

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)
Re-Accredited with “A” Grade by NAAC.

UTHAMAPALAYAM - 625 533



DEPARTMENT OF ZOOLOGY Bachelor of Science - Zoology Syllabus

(Effect from the Academic Year 2014 – 2015 Onwards)

Program Specific Outcome

PSO1: To enable the students to understand the Basic knowledge of Zoology.

PSO2: To acquire skills in the field of life oriented, application oriented and job oriented Zoology.

PSO3: Study of skill based subject can develop various skills in the field of Zoology which will enable the students to get a job.

PSO4: Visit of students to Zoo, Bird Sanctuaries, Animal reservoir will create a sound knowledge in the field of Biodiversity.

PSO5: Study of Ecosystem and Visit to various fields helps for linking of Colleges with the environment.

**HAJEE KARUTHA ROWTHER HOWDIA COLLEGE
(AUTONOMOUS)**

UTHAMAPALAYAM -625 533.

**Programme Name: B.Sc., Zoology (Choice Based Credit System) Programme Scheme,
Scheme of Examinations & Syllabus (Effect from the Academic Year 2014 – 2015 Onwards)**

Eligibility : A pass in +2 examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu with Mathematics as one of the subject OR any other examination accepted by the Syndicate as equivalent.

Duration of the Course: The students who are joining the degree shall undergo a study period of three academic years- Six Semesters.

Eligibility for the degree: A candidate shall be declared as passed the program if he/she scored a minimum of 40% of total marks (internal and External) in each course. Minimum required marks in external is 27.

Subjects of study:

Medium of instruction :

English Part – I - Tamil / Arabic / Malayalam

Part –II – English

Part –III – 1.Core Subjects - Zoology

2.Allied Subject –Chemistry/Botany

Part –IV - 1.Non-Major subject

2.Skill Based Subjects

3.Environmental Studies

4.Value Education

Part- V - Extension Activities

Evaluation:

Theory: Internal – 25 marks

External – 75 marks

Total – 100 marks

Practical:

Internal – 40 marks

External – 60 marks

Total – 100 marks

Internal Examination : 25 Marks

1. Two Tests to be conducted - 20 marks (average of 2 tests to be taken).
2. Seminar / Assignment / Quiz - 5 marks.
3. Third Test may be allowed for absentees of any one of the two tests.

External Examination:

75 Marks - Time: 3 hours.

The pattern of External Examination Question Paper for **Part I, Part III and IV** will be as follows :

Section – A (10 X 1 = 10 Marks)

Question numbers 1 to 10 - Answer all questions. (multiple choice) Two questions from each unit. Four choices in each question.

Section – B (5 X 7 = 35 Marks)

Question numbers 11 to 15. Answer all questions choosing either A or B. One question from each unit. 11 A or 11 B 12 A or 12 B 13 A or 13 B 14 A or 14 B 15 A or 15 B

Section – C (3 X 10 = 30 Marks)

Question numbers 16 to 20. Answer any three out of five. One question from each unit.

The pattern of External Examination Question Paper for **Part II** will be as follows :

Section – A: Prose 16 Marks.

Section – B: Poetry 11 Marks.

Section – C: Short Story 13 Marks.

Section – D: Grammar 19 Marks.

Section – E: Composition 16 Marks.

The pattern of External Examination Question Paper for **Part IV Environmental Studies and Value Education** will be as follows :

Section – A: (5 X 6 = 30 Marks)

Question numbers 1 to 5 – Answer all questions choosing either (a) or (b). One question from each unit. Descriptive Type – 100 words each.

Section – B (3 X 15 = 45 Marks)

Question numbers 6 to 10. Answer any three out of five. One question from each unit. Descriptive and Analytical Type – 250 words each.

Hajee Karutha Rowther Howdia College (Autonomous

B.sc, Zoology- Programme content & syllabus (2014-2015 onwards)

Sem	Part	Course category	Course code	Title of the course	Credits	Hours	Int. Marks	Ext. Marks	Total Marks
I	I	Language	14UTAL11 / 14UARL11 / 14UMAL11	Tamil / Arabic / Malayalam	3	6	25	75	100
	II	Language	14UENL11	English – I	3	6	25	75	100
	III	Core	14UZYC11	Core Subject– I- INVERTEBRATA	6	6	25	75	100
	III	Core practical	14UZYC2P	Core Paper III practical-I; Invertebrata & Chordata (No exam in this semester)	-	2	40	60	100
	III	Allied	14UZYA11	Allied Subject – I - paper 1 INVERTEBRATA	4	4	25	75	100
		Skill	14UZYS11	Skill Based Subject – I BIOSTATISTICS	2	2	25	75	100
			14UZYS21	Skill Based Subject – I COMPUTER APPLICATION AND INFORMATION TECHNOLOGY	2	2	25	75	100
		Allied Practical	14UZYA2P	Allied Subject –I- practical-1; Invertebrata & Chordata (No exam in this semester)	-	2	40	60	100
	IV	NME	14UZYN11	Non Major Elective – 1 HUMAN BIOLOGY	2	2	25	75	100
	Total					22	32	255	645

Sem	Part	Code	Title of the paper	Credits	Hours	Int. Marks	Ext. Marks	Total Marks
II	I	14UTAL21/ 14UARL21/ 14UMAL21	Tamil /Arabic/Malayalam	3	6	25	75	100
	II	14UENL21	English	3	6	25	75	100
	III	14UZYC21	Core Subject– II- CHORDATA	3	6	25	75	100
		14UZYC2P	Core Subject III Practical- IINVERTEBRATA&CHO RDATA	5	2	40	60	100
		14UCHA21	Allied Subject – I paper II CHORDATA	4	4	25	75	100
		14UZYA2P	Allied Subject I Practical- 1(Invertebrata& chordata)	1	2	40	60	100
		14UZYS21	Skill Based Subject- 1 IMMUNOLOGY	2	2	25	75	100
	IV	14UZYS22	Skill Based Subject- 2 FISHERY BIOLOGY	2	2	25	75	100
		174UZYN21	Non Major Elective – II ORNAMENTAL FISH CULTURE	2	2	25	75	100
	Total				25	32	255	645

Sem	Part	Code	Title of the paper	Credits	Hours	Int. Marks	Ext. Marks	Total Marks		
III	I	14UTAL31/ 14UARL31/ 14UMAL31	Tamil / Arabic/Malayalam	3	6	25	75	100		
	II	14UENL31	English	3	6	25	75	100		
	III	14UZYC31	Core Subject – IV CELL BIOLOGY	4	4	25	75	100		
		14UZYC4P	Core Subject VI Practical-II ; DEVELOPMENTAL BIOLOGY & CELL BIOLOGY (No exam in this semester)	-	2	40	60	100		
		14UZYA31	Allied Subject I - paper III Microbiology, Cell Biology, Genetics, Molecular Biology Biotechnology	4	4	25	75	100		
		14UBYA4P	Allied Subject I– practical II Microbiology, Cell Biology, Genetics, Molecular Biology Biotechnology (No exam in this semester)	-	2	40	60	100		
		14UBYA11	Allied Subject – II - paper I Botany	4	4	25	75	100		
		14UBYA4P	Allied Subject II – practical I (No exam in this semester)	-	2	40	60	100		
		Total				18	30	245	555	800

