics,and AnimalBehaviour

Unit-I

1.1 Adaptations of animals with referenceto physical conditions: temperatureand light.
1.2 Chemical conditions: oxygen,carbon dioxide.
1.3 Physiological process:osmoregulation and thermoregulation.
1.4 Physiological process:Bioluminescence and Echolocation.

Unit-II

2.1Influenceof physicalenvironment on organism:viscosity, surfacetension, salinity, pressure, buoyancyand surface film animals.
2.2 Biological Rhythms:photoperiodism, biological clock, annual and lunar periodicity.
2.3 Mimicryand protectivecolouration: definition ofmimicry, kinds of mimicry.
2.4 Batesionand mullerian mimicryand significance.

Unit-III

3.1 Population dynamics: population structure, pattern of population distribution, population growth and densityrelationship, population fluctuations and dispersal of population.
3.2 Dispersal:Barriers ofdispersal, means of dispersal, migration.
3.3Intersepecificrelationship: mutualism, commensalism, parasitism, synergism, antagonism and competition.
3.4 Preyand Predator relationship

Unit-IV

4.1Intraspecific relationship: aggregations and social organization.

4.2 Animal behavior: innate orinherent behavior,learned behavior, visinand behavior, sound and behavior.
4.3 Social behaviour: mating, family, andgroupbehavior, advantages of social behavior
4.4 Genetic, hormonaland evolutionaryaspects ofbehavior.

(M.Sc. Part-II) Semester-III,Practical-VI,SpecialGroup-Entomology

1. Anatomical observations, demonstrationand detailed explanation ofthevariousorgansand systemsin insects such ascockroach, grasshopper, cricket, molecricket, redcotton bug, honeybee, beetle, housefly, butterfly/ mothandcaterpillars with thehelp of ICT tools/ models/charts/ photographsetc.

2. Histological studyofalimentarycanal, salivaryglands, gastriccaecae, malpighian tubules, testis, ovary, sex accessory glands, exocrineglands, endocrineglands, brain and other gangliawith thehelp ofalreadyavailablepermanent slides/ ICT tools/ models/ charts/ photographsetc.

3. Wholemount preparation ofinsect partsusinginsectsfrom agriculturalwastesor withthehelp of alreadyavailablepermanent slides/ ICT tools/charts/ photographs/ modelsetc.

4. Insectstudy- preservation, identification,classificationandcharactersup to familiesbelongingto orders- Odonata, Orthoptera, Dictyoptera,Hemiptera, Lepidoptera, Coleoptera, Hymenoptera, Diptera etc.with thehelpofalreadyavailablemuseum specimens, permanentslides/ ICT tools/ charts/ photographs/modelsetc.

5. **Physiological Experiments:**
a) Differential andtotal haemocytescount.
b) Qualitativesurveyofdigestive enzymesin salivaryglands. c) Qualitativesurveyofdigestive enzymesin gut.
d) Estimation oftotal proteins/carbohydrates/lipidsin haemolymph/tissues.
e) Detection ofuricacid asend product ofexcretionin terrestrialinsects.
f) Chromatographicseparation of freeaminoacidsin haemolymph.
g) Separation ofhaemolymph proteinsbyelectrophoresisand specificproteinbyblotting. h) Estimation ofNa^+andK^+in haemolymphbyflamephotometer.
i) Estimation ofDNA andRNAin haemocytes/tissues.

6. Visitstoagriculturalfields,national parksand forestsfor collection and observationsofinsects arecompulsory.
Note: Student should submitinsect collection and about10 morphological and10 histological Slide preparationsatthetimeofexamination.