Sem	Part	Code	Title of the paper	Credits	Hours	Int. Marks	Ext. Marks	Total Marks
IV	I	14UTAL41/ 14UARL41/ 14UMAL41	Tamil / Arabic/Malayalam	3	6	25	75	100
	II	14UENL41	English	3	6	25	75	100
	III	14UZYC4 1	Core Subject –V DEVELOPMENTAL BIOLOGY	4	4	25	75	100
		14UZYC4 P	Core Subject VI Practical-II- DEVELOPMENTAL BIOLOGY & CELL BIOLOGY	2	2	40	60	100
		14UZYA4 1	Allied Subject I - paper IV ECONOMIC ZOOLOGY	4	4	25	75	100
		14UZYA4 P	Allied Subject I– practical II; Microbiology, Cell Biology, Genetics, Molecular Biology Biotechnology &Economic Zoology	1	2	40	60	100
		14UBYA4 1	Allied Subject – II - paper II Botany	4	4	25	75	100
		14UBYA2 P	Allied Subject II – practical I	1	2	40	60	100
		Total				22	30	245

Sem	Part	Code	Title of the paper	Credits	Hours	Int. Marks	Ext. Marks	Total Marks
V	III	14UZYC51	Core Subject – VII ECOLOGY	5	5	25	75	100
		14UZYC52	Core Subject– VIII MICROBIOLOGY	4	5	25	75	100
		14UZYC53	Core Subject–IX GENETICS &MOLECULAR BIOLOGY	5	5	25	75	100
		14UZYS51	Skill based Subject-III POULTRY SCIENCE					
		14UZYC6P	Core Subject XII Practical-3 Genetics & Biostatistics, Microbiology & Biotechnology (No exam in this semester)	-	2	40	60	100
		14UZYC6Q	Core Subject XIII Practical- 4, Biochemistry, Physiology, Ecology, &Evolution (No exam in this semester)	-	2	40	60	100
		14UBYA51	Allied Subject – II - paper III Botany	4	4	25	75	100
		14UBYA6P	Allied Subject II – practical II (No exam in this semester)	-	2	40	60	100
		14UEVS51	Environmental Studies	2	2	25	75	100
Total				22	30	285	515	900

Sem.	Part	Code	Title of the paper	Credits	Hours	Int. Marks	Ext. Marks	Total Marks
VI	III	14UZYC61	Core Paper - X BIOTECHNOLOGY	6	5	25	75	100
		14UZYC62	Core Paper - XI BIOCHEMISTRY & PHYSIOLOGY	6	5	25	75	100
		14UZYC63	Core Paper – XII EVOLUTION	6	5	25	75	100
		14UZYC6P	Core Subject XII Practical-3- Genetics ,Molecular biology & Microbiology	5	3	40	60	100
		14UZYC6Q	Core Subject XIII Practical-4- Biochemistry & Ecology	5	3	40	60	100
		14UZYC6R	Core Subject XIII Practical-5 Physiology, biochemistry & Evolution	5	3	40	60	100
		14UBYA64	Allied Subject – II paper IV Botany	4	4	25	75	100
		14UBYA6P	Allied Subject II – practical II	1	2	40	60	100
	IV	14UZYS61	Skill based Subject-IV ECONOMIC ENTOMOLOGY & SERICULTURE TECHNOLOGY	2	4	25	75	100
		14UVED61	Value Education	2	4	25	75	100
	V	14UEAC61	Extension Activities	2	-	25	75	100
	Total				44	33	320	75

B.Sc., Zoology Major
Core Paper - I

Part-III
INVERTEBRATA

Semester - I
(4 credits)

Contact Hours per Week - 4 Hrs
Contact Hours per Semester - 60 Hrs

Course outcome:

- To learn the taxonomy of invertebrates.
- To learn the structure of representative invertebrates.
- To learn to sample and identify invertebrates in the lab and field.
- To understand the relationships between invertebrates and their environment.
- To understand the evolutionary relationships among the invertebrate groups.

Unit- I: TAXONOMY

- 12 hours

1. Definition.
2. Principles of classification – Symmetry and Coelom.
3. Units of classification - Binomial nomenclature.
4. Outline classification of Animal kingdom up to class level with example. Flow chart only.
5. General characters of the following phyla, i) Protozoa, ii) Porifera, iii) Coelenterata, iv) Platyhelminthes, v) Nematoda, vi) Annelida, vii) Arthropoda, viii) Mollusca, ix) Echinodermata.

Unit- II: PROTOZOA and PORIFERA

- 12hours

Protozoa

1. Paramecium – (Type study)
General organization, Cyclosis, Contractile vacuole and conjugation only.
2. Structure, pathology, prevention and control measures of i) Plasmodium vivax and ii) Entamoeba histolytica.

Porifera:

1. Olynthus – (Type study).
General organization, histology, Spicules, Reproduction and Development only.
2. Canal system in sponges.

Unit- III: COELENTERATA AND HELMINTHES

- 12 hours

Coelenterata

1. Obelia – (Type study)
Structure of Obelia colony, Medusa and Nemetocyst, Reproduction and development (Metagenesis).
2. Polymorphism in Coelenterata.

Helminthes:

1. Fasciola hepatica (Liver Fluke) - Type study.
External characters, Digestive system, Excretion, Reproduction and Development (Life cycle).
2. Structure, pathology, prevention and control measures of Ascaris and Wucheraria.

Unit-IV: ANNELIDA AND ARTHROPODA

- 12 hours

Annelida:

1. Earth worm – Type study

External morphology, Setae, Nephridia, Nervous system and Reproductive system only.

2. Metamerism in Annelids.

Arthropoda:

1. Penaeus (Marine Prawn) - Type study.

External morphology, Appendages, Respiratory system, Reproduction and Development.

1. Affinities of Peripatus.

Unit- V: MOLLUSCA AND ECHINODERMATA - 12 hours

Mollusca:

1. Pila globosa – Type study

External morphology, Digestive system, Respiratory system, Osphradium only.

2. Cephalopods as an advanced Mollusc.

Echinodermata:

1. Star fish - Type study.

External morphology, Pedicellaria, Water vascular system only.

2. Larval forms in Echinodermata.

Text book & References:

1. A text book of Invertebrata - N. Arumugam et al., (2010) Saras Publications,
2. Invertebrate Zoology – T.C. Majupuria, Pradeep Publications, Jalandar.
3. Manual of Zoology – M. Ekambaranatha Iyer and T.N. Ananthakrishnan, Vishwanathan publishers – Chennai.
4. Invertebrate Zoology – E.L. Jordon and P.S. Verma. S. Chand and Company, New Delhi
5. Invertebrate Zoology – R.L. Kotpol, Rostogi publications, Meerut.
6. Invertebrate Zoology – P.S. Dhomi and J.K. Dhami, R.Chand Company, New Delhi.

B.Sc., Zoology Major
Skill Based Elective Paper – I

Part :IV
Biostatistics

Semester – I
(2 credits)

Contact hours per week

- 2 hours

Contact hours per semester

- 30 hours

Course outcome:

- Define and distinguish between populations and samples.
- Define and distinguish between population parameters and sample statistics.
- Compute a sample mean, sample variance, and sample standard deviation.
- Compute a population mean, population variance, and population standard deviation.
- Explain what is meant by statistical inference.

Unit – I

6 hours

Collection of data _ Primary and Secondary data.

Classification and tabulation of data

Diagrammatic and graphic representations.

Unit – II

6 hours

Measures of central tendency – Mean, median and mode – Individual, discrete and continuous series.

Standard deviation.

Unit – III

6 hours

Measures of dispersion – Range and Quartile deviation.

Rank correlation.

Unit IV

6 hours

Regression - types and equation.

Binomial dispersion.

Unit – V

6 hours

Probability – addition theorem – simple problems.

Chi – square test and students test.

Text Books:

Biostatistics and Computer application, Arumugam N. (2005) Saras publications, Kottar, Nagercoil.

References:

1. Statistical method, Gupta S.P. (2005) Sulthan chand & sons, educational publishers, New Delhi.
2. Fundamental of Biostatistics, Khan A.S, & Khanum A. (2005) Ukass publishers, Hyderabad.
3. Methods of Biostatistics, Baskararao T. (2001) PARAS publications, Hyderabad.

Skill Based Elective Paper – II **Computer Applications and Information Technology**

(2 credits)

Contact Hours per Week - 2 Hrs

Contact Hours per Semester - 30 Hrs

Course outcome:

- Demonstrate proficiency in problem-solving techniques using the computer
- Demonstrate proficiency in at least two high-level programming languages and two operating systems.
- Developed a product or process by applying knowledge of programming, web, database, human computer interaction, networking and security tools

Unit – I 6 hours

Introduction to Computer – Block diagram.

Characteristics of Computer.

Generation and classification of Computer.

Unit – II 6 hours

Computer and communication: Type – needs – Communication media – Network topologies.

Unit – III 6 hours

MS word: File Operations: New, Open, Save, & Print. Editing: Cut, Copy, Paste, Find & Replace. Insert: Page numbers & Pictures.

Unit IV 6 hours

MS word: Format: Font, Bullet & Numbering, Paragraph & Background. Tools: Spelling & Grammar. Data: Sort.

Unit – V 6 hours

Internet: Internet concept – Types of internet connection- Internet services – Browsing techniques – Websites – Email – Applications of Internet.

Text Books:

Biostatistics and Computer application, Arumugam N. (2005) Saras publications, Kottar, Nagercoil.

References:

1. Computer application in Business - I. Vasanthi Ramanathan – Meenakshi pathippagam, Madurai – 20.
2. Fundamentals of Computer, V. Rajaraman.
3. Fundamentals of Information Technology, Pragathi Prakasam, Meerut.
4. MS: OFFICE for Win 95 – Microsoft office Press.
5. Developing Application with MS: OFFICE – Christine Solomon – Microsoft Office Press.

Zoology Major. Part-IV Semester - I
Non Major Elective - I **Human Biology** (2 credits)
Contact Hours per Week - 2 Hrs
Contact Hours per Semester - 30 Hrs

(For non biology students)

Course outcome:

- To study about Aerobic Respiration in human
- To study about the reproductive system of human
- It help to study about the chromosome and chromosomal abnormality.
- To study about the Human health and Hygiene

Unit- I: Human Embryology -6 hours

Structure of Human Sperm & Ovum- Menstrual cycle – Menopause – pregnancy – parturition – Twins – Test tube Baby.

Unit- II: Human Physiology -6 hours

Respiration – Oxygen and Carbon di oxide transport: Blood: Composition of Blood. Structure & function of Human Heart, Electrocardiogram (ECG), Blood Pressure, Blood urea: Structure of kidney, nephron – Formation of urine.

Unit- III: Human Genetics -6 hours

Sex determination in Man – Chromosomal abnormalities (Down, Turner’s and Klinefelter’s syndromes) – Human blood groups.

Unit- IV: Human health and Hygiene: -6 hours

Composition of food, Digestion and absorption of food, Balanced diet, Vitamins- types & Deficiency, Malnutrition and Obesity.

Unit- V: Human History -6 hours

Origin of human beings - Biological & cultural evolution – Human in future.

Text book & References

1. Chordate Embryology, Verma. S. And Agarwal V.K.,(2000), S.Chand & Co., New Delhi.
2. Text Book of Embryology, Armugam, N.A.(2008) Saras publication, Kottar.
- 3.An Introduction to Embryology. Balinsky,B.I.1981. W.B.Saunders company, Philadelphia.
4. Hoar S. William- General, Comparative physiology,(2005) Prentice Hall of Indian Pvt. Ltd, New Delhi.
5. Sinnot, E.W.,Dunn,L.C & Dobzhansky, 1958, Principles of Genetics, Mc Graw Hill Co., New York.
6. Organic Evolution, Rastogi, V.B. (2006) Kedar Nath & Ramnath, Meerut.
7. Biochemistry, Ambika Shanmugam (2006), Chennai.

B.Sc., Zoology Allied
Paper- I

Part-III
INVERTEBRATA

Semester - I
(4 credits)

Contact Hours per Week - 4 Hrs
Contact Hours per Semester - 60 Hrs

Course outcome:

- To learn the taxonomy of invertebrates.
- To learn the structure of representative invertebrates.
- To learn to sample and identify invertebrates in the lab and field.
- To understand the relationships between invertebrates and their environment.
- To understand the evolutionary relationships among the invertebrate groups.

Unit- I: TAXONOMY AND PROTOZOA: - 12 hours

1. Types of classification and nomenclature – Symmetry and Coelom.
2. General characters of Phylum Protozoa,
3. Amoeba – Type study – External, Nutrition and reproduction
4. Plasmodium: Life history, transmission, prevention and control.

Unit- II: PORIFERA AND COELENTRATA - 12hours

Protozoa

1. General characters of Phylum Porifera and Coelenterata,
2. Obelia – Type study – Structural organization of Obelia colony and Life cycle of Obelia(Metagenesis).
3. Canal system of Sponges.
4. Corals – Types and its importance.

Unit- III: HELMINTHES - 12 hours

General characters of Platyhelminthes and Nematoda.

1. Fasciola hepatica (Liver Fluke) - Type study, External characters, Digestive system, Reproduction and Development (Life cycle).
2. Wucheraria: Structure, pathology, prevention and control measures of Ascaries and Wucheraria. Life history, transmission, prevention and control.
3. Parasitic adaptations of helminthes worms.

Unit-IV: ANNELIDA AND ARTHROPODA - 12 hours

General characters of Annelida and Arthropoda:

1. Earth worm – Type study - External morphology, Setae, and Reproduction and development only.
2. Pest of Paddy (any two) and Pest of Coconut (any two).
3. Apiculture _ Polymorphism, Newton’s bee hive, Honey, Bee wax and Bee venom.

Unit- V: MOLLUSCA AND ECHINODERMATA - 12 hours

General characters of Mollusca and Echinodermata

1. Star fish - Type study: External morphology, Pedicellaria, Water vascular system and Reproduction and development only.
2. Pearl culture: Structure of Pearl oyster, formation of pearl and types of culture.
3. Oyster Culture: Structure of edible oyster, types of culture and its food value.

Text book:

A text book of Invertebrata - N. Arumugam et al., (2010) Saras Publications,
Invertebrate Zoology – T.C. Majupuria, Pradeep Publications, Jalandar.

Manual of Zoology – M. Ekambaranathe Iyer and T.N. Ananthkrishnan, Vishwanathan publishers – Chennai.

Invertebrate Zoology – E.L. Jordon and P.S. Verma. S. Chand and Company, New Delhi

Invertebrate Zoology – R.L. Kotpol, Rostogi publications, Meerut.

Unit- V: - 12 hours

Classification of Mammals upto orders level with examples.

Type study: Rabbit - . External morphology, Digestive system, Nervous system and Urinogenital system only.

General topics:

1. Dentition in mammals.
2. Adaptation of aquatic mammals.

Text book:

A manual of Zoology, Ekambaranatha Ayyar, M. & Ananthakrishnan, T.N. Vol. II Chordata: S.Viswanathan Pvt Ltd, Chennai.

Vertebrata – Kotpal, R.M. (2005 Reprint) Rastogi Publishers, Meerut.

References:

The Chordates – II Alexander, R.MCN (1981) International Edition – New Delhi.

Comparative Anatomy of Vertebrates, Kent. C. George, Mosby International Edition, Japan.

The vertebrate Body, Romer, R.S. & Parson, T.S. (1996) VII Edition, Philadelphia.

Chordate Zoology(2006 reprint) E.. Jordon & P.S. Verma , Chand and Co. New

Delhi.

Chordate Zoology (2006 Reprint) P.S. Dhama & J.K. Dhama, Chand & Company, New Delhi.