DistributionofMarksTotal: 80

1. Anatomical observation ……. 15
2. Physiological Experiment ……. 10
3. Identification ofhistological slidesandinsects(1-15) ……. 30
4. Permanent stained preparation ……. 05
5. Classrecordsandinsectcollection …….. 10
6. Submission ofhistological slides……. 05
7. Viva-voce…….. 05

Internal Assessment 20

Total marks 100

Semester-III, Practical-VI, SpecialGroup-FishandFisheries

1. Identification oflocal fishesupon species.
2. Anatomical observations, demonstrationand detailed explanation of fish in general, reproductive and urinogenital system, Endocrineglands with thehelp of ICT tools/ models/ charts/ photographs etc.
3. Studyofcranial nervesin*Wallago*and *Labeo*with thehelp ofalreadyavailablepermanent slides/ ICT tools/ models/charts/photographsetc.
4. Identification of various stagesof fryand fingerlingsofmajor carps with thehelp ofalready availablepreserved material, permanent slides/ charts/ models/ photographs/ ICT toolsetc.5 5.
5..Permanentpreparationof various scalesusingwastesfromrecognized fish markets.
6. Estimation ofdissolveoxygen in water sample.
7. Estimation ofCO_2in water sample.
8. Estimation ofchloridesamplein water.
9. Estimation ofprotein inblood of fish (Sourceof fish blood: Local recognized fish markets).
10. Estimation ofsodium in blood of fish (Sourceof fish blood: Local recognized fish markets).
11. Estimation ofpotassium in blood of fish (Sourceof fish blood: Local recognized fish markets).

DistributionofMarks:Marks

1. Anatomical observation ……. 15
2. PhysiologyExperiment…… 15
3. MountingofScale…… 05
4. Identification of fishes…… 30
5. Practical Record …… 10
6. Vivavoce…… 05

Total Marks 80

Internal Assessment20

Totalmarks100

Semester-III,Practical-II,

SpecialGroup-Aquaculture

1)Physicochemical analysis of pond water for determination ofpH, Turbidity, DO,FreeCO2, Ammonia, Alkalinity, Hardness, Nitratesand Phosphates.

2)Physicochemical analysis of pond soil to determineits texture,pH, particlesize, available nitrogen, phosphorus andfreeCaCO3.

3)Qualitative and quantitative studyof planktonand benthos.

4)Studyof foodchain infresh waterpond ecosystem.

5)Estimation of primaryproductivitybylightanddark bottle method.

6)Identification oflocalfish fauna.

7)Identification andclassification ofIndian andexoticcarps.

8) Estimation of fecundity.

9) Dissection ofcarp /catfish to collect pituitary.

10) Preparation of fish pituitaryextract anddetection ofdosesfor injection.

11) Visit toafish seed hatchery.

DistributionofmarksMarks

1) Analysisofpond water……15
2) Analysisofpond soil ……..10
3) Quantitative analysisof plankton / detection ofprimaryproductivity…… 10
4) Estimation ofFecundity…….. 05
5) Identification ofspots(1 to10)……20
6) Dissection/Permanentmounting…….. 05
7) Practical record &submission ……10
8) Viva– voce……05

Total Marks 80

Internal Assessment20

Totalmarks100

Semester –III, Practical-II,

SpecialGroup-EnvironmentalBiology

1. Samplingofwater determination ofpH, temperature andturbidity.
2. Plankton study- collection and analysisof zooplanktons(Quantitative and qualitative analysis)
3. Identification ofcrustaceans, insects, snailsfrom fresh water /lake/ pond
4. Identification ofcommon aquaticweeds, predatoryfishesand harmful insectsfromthe pond.
5. Studyofindicationofpollution- estimation ofBODand COD.
6. Determination ofprimaryproductivitybylight and dark bottlemethod.
7. Estimation ofdissolved oxygen in water samplebywrinkler's method.
8. Estimation ofcarbon dioxidefromgiven water sample.
9. Determination ofrelativehumiditybyhygrometer/ psychrometer.
10. Determination ofwindvelocitybyanemometer.
11. Physico-chemical analysisofwater for determination ofalkalinity, hardness, nitritesand phosphates.
12. Estimation ofSodiumand potassium byflamephotometry.
13. Identification ofbenthic andperiphytonicorganisms.

DistributionofMarksMarks

1. Major experiment	15
2. Minor experiment	10
3. Minor experiment	10
4. Identification and comment on given spots(1-10)	30
5. Classrecord	10
6. Vivavoce	05
	80
Internal Assessment	20
Totalmarks	100