B.Sc., Zoology Major. Part-IV
Skill Based Elective Paper - III
Contact Hours per Week - 2 Hrs
Contact Hours per Semester - 30 Hrs

Immunology

Semester - II
(2 credits)

Course outcome:

- Understand the overall organization of the immune system
- An understanding of humoral and cellular immunity and their relative significances to transfusion science theory and practice.
- An understanding of the characteristics of antigens and antibodies.
- An understanding of the nature of antigen-antibody reactions.
- An appreciation of the importance of immunology as a foundation of transfusion medicine theory and practice.

Unit- I: Introduction to Immunology -6 hours

1. Introduction
2. Primary & secondary lymphoid Organs(Thymus, Spleen)

Unit- II: -6 hours

1. Antigens: Haptens, Epitopes, Paratope.
2. Antibodies: Structure & functions of IgG

Unit- III: -6 hours

1. Antigen- Antibody reactions: Immune complex, Avidity, Precipitation, agglutination.

Unit- IV: -6 hours

1. Hypersensitivity- types i. Antibody dependent Hypersensitivity ii. Cytotoxic Hypersensitivity alone.
2. Autoimmune Disease- Rheumatoid arthritis, Haemolytic Anaemia.

Unit- V: -6 hours

1. Vaccines- Types- Inactivated & Attenuated
2. Immunization- Active & Passive.

Text book & References

1. Essentials of Immunology, Roitt, I.M.(2000) Blackwell Scientific Publishers.
2. Immunology Kuby, J.(1999) W.H. Freeman and company, New York.
3. Immunology Roiff, J.M., Brostoff J., D.K. Male. 1997, Moby International Ltd., W.H. Freeman and company, New York.
4. Text Book of Immunology, Dulsi Fatima, Armugam, N.A.(2008) Saras publication, Kottar.

B.Sc., Zoology Major

Part-IV

Semester - I

Skill Based elective Paper - IV **FISHERIES BIOLOGY**

(2 credits)

Contact Hours per Week - 2 Hrs

Contact Hours per Semester - 30 Hrs

Course outcome:

- It gives increased understanding of the evolutionary origins of the major fish taxonomic Classes, with emphasis on the bony fishes.
- It give greater understanding of the genetic and environmental factors regulating reproduction in fishes.
- To gain an understanding of the various 'modes' of reproduction in fishes.
- To study how abiotic factors influence adaptive capabilities in fishes.
- To study how growth is regulated in fishes.

Unit- I: - 6 hours

1. Classification of Fisheries.
2. Importance of Fisheries.
3. Fisheries management.
4. Fishing gears and crafts in India.

Unit- II: - 6 hours

1. Food and feeding habit of fishes.
2. Age and growth of fishes.
3. Migration in fishes.

Unit- III: - 6 hours

1. Induced spawning of Indian Carps.
2. Paddy cum fish culture.
3. Monoculture.
4. Composite fish culture.
5. Sewage fed fisheries.
6. Cage fish culture.

Unit-IV: - 6 hours

1. Canning of fishes,
2. Products of fishes – fish oil, CIFT.

Unit- V: - 6 hours

1. Economic importance of common South Indian fishes.
1. Parasites and diseases of fishes.

Text book:

Aquaculture, N.Arumugam, Saras Publication, Nagercoil.

References:

Fish and Fisheries, Pandey and Shukla, Rostogi Publication, Meerut.

Fish Biolgy, Srivastava,C.B.L. Narendra Publishing House,New Delhi.

Fish culture, Satyanarayana, V. (2009)

Fisheries Resources and Food Security, Saxena and Amita, Narendra Publishing House,New Delhi.

B.Sc., Zoology Major	Part :IV	Semester – II
Non Major Elective – IV	Ornamental Fish Culture	(2 credits)
Contact hours per week	- 2 hours	
Contact hours per semester	- 30 hours	
(For non-biology students)		

Course outcome:

- To collect baseline data on the ecosystem, socio-economy and diversity of fishes and to analyze the impact of the aquarium fish trade on social and natural environments.
- To encourage local entrepreneurship, eco-tourism, the production of local crafts and the commercialization of other sustainable natural resources.

Unit – I

Identification of popular Ornamental fishes: -6 hours

Siamese fighting fish, Gold fish, Rosy barb, Tiger barb, Angel fish, Black molly, Guppy and Sword tail.

Unit – II -6 hours

Construction of fish tank:

Size and shape of fish tank, bottom settings, stocking of fish, Accessories of fish tank – aerators, types of filters, nets, lights and hood.

Unit – III -6 hours

Transport of fishes: Oxygen packing.

Food and feeding: culture of live food organisms-chironomous larva and tubifex.

Artificial feed.

Unit IV -6 hours

Breeding methods:

Siamese fighting fish, Gold fish, Black molly, Guppy and Sword tail.

Unit – V -6 hours

Common diseases and treatment of ornamental fishes:

White spot diseases, Fungal diseases, Bacterial diseases, Dropsy and ectoparasites.

TEXT BOOK:

Manual of Ornamental fishes and forming technologies, Jameson J.D & R. Santhanam, 1996, Fisheries college & Research Institute, Tamil Nadu.

REFERNCES:

Manual of tropical fish diseases diagnosis. Felix S. Sunderraj and S. Thilakar, Tamil Nadu Veterinary & Animal Sciences University, Chennai.

Manual of Breeding & Larval rearing of Cultivable fishes, Ramanathan, N and T, Francis, Tamil Nadu Veterinary & Animal Sciences University, Chennai.

Manual of Aquatic Engineering, Sampathkumar J.S. & Sundararaj.V. Tamil Nadu Veterinary & Animal Sciences University, Chennai.

B.Sc., Allied Paper Part-III
Paper - II **CHORDATA**

Semester - II
(4 credits)

Contact Hours per Week - 4 Hrs

Contact Hours per Semester - 60 Hrs

Course outcome:

- Describe the distinguishing characteristics of chordates
- Discuss the invertebrate chordate lineages
- Identify the derived character of craniates that sets them apart from other chordates

Unit- I: - 12 hours

Chordata characteristics, Outline classification upto class level with examples.

Type study: Amphioxus – External morphology, feeding and digestion.

Gene

ral topics:

1. Affinities of Balanoglossus.

Unit- II: - 12hours

Classification of Fishes upto order level with examples.

Type study: Shark – External morphology and circulatory system only.

General topics:

1. Migration of Fishes.
2. Parental care in Amphibia.

Unit- III: - 12 hours

Classification of Reptiles upto orders level with examples.

Type study: Calotes – External morphology and respiratory system only.

General topics:

1. Poisonous and non-poisonous snakes – Nature of venom and first aid for snake bite.

Unit-IV: - 12 hours

Classification of Aves upto orders level with examples.

Type study: Pigeon – External morphology, Urinogenital system only.

General topics:

1. Flight adaptations in birds.
2. Archaeopteryx and its Evolutionary importance.

Unit- V: - 12 hours

Classification of Mammals upto orders level with examples.

Type study: Rabbit - . External morphology, Brain and Reproductive system only.

General topics:

1. Dentition in mammals.

Text book:

A manual of Zoology, Ekambaranatha Ayyar, M. & Ananthkrishnan, T.N. Vol. II
Chordata: S.Viswanathan Pvt Ltd, Chennai.

Vertebrata – Kotpal, R.M. (2005 Reprint) Rastogi Publishers, Meerut.

References:

The Chordates – II Alexander, R.MCN (1981) International Edition – New Delhi.

Comparative Anatomy of Vertebrates, Kent. C. George, Mosby International Edition,
Japan.

The vertebrate Body, Romer, R.S. & Parson, T.S. (1996) VII Edition, Philadelphia.

Chordate Zoology(2006 reprint) E.. Jordon & P.S. Verma , Chand and Co. New

Delhi.

Chordate Zoolgy (2006 Reprint) P.S. Dhama & J.K. Dhama, Chand & Company, New
Delhi.

B.Sc., Zoology Major Part-III Semester - II

Core Paper - III Practical - I ***INVERTEBRATA AND CHORDATA*** (2 credits)

Contact Hours per Week - 2 Hrs

Contact Hours per Semester - 30 Hrs

(to be done at the end of the Second semester)

Anatomical observation and Comments on the following systems (Models/Charts/Visual aids and Transparency)

Earthworm: Nerve ring and nerve cord, Mounting of Body setae & Penial setae.

Honey bee: Mouth parts & sting.

Cockroach: Digestive system and Nervous system.

Pila; Digestive system.

Pisces: Mounting of Placoid, cycloid & ptenoid scales.

Rat: Brain, Arterial system ,venous system& reproductive system

Frog: Arterial and Venous system

Shark: Cranial nerves.

Observation of larval forms of the following animals:

Liver fluke: Miracidium, Redia & Cercaria.

Prawn: Nauplius. Zoea & Mysis.

Any two Echinoderm larvae – Bipinnaria and Ophiopluteus.

Salamander: Axolotyl.

Spotters:

Protozoa: Paramecium, Paramecium conjugation, Euglena, Entamoeba, Plasmodium.

Porifera: Simple sponge, Sponge-Gemmule, Sponge –Spicules,

Coelenterata: , Hydra., Obelia colony, Obelia medusa, Jelly fish, Aurelia, Physalia, Sea anemone.

Helminthes: Tape worm, Liver fluke, Ascaris (male and female). Wuchereria.

Annelida: Earthworm, Neries, Heteroneries, Chaetopterus, Leech

Arthropoda: Prawn, Peripatus, Octopus.

Echinoderm: Starfish.

Chordata: Amphioxus, Balanoglossus, Sea ascidians, any five edible fishes, Hippocampus, Narcine, Bufo, Salamander, Chaemeleon, Draco, Cobra, natrix, viper, krait, penguin, Pectoral, pelvic girdle of pigeon, Bat, Pangolin.

B.S., Zoology Allied

Part-III

II Semester

Practical –I: *Invertebrata and Chordata*

(1 Credits)

Contact Hours per Week - 2 Hrs

Contact Hours per Semester - 30 Hrs

- I. Anatomical observation and comments of the following systems (Models/charts/Visual aids/ Transparency):

Earth worm:

1. Nerve ring and nerve cord.
2. Body setae.

Honey bee:

1. Mouth parts and sting of Honey bee.

Frog:

1. Arterial system,
2. Venous system and Brain

II. List of spotters:

Invertebrata:

Protozoa: Amoeba, Paramecium, Euglena and Plasmodium.

Coelenterata: Hydra, Obelia – colony, Obelia – Medusa, Jelly fish and sea anemone.

Platyhelminthes: tape worm, Liver fluke, Redia and cercaria.

Nematoda: Ascaris and Wuchereria.

Annelida: Nereis, Earth worm and Leech.

Arthropoda: Honey bee – Queen, Drone and workers, Silk worm – Moth, Larva and cocoon,

Paddy pest – Tryphoryza and Leptocorisa, Coconut pest – Oryctes rhinoceros and Nephantis.

Mollusca; Pila and Pearl oyster.

Echinodermata: Starfish – oral and aboral view.

Chordata: Amphioxus, Balanoglossus, Sea ascidians, any five edible fishes, Cobra, Kriat, Viper, Dryophis, Ptyas, Eryx,

Osteology: Rabbit – Skull, Axis, Atlas, Pectoral girdle, Pelvic girdle, Fore limb and Hind limb.

Paper – III Microbiology, Cell Biology, Genetics, Molecular Biology and Biotechnology

(2 credits)

Contact Hours per Week - 4 Hrs

Contact Hours per Semester - 60 Hrs

Course outcome:

- Demonstrate safe practices in a microbiology laboratory.
- Explain and correctly demonstrate use of the scientific method
- List the fundamental features of prokaryotic and eukaryotic cells and methods used to examine them.
- Describe the structure, composition and role of eukaryotic cell membranes.
- To identify and describe the process and purposes of the cell cycle, meiosis, and mitosis, as well as predict the outcomes of these processes.
- To solve transmission genetics problems, make accurate predictions about inheritance of genetic traits, and map the locations of genes.
- To study the physical and functional characterization of genomes
- To study on the expression of genomic information in cellular and cell-free systems.
- To develop industrial processes for production of antibiotics,enzymes etc.
- To develop gene surgery and gene therapy to cure genetic disease.

Unit – I: Microbiology 12 hours

1. Structure of a prokaryotic cell (E.Coli)
2. Structure of T4 Phage
3. Morphology of Bacteria i) coccus type – Micrococcus, Diplococcus, Streptococcus and Staphylococcus. ii) Bacillus type: - Microbacillus, Diplocillus, Streptobacillus and Staphylobacillus iii) Spirochaetes and iv) Comma shaped
4. Bacterial and Viral disease – Gonorrhoea and AIDS (Pathogenesis, symptoms, prevention and control)

Unit – II: Cell Biology 12 hours

Structure and functions of the following cell components;

1. Cell membrane
2. Mitochondria
3. Endoplasmic reticulum and Ribosomes
4. Golgi body

Unit – III: Genetics 12 hours

1. Mendel's Laws – Mono and Dihybrid crosses
2. Linkage and Crossing over

3. Multiple Allele and polygene inheritance
4. Sex linked inheritance in Man

Unit – IV: Molecular biology 12 hours

1. Structure and functions of DNA
2. Structure and functions of RNAs (t RNA, mRNA & r RNA)
3. DNA replication
4. Protein synthesis

Unit – V: Biotechnology 12 hours

1. Recombinant DNA – Construction and applications
2. Stem Cell Culture – Methods and applications
3. Transgenic animals – Methods and applications
4. DNA finger printing – Methods and applications

REFERENCE BOOKS

1. A text book of Microbiology, 1995, Chakaraborty. P.New central book agency Ltd., Calcutta.
2. Ananthanarayanan,R., and C.K. Jayaram Paniker, 1994: Text book of Microbiology, v Edition, Orient Longman.
3. Cell Biology – De Robertis, E.D. Nowinski and Saez. (2001 reprint) WB Saunders Co. Philadelphia.
4. Cell Biology – Ambrose E.J., Dorothy M.E., (2002) ELBS camlet press, GB.
5. Cell and Molecular Biology – De Robertis and De Robertis. (2004 reprint)3
6. Molecular Biology – david Freifelter (II edition 2005) New Delhi.
7. Genetics – Verma & Agarwal
8. Genetics – K.Gupta.
9. Principles of Genetics – Eldon Jhon Gardener.
10. Principles of Genetics – Robert H. Tamarin
11. A text book of Biotechnology - Sathyanarayana
12. A text book of Biotechnology - Armugam.

2. Amphibian metamorphosis- Definition, Ecological, Morphological & Physiological changes.
3. Regeneration- Definition, types, regeneration of limb in salamander.

Unit- V:

-12 hours

1. Human reproduction: Puberty, Menopause, Menstrual cycle, Pregnancy, Parturition & lactation.
2. Birth Control: Contraception, its types.
3. Infertility method to overcome- IUI, IUF, Test tube baby- Ethical issues.

Text book:

1. Chordate Embryology, Verma. S. And Agarwal V.K.,(2000), S.Chand & Co., New Delhi.
2. Text Book of Embryology, Arumugam, N.A.(2008) Saras publication, Kottar.

References

1. An Introduction to Embryology. Balinsky,B.I.1981. W.B.Saunders company, Philadelphia.
2. Developmental Biology, Berril, N.J., 1986,Mc Graw Hill, New Delhi.
3. Developmental Biology, Browder L.W. Erickson C.A. Williams, (1992) 3rd Edition, R.J. Saunders College Publications, London.
4. Foundations of Embryology, Patten, B.M.,1958, Mc Graw Hill, New York.

B.Sc., Zoology Major. Part-III

Core Paper – VI Practical – II *Developmental Biology and Cell Biology* (2 Credits)

(To be done at the end of the Fourth Semester)

Contact Hours per Week - 2 Hrs

Contact Hours per Semester - 30 Hrs

Developmental Biology:

1. Mounting of different embryological stages of Chick (slides and Museum specimens)
2. Metamorphosis – in Frog.
3. Observation of mammalian Egg and Sperm.
4. Placenta of sheep.

Cell Biology:

1. Microscopy: Handling of dissection and Compound microscopes.
2. Observation of Meiotic stages.
3. Charts on – Mitochondria, Golgi apparatus, Endoplasmic reticulum, Ribosome and Chromosomes.
4. Observation of Polytene chromosome in Chironomous larva.
5. Blood smearing.
6. Charts on Blood cells – RBC and WBC.

Part-III – Allied Paper-IV
Core Economic Zoology 14UZYA41

Contact Hours per Week - 2 Hrs

Contact Hours per Semester - 30 Hrs

Course outcome:

- To understand the importance of beneficial insects and animals.
- To study the rearing methods of beneficial organisms- an economic perspective

Unit- I: Aquaculture - 6 hours

1. Introduction to Aquaculture – importance- fisheries Management.
2. Induced Spawning of Indian Carps.
3. Culture aspects- Monoculture- Composite fish culture.
4. Paddy Cum fish culture.

Unit- II: Apiculture - 6 hours

1. Definition: Species of Honey bees.
2. Social Organisation.- Newton’s Bee Hive.
3. Location of Apiary- Honey extraction

Unit- III: Sericulture - 6 hours

1. Definition: Species of Silk worms.
2. Moriculture in general.
3. Biology of Silkworm- Uses.

Unit- IV: Vermiculture - 6 hours

1. Definition: Species of Earthworms(Epigeic, Endogeic & Anaecic worms)
2. Construction of Model Vermiculture Unit.
3. Vermicomposting, Vermiwash - Uses

Unit- V: Poultry Science - 6 hours

1. Definition: Modern Poultry House.
2. Practical Aspects of Chick rearing.
3. Vaccination Programme.

Text books:

1. Manual of Fresh water Aquaculture, Santhanam. R, Sukumaran.N and Natarajan.P, Oxford and IBH Publishing Co Pvt Ltd., New Delhi 1990.
2. A Text Book of Invertebrates, Armugam, N.A.(2008) Saras publication, Kottar.
3. The Earthworm Book, Sulthan Ahmed Ismail (2005) other India press.
4. Modern aspects of commercial Poultry Keeping: M.R. Gnanamani(2003), Giri Publication, Nagamalai, Madurai

Practical –II: MICROBIOLOGY, CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY & ECONOMIC ZOOLOGY. (1 Credits)

Contact Hours per Week - 2 Hrs

Contact Hours per Semester - 45 Hrs

Practicals

- I. Gram's staining.
- II. Mitotic cell division identification using onion root tip.
- III. Simple Mendelian traits in man.
- IV. Blood Grouping- A, B, AB, O.
- V. Silk gland in IVth Instar Larva of silkworm- Diagram alone is enough.

Models

- VI. DNA, RNA & Protein synthesis.
- VII. Newton's Bee Hive- model.
- VIII. Few Silkworm rearing Appliances- Chopping knife, Brush, Netrica,
- IX. Waterer.

Charts

- X. Ribosomes, Golgi complex, Endoplasmic reticulum, Lysosomes.
- XI. Tilapia, Catla Catla, Rohu.
- XII. Modern Poultry house.

References

Any Laboratory Manual in Genetics & Molecular Biology

Any Laboratory Manual in Microbiology

Any Laboratory Manual in Economic Zoology.

B.Sc., Zoology Major. Part-III Semester - V
Core Paper - VII **Ecology** (4 credits)
Contact Hours per Week - 4 Hrs
Contact Hours per Semester - 60 Hrs

Course outcome:

- To study about the local and geographical distribution and abundance of organisms (habitat niche, community, bio-geography).
- Temporal changes in the occurrence, abundance and activities of organisms (seasonal, annual, successional, geological).
- The inter-relationship between organism in population and communities (population ecology).
- The structural adaptations and functional adjustment of organisms to their physical environment.
- The behaviour of organism under natural conditions (ethology).

Unit- I: Physico-chemical factors -12 hours

1. Light: Spectral compositions, Light on land and in water, Biological effects of Light (effect on metabolism, reproduction, pigmentation, development, locomotion and movement, diurnal migration only).
2. Temperature: Range, diurnal variation, thermal stratification and biological effects (metabolism, reproduction, development, morphology and cyclomorphosis only)'
3. Medium and substratum: Air as a medium for living organism. Soil profile, soil fauna and adaptation of soil animals. Role of salt content, temperature, and O₂ in fresh water, estuaries and marine water.

Unit- II: Habitat Ecology -12 hours

1. Terrestrial habitat: characteristics, ecological classification of land, their fauna, the their adaptation.
2. Fresh water: Thermal stratification, types of ponds and pond fauna.
3. Marine water: Characteristics stratification, plain muddy shore and deep sea adaptations.
4. Estuaries: Fauna and their adaptations.

Unit- III: Community Ecology -12 hours

1. Definition, characteristics, diversity, dominance, straxxxx, periodicity, ecotone and edge effect and ecological niche, equivalence and ecological succession.
2. Ecosystem – Definition, components, food chain and its types, food-web, ecological pyramid.
3. Bio-geochemical cycles – carbon, phosphorous and nitrogen cyclers.

Unit- IV: Population Ecology

-12 hours

1. Types, diversity and estimation, natality, mortality, age distribution, growth factors, fluctuation and equilibrium, dispersal and distribution, regulation of population.
2. Animal relationship -= Intraspecific and interspecific relationship, neutralism, mutualism, commensalism, parasitism, predation and competition.
3. Adaptive colouration and mimicry.

Unit- V: Pollution and Social issues

-12 hours

1. Causes, effects and control measures of air, water, nuclear and thermal pollutions.
2. Climatic change, green house effect and global warming, acid rain, Ozone layer depletion, Bhopal episode, stone leprosy in Taj Mahal and minameta diseases.

Text book and References

Concept of Ecology – N.Arumugam (2009), Saras Publication, Nagercoil.

1. Environmental Ecology – P.D.Sharma (2006) Rastogi Publication, Meerut.
2. Fundamentals of Ecology – E.P.Odum 1985) w.r.Saunders Publications, Philadelphia.
3. Fundamentals of Ecology – M.C.Dash (2996) Tata Mc.Grow Hill publishing ltd, New Delhi.

B.Sc., Zoology Major.

Part-III

Semester - V

Core Paper- VIII

Microbiology

(4 credits)

Contact Hours per Week - 4 Hrs

Contact Hours per Semester - 60 Hrs

Course outcome:

- Demonstrate safe practices in a microbiology laboratory.
- Explain and correctly demonstrate use of the scientific method
- Demonstrate proper usage, identify the parts/functions of the following microscopes: brightfield and stereoscopic.
- Transfer living microbes using aseptic technique.
- Demonstrate proficiency and use of the following in the laboratory: streak plate isolation technique; bacterial staining techniques; wet mounts; and proper culture handling.
- Visually recognize and explain the macroscopic and microscopic characteristics of fungi, protozoa, and bacteria
- Understand and explain environmental factors that influence microbes.
- Properly obtain, culture, identify, and explain microorganisms in environmental cultures

Unit- I: Basic Microbiology -12 hours

1. Definition for Microbiology, History of Microbiology & its Scope.
2. Classification of Microorganisms, Different morphological appearances of Bacteria. Structure of a typical prokaryotic bacterium (E.coli) and its cell components.
3. Structure of a typical T₄ Bacteriophage and its Life cycle.

Unit- II: Microbial culture techniques -12 hours

1. Media and its types. Preparation of Nutrient Agar Plates. Broth culture, Stab culture, Slant culture.
2. Autoclave- sterilization. Aseptic transfer, Inoculation,
3. Spread plate, Streak plate- types, pour plate, serial dilution.
4. Gram staining technique, Bacterial growth curve.

Unit- III: Medical Microbiology -12 hours

1. Definition. Types of diseases (Air borne, water borne). Nosocomial infections.
2. Bacterial disease – Tuberculosis & Gonorrhoea-, Disease diagnosis, mode of transmission, epidemiology, eradication methods.
3. Viral disease – AIDS, Dengue -, Disease diagnosis, mode of transmission, epidemiology, eradication methods.

Unit- IV: Food Microbiology -12 hours

1. Definition- Food spoilage and its biochemical changes.
2. Food Poisoning.
3. Food preservation- methods.

Unit- V: Agricultural Microbiology

-12 hours

1. Nitrogen fixing organism- mechanism of N₂ fixation in the root nodules of Leguminous plants(Groundnut)
2. Blue Green Algae (BGA)/ Cyanobacteria- non symbiosis- Azospirillum, Azotobacter.
3. Mycorrhizae – types.

Text book:

14. A text book of Microbiology, 1995, Chakarabarty. P.New central book agency Ltd., Calcutta.
15. Ananthanarayanan,R., and C.K. Jayaram Paniker, 1994: Text book of Microbiology, v Edition, Orient Longman.

References

1. Adams. M.R. and Moses, M.D.1995. Food Microbiology, New age Int. Ltd
2. Microbiology- Prescott. L. Harley. And Klein, 2004 : Wmc Brown McGraw Hill Publications.
3. Medical Microbiology- Jawatz.

B.Sc., Zoology Major
Core Paper – IX

Part :IV
Genetics and Molecular Biology

Semester – VI
(4 credits)

Contact hours per week - 2 hours
Contact hours per semester - 30 hours

Course outcome:

- To identify and describe the process and purposes of the cell cycle, meiosis, and mitosis, as well as predict the outcomes of these processes.
- To solve transmission genetics problems, make accurate predictions about inheritance of genetic traits, and map the locations of genes.
- To identify the parts, structure, and dimensions of DNA molecules, RNA molecules, and chromosomes, and be able to categorize DNA as well as describe how DNA is stored.
- To study the physical and functional characterization of genomes
- To study on the expression of genomic information in cellular and cell-free systems.
- To study the development and application of technologies for the detection of single molecules and molecular interactions (molecular recognition).

UNIT I:

1. Mendelian principles: Dominance, Monohybrid and dihybrid cross, Mendel's law of inheritance, non Mendelian principle.
2. Concepts of Gene: Allele, multiple alleles, Pseudoallele, Complementation tests.
3. Multiple factors: Skin colour in Human beings.

UNIT II:

1. Structural and numerical alterations of Chromosomes: Deletion, Duplication, Inversion, Translocation, Ploidy and their genetic implications.
2. Sex linkage in Man, Sex determination, Environmental, Hormonal control of sex determinations.
3. Linkage and crossing over in Drosophila.

UNIT III:

1. Human genetics : Pedigree analysis, lod score for linkage testing, symbols used in Pedigree analysis.
2. Human Genome Project.
3. Human chromosome – Normal Human karyotype, inherited disorders – Allosomal and Autosomal types.

UNIT IV:

1. Nucleic acids : Structure and types of DNA, RNA, DNA replication.
2. Experimental proof of DNA & RNA as genetic material.
3. Eugenics (positive and negative), Genetic counselling.

UNIT V:

1. Genetic code: features.
2. Gene action: Protein synthesis and processing. Transcription and translation in Prokaryotes.
3. Regulation of gene expression in prokaryotes (Lac – Operon concept)

Text Books and References:

Genetics – Verma & Agarwal

Genetics – K.Gupta.

Principles of Genetics – Eldon Jhon Gardener.

Theory and problems of Genetics – W.D.Stansfield

Principles of Genetics – Robert H. Tamarin

Genetics – Monroe W.Stick Berger.

B.Sc., Zoology Major
VI

Part :III

Semester –

Core Paper – XI

Biochemistry and Physiology

(4 credits)

Contact hours per week - 4 hours

Contact hours per semester - 60 hours

Course outcome:

- To study the molecular architecture of eukaryotic cells and organelles, including membrane structure and dynamics;
- To study the principles of bioenergetics and enzyme catalysis;
- To study the chemical nature of biological macromolecules, their three-dimensional construction, and the principles of molecular recognition;
- To study the dietary requirements of man and selected domestic animals;
- To study the metabolism of dietary and endogenous carbohydrate, lipid, and protein;
- To study the principles and major mechanisms of metabolic control and of molecular signalling by hormones

Unit – I 12 hours

Biochemical techniques: pH metry, Paper Chromotography and Spectrophotometry.
Carbohydrate: Outline classification – Structure of Monosaccharide (Glucose),
Disaccharide (Sucrose) and Polysaccharide(Starch)
Protein: Structure and classification
Lipid: Structure and classification.

Unit – II 12 hours

Enzymes: Classification, mechanism of enzyme action and factor affecting enzyme action.
Vitamins: structure and function of Fat and Water soluble vitamins.

Unit – III 12 hours

Digestion: Physicochemical process of digestion and absorption of Carbohydrate, Proteins and Lipids.
Circulation: Mechanism of Heart beat, Pace makers, ECG, Blood pressure and Blood coagulation.
Respiration: respiratory pigments – transport of Oxygen and carbon di oxide – Respiratory Quotient – Mechanism of pulmonary respiration.
Excretion: Structure of nephron and formation of Urine.

Unit IV 12 hours

Muscle physiology: Ultra structure of muscle – theories of muscle contraction
Nerve physiology: Ultra structure of neuron – physiology of nerve coordination.
Reflex Action: definition of vision and hearing in man.

Unit – V 12 hours

Osmoregulation in crustaceans and teleost fish.
Thermoregulation: Poiklotherms and Homeotherms.
Hormonal function: Pituitary, Thyroid, Parathyroid, adrenal, Islets of Langerhans and testes and Ovary.
Chronobiology: characteristics of Circadian rhythm – examples.

References:

Principles of Biochemistry, Lenninger, (2001) Nelson & co., CBS Publishers, New Delhi
Text book of Physiology and Biochemistry, Bell, Davidson and Scarborough, (2005) Livingstone.
Biochemistry, Ambika Shanmugam., (2007) west CIT Nagar, Chennai.
Animal Function – Principles and adaptations. Gordon, S.Maleon, et.al., The Macmillan company.
General Comparative Physiology, Hoar, S.William – (2004) Prentice Hall of Indian Pvt Ltd, New Delhi.

B.Sc., Zoology Major
Core Paper – XII

Part :III
Evolution

Semester – VI
(4 credits)

Contact hours per week - 2 hours
Contact hours per semester - 30 hours

Course outcome:

- Charles Darwin and his contribution to the theory of evolution
- Define natural selection and how it relates to evolution
- The relationship between natural selection and evolution
- To study about adaptive radiation
- To study about the difference between homologous and analogous
- To study how do fossils provide a historical record of evolution

Unit – I 12 hours

Theories of origin of life(Abiogenesis and Biogenesis).

Evidences – morphological, Embryological, Biochemical and Paleontological evidences.

Unit – II 12 hours

Lamarckism and Neo – Lamarckism.

Darwin voyage to Galapagos island.

Darwinism and Neo – Darwinism.

Supplementary theories of Darwin.

Mutation and modern mutation theory.

Modern synthetic theory

Unit – III 12 hours

Micro and Macroevolution – Elementary forces and Mechanism with example.

Adaptive colouration, Mimicry – Batesian and Mullerian types, Co-evolution.

Convergent and Divergent evolution.

Parallel evolution and adaptive radiation.

Unit IV 12 hours

Sources of variation.

Hardy-weinberg Law and evolution.

Isolation – Isolating mechanism and role of isolation in Speciation

Species concepts, mechanism of Allopatric and Sympatric speciation

Unit – V 6 hours

Fossils; Types, methods of Fossilization, methods of dating fossils, geological time table

Horse evolution – Trends, fossil records, orthogenesis

Human evolution _ Fossil records, cultural evolution and future evolution of Man

Text and reference Books:

Organic Evolution, Rastogi, V.B., (2003) Kedar Nath and Ram Nath, Meerat.

Process of Organic evolution, Stabbins

Animal Species and Evolution, Mayr, E

An Introduction of Evolution, Moody, P.A., Kalyani Publisghers, Ludhiana.

Major features of Evolution, simpson, G.G

The Vertebrate story, Romer., A.S.

Evolution, Dobzhansky, Ayala, stebbin and Valentine

ECONOMIC ENTOMOLOGY AND SERICULTURE TECHNOLOGY

(4 credits)

Contact Hours per Week - 2 Hrs

Contact Hours per Semester - 30 Hrs

Course outcome:

- Gain a basic understanding of the balance of insects on the farm/garden (pests and beneficial insects.)
- Be able to identify a number of common pests and suggest methods of control.
- Identify many beneficial and destructive insects and their close relatives.
- Identify the class and order, type of metamorphosis, type of mouthparts, and understand common pest control strategies. Motivating the farmers to plant high yielding mulberry varieties to increase income and productivity.
- Imparting training in mulberry cultivation, silkworm rearing and silk reeling.
- Assist in procurement of improved rearing equipment and construction of separate rearing house.

Unit- I: Insect Growth - 6 hours

1. Salient features of Insects, Dominance of insects among animals,
2. Economic classification of insects.
3. Insect development and metamorphosis, larval and pupal types.

Unit- II: Beneficial Insects - 6hours

Protozoa

2. Apiculture: Biology, production and uses.
3. Sericulture: Biology, production and uses.

Unit- III: Helpful Insects - 6 hours

1. Scavengers, pollinators, predators and parasites effecting biological control.

Unit-IV: Pest Control - 6 hours

1. Physical, chemical, mechanical, biological and integrated control methods.

Unit- V: Medical Entomology - 6 hours

1. House hold insect pests and their control measures. Disease causing vectors – Housefly, mosquito, lice, Tsetse fly – Life cycle, disease transmitted and their control measures.

Text book:

Text book of Economic Entomology, Vasantha Raj David.

Text book of Entomology, - M.S.Moni.

Hand book of Economic Entomology for South India – T.V. Ramakrishna.

B.Sc., Zoology Major. Part-III

Core Paper XIII Practical – III **Biochemistry and Ecology** (5 Credits)

(To be done at the end of the Sixth Semester)

Contact Hours per Week - 2 Hrs

Contact Hours per Semester - 30 Hrs

Course outcome:

- To study the molecular architecture of eukaryotic cells and organelles, including membrane structure and dynamics;
- To study the principles of bioenergetics and enzyme catalysis;
- To study the chemical nature of biological macromolecules, their three-dimensional construction, and the principles of molecular recognition.
- To study about the local and geographical distribution and abundance of organisms (habitat niche, community, bio-geography).
- Temporal changes in the occurrence, abundance and activities of organisms (seasonal, annual, successional, geological)

Biochemistry:

1. Qualitative analysis of protein, carbohydrates and lipids.
2. Instrumentation: Principle and uses of a) pH meter, b) Electrophoresis – Paper Electrophoresis, c) Chromatography – Paper Chromatography, d) Spectrophotometer or Colorimeter, e) Centrifuges.

Ecology:

1. Estimation of Dissolved Oxygen in water samples.
2. Plankton mounting- Fresh water and marine planktons,
3. Study of abiotic factors in aquatic environment – Dissolved oxygen, pH and turbidity.
4. Examples illustrating animal association.
5. Food chain and food web in a pond Ecosystem.
6. Adaptations: a) Parasitic adaptations? – Ascaris, Taenia solium and Sacculina, b) Flight adaptations – Birds and bat, c) Aquatic adaptations – (Model or proper cuttings), d) Burrowing adaptations – Rat/Pangolin.

B.Sc., Zoology Major. Part-III
Core Paper XIV Practical –IV **Genetics, Molecular Biology & Microbiology**
(5 Credits)
(To be done at the end of the Sixth Semester)
Contact Hours per Week - 2 Hrs
Contact Hours per Semester - 40 Hrs

GENETICS & MOLECULAR BIOLOGY

Practicals

1. Simple Mendelian traits in man.
2. Blood Grouping- A, B, AB,O & Rh.
3. Study of Drosophila Culture and isolation of Virgin flies.
4. Mounting of Barr body.
5. Polygenic inheritance.

Models

6. DNA, RNA & Protein synthesis.

Charts

7. Pedigree Analysis.
8. Conjugation, Transformation and Transduction.

MICROBIOLOGY

1. Lab Safety and Aseptic Techniques.
2. Gram staining- Capsular staining, flagellar staining.
3. Isolation of bacteria from pickles/ ice creams/ (Streak plate, Spread plate, Pour plate, serial dilution methods.
4. Visualisation of Bacterial Motility using Hanging Drop Method
5. Microbial Gas production using Durham's tube
6. Measurement of Bacterial cell using stage & Ocular micrometer.

References

Any Laboratory Manual in Genetics & Molecular Biology

Any Laboratory Manual in Microbiology

B.Sc., Zoology Major. Part-III

Core Paper XV Practical –V **Physiology, Biotechnology and Evolution** (5 Credits)

(To be done at the end of the Sixth Semester)

Contact Hours per Week - 3 Hrs

Contact Hours per Semester - 45 Hrs

Physiology:

1. Amylase activity in human saliva in relation to pH and Temperature.
2. Estimation of dissolved oxygen in different water samples.
3. Human blood grouping – Demonstration only.
4. Qualitative analysis of nitrogenous waste products in fish tank water, bird excreta & mammalian urine.
5. Blood pressure demonstration under normal condition and stress.

Biotechnology:

1. Demonstration of P.C.R technique and Southern blot (Demo through CD)

Evolution:

1. Homologous and Analogous organs.
2. Vestigial organs.
3. Fossils.
4. Examples of evolutionary importance – Peripatus and Limulus.
5. Animals with adaptive colouration – Leaf insect, Stick insect and Chaemeleon.
6. Variation – Finger prints.

Study Tour:

Study tour to a minimum of 3 days duration, to be conducted compulsorily, Exposing students to different habit / habitat like forest, pollution area, wildlife sanctuaries, Zoo, aquarium, Marine habitat, Bird sanctuaries, Museums, Snake parks, Crocodile park, Genetic clinics, Biotechnology industries, Vermiculture farms etc., and submit a Tour report